

Modelling the Influence of Communication on Fertility Behaviour of Women in Rural Bangladesh

Kaberi Gayen

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Abstract

The total fertility rate in Bangladesh declined from 6.3 children per women in 1975 to 3.3 in 1997-1999. This decline of 48 per cent over a 25-year period occurred without a substantial improvement in socio-economic status, health conditions and other factors thought to be essential for fertility decline. In this thesis it is postulated that current fertility behaviour is a manifestation of ideational change, which has occurred through mass media and interpersonal communication channels. To investigate the influence of communication on fertility behaviour and to control for demographic and socio-economic and cultural variables, 724 married women of reproductive age were interviewed from six rural villages of the six administrative divisions of Bangladesh. Another village was surveyed to compare the influence of religion. Data were collected in a full network basis in that one currently married woman with at least one child from each household of the entire village was interviewed. Sociometric data along with socio-economic-cultural and family planning practice data were collected using a structured questionnaire. The data have been analysed using statistical methods to construct models of factors, which influence the total number of children a woman has and those that determine the likelihood that a woman practices family planning. The main influencing variables to explain the total number of children were found to be wife's age, age at first child born, number of family members, demand for male children, demand for female children, death of male children, place of giving birth, housing score, religion, equipment score, land property, FWA and information score. Whereas the influencing variables to explain the family planning practice were demand for male children, death of male children and variables connected with communication such as degree of interpersonal communication, mass media exposure, husband, Family Welfare Assistants (FWAs) and frequency of discussion with FWAs. Communication variables, especially interpersonal communication, were found to be most important in explaining family planning practice. More particularly, the dominant source of general information is relatives and friends. FWAs followed by friends and relatives are the main source of family planning information that along with husband influence fertility decisions. Hence, there was a need to further understand the web of interactions among individuals, peer groups and opinion leaders using social network analysis. The web of communication links in which an individual exists and takes fertility decision was then modeled with the collected sociometric data. To do this,

three matrices were constructed to reflect any communication link, the strength of these links and approval of family planning. Various centrality measures (in-degree, out-degree, betweenness and power), clique patterns and actors positions in the network were produced and analysed using Ucinet-6. This revealed that the actors who were not strongly connected or exist in the periphery of this web tended not to practice family planning. Also it was found that actors who overlap more than one clique are more likely to practice family planning. Variables created from the centrality measures were then added to the regression models for the total number of children and the use of family planning. In both the cases sociometric variables were found significant which further enhanced the explanation of fertility behaviour of the women in rural Bangladesh. Using Structural Equation Models the direct and indirect effects of these variables were determined. Demographic, socio-economic-cultural variables were more directly associated in explaining total number of children while communication variables were directly associated in explaining family planning use, and family planning practice has a direct influence on the number of children born. Thus, as communication directly influences family planning practice it has an indirect influence on the Total Fertility Rate. From this work it is recommended that the service that was provided by the FWAs be reestablished and strengthened, husbands should be targeted in family planning motivation programmes and male contraceptive methods should be promoted. Also more motivational programmes should be incorporated in family planning programmes to create a positive image of female children and the extent of the social interaction among village women should be increased.

Declaration

**I declare that the work presented in this thesis was carried out by myself at
Napier University, unless otherwise acknowledged.**

**Kaberi Gayen
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Edinburgh**

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Abu (cultural activist), Gouranga Roy Chowdhury (Ex-Zaminder of Royer Kathi village and a social worker) and Manjila Begum (house-wife) collected data in Barisal division. Students of Journalism Department in Chittagong University Md Morshedul Islam, Jhimi Chakma, Rejaul Karim, Shameem Jahangir, Tati Barua, Nihar Shirin Runu, Mainul Islam Liton collected data in Chittagong division. Probir Paul (Lecturer, Fultala Degree College), Shova Paul (family planning field worker, Paygram), Laltu Paul (HSC student), Md Halim Sheikh (newspaper delivery person) and Tania Islam (undergraduate student in Government BL College) collected data in Khulna division. Moni Paul, Suraeya Akhter, Sanjoy Krishna Biswas, Sharmin Siraj, Hamida Akhtar and Syeda Mashina Akhter of Anthropology Department collected data in Sylhet division. Shamsun Nahar Begum (member, Nagar Pur Union Parishad), Bilkis Begum (teacher, Nagar Pur Aliya Madrasa, Tangail), Hasi Begum (house-wife), Runu Khatun (house-wife) and Md Salam Mollah (honey-bee cultivator, Nagar Pur Tangail) collected data in Dhaka division. Sumona Sarkar, an MPhil research student of Rajshahi University, was all along with me in this data collection procedure. They embraced the stressful job of interviewing woman from each household of the village as their own job. I want to take the opportunity to thank them all.

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Dedication

To the women of Bangladesh

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Chapter 1

Introduction

The aim of this research is to understand the factors that have influenced the recent fertility behaviour in rural Bangladesh with an emphasis on the role played by communication. The role of communication in determining the decision to adopt family planning in rural Bangladesh was investigated while controlling for other socio-economic and cultural variables. To achieve this broad aim of the research, women in seven rural villages and one small town *mahalla* were interviewed with structured questionnaires. This gave a database of 724 cases, which was then analysed and conclusions were drawn. The back ground to the study, the research objectives and the research approach are detailed in this chapter, which is organised in the following sections:

Section 1: Background to the study;

Section 2: Objectives of the research;

Section 3: Hypotheses to be tested;

Section 4: Research Method;

Section 5: Organisation of Chapters.

1.1 Background

The total fertility rate (TFR) of Bangladesh declined from 6.3 children per woman in 1971-1975 to 3.3 in 1997-99 (The Fifth Five Year Plan (FFYP) 1997-99; Bangladesh Demographic and Health Survey (BDHS) 1999-2000), a decline of 48 per cent over a 25-year period. The gradual decline of TFR is recorded as 6.3 in 1971-75, 5.1 in 1984-1988, 4.8 in 1986-1988, 4.3 in 1989-1991, 3.4 in 1991-1993, 3.3 in 1994-1996 and then remained constant in 1997-1999 (BDHS 1999-2000). Several studies have documented this decline and demographers have commented that the third stage of the fertility transition has begun (see Cleland *et al* 1994; Amin *et al* 1994; Mitra *et al* 1994). This decline has created interest among researchers, policy makers and academicians because such a dramatic change in fertility has occurred without a substantial improvement in socio-economic status, health conditions and other factors thought to be essential for fertility decline. Cleland *et al* (1994) have termed this decline as a “success in a challenging environment”. They explained that such a

dramatic and steep decline is unprecedented for a country with such poor social and economic conditions and low status of women. The fertility decline in Bangladesh Figure is displayed in figure 1.1-1.

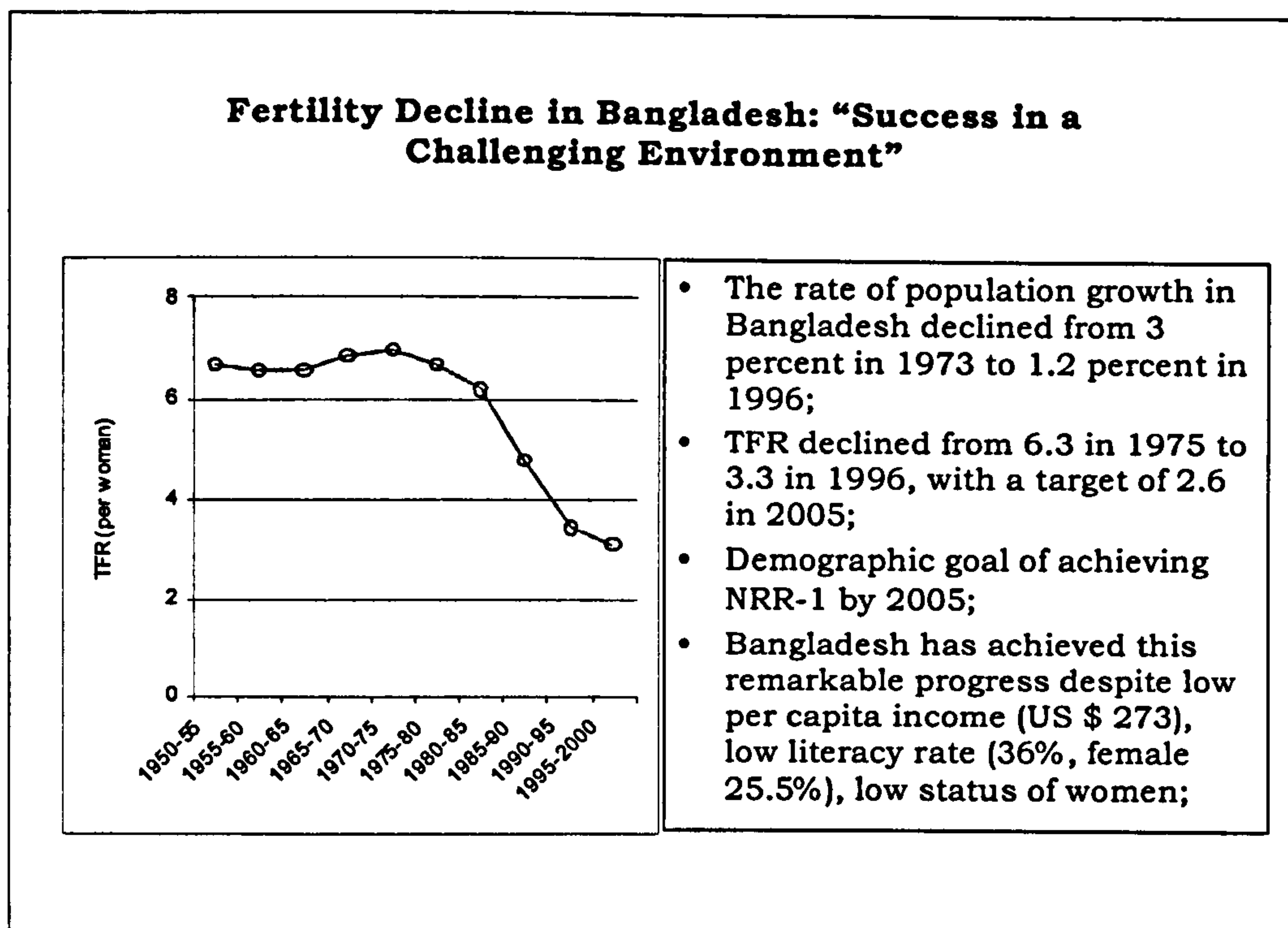


Figure 1.1-1: Fertility Decline in Bangladesh

Some researchers have attributed this achievement to the increased use of contraception. The contraceptive prevalence rate among married women in Bangladesh increased from 8 per cent in 1975 to 54 per cent in 1999-2000. The prevalence of modern methods has increased even faster, more than eightfold, from 5 per cent in 1975 to 43 per cent in 1999-2000. This increased contraceptive prevalence in turn has been credited to a strong and successful family planning programme in the country. The Bangladesh Family Planning Programme is recognised as a success story in the contemporary third world (Cleland *et al* 1994).

Some (for example, Islam *et al* 1998) pointed to the factors that Bongaarts (1982) termed as the 'proximate determinants' (*marriage, contraception, induced abortion and lactational infecundability*) of fertility. Many put emphasis on various socio-economic changes as well as improvement of women-status (Ullah and Chakraborty 1993). The role of Non-Government Organisations (NGOs) and several communication aspects are also perceived as contributing factors. In this research an attempt is made to test all these socio-economic-cultural as well as communication

variables to understand the factors that might have influenced the recent fertility behaviour of rural Bangladesh and the magnitude of the role of communication in it.

1.1.1 Rationale for Understanding Fertility Decision Making in Bangladesh

For many reasons it is important to understand the factors that influence fertility decisions in Bangladesh. Bangladesh is a small country of total 147, 570 square kilometres including forest area of 19710 square kilometres and river area of 8236 square kilometres. Agriculture is the most important sector of the nation's economy. It accounts for 30 per cent of the gross domestic product (GDP) and employs 64 per cent of the work force (Bangladesh Bureau of Statistics (BBS) 1997). Industry is still at a nascent stage. The per capita income is only US\$275 and according to Government of Bangladesh (Government of Bangladesh (GOB) 1994) and the World Bank Report (1995: xvii), half of the Bangladesh's population in the 1990s had an income below the poverty line. According to the preliminary report of Population Census 2001 total population is around 129 million compared to about 42 million that was within this area in 1941 (BBS 1997). This huge growth has made Bangladesh the ninth most populous and one of the most densely populated countries in the world. In 2003 this population is more than 135 million (The World Factbook 2003, World Bank Group Country Brief 2003, Unicef 2003) with a yearly growth of 2.06 per cent (according to the preliminary report of Census-2001, growth is 1.48) that adds 4.2 million more people each year (Unicef 2003). The population density per square kilometre is 834 (Census-2001 preliminary report). According to the 1991 census, 45 per cent of the population is under 15 years of age, 52 per cent is between 15 to 64 years and 3 per cent is of 65 years or over. This relatively young age structure of the population indicates the continued and rapid population growth in future, even at the face of steep fertility decline. For example, in 1992, Bangladesh had about 22 million married women of reproductive age; this rate is projected to rise to 31 million (GOB 1994) by 2002. Even if the replacement-level fertility is achieved by the year 2005, as targeted by the government (The FFYP 1997-2002), there will be a net increase of 42.74 million people by the year of 2020 and the country will have to wait 40-45 years for its population to stabilise at around 170 million. One projection suggests that the population of Bangladesh may stabilise at 211 million by the year of 2056 (BDHS 1999-2000).

In the FFYP (1997-2002), probable implications of the estimated net increase of 42.74 million people by 2020 are discussed. According to this government document, the most serious implication of population growth will be in the social sector. The number of primary education enrolments in 1995 was 17.3 million giving 92 per cent rate with a teacher-student ratio of nearly 1:70. For providing a universal primary education and improving this teacher-student ratio to 1: 50, according to this plan, it will require almost double the present level of resources to provide more teachers, classroom facilities, equipment and institutions. At present, the doctor-patient ratio is 1:5506, hospital bed-patient ratio is 1: 3231 and per capita health expenditure is TK 135 (less than £1.5) per annum. To improve this situation “up to a minimum satisfactory level”, the per capita health expenditure to cover the entire population will need to be doubled. But the immediate impact will be on land. The population density of around 850 per square kilometre will increase to 1,130 by 2020. This will further aggravate the poverty and cause adverse impact on per capita food production, food availability, and job market.

According to the UNDP Human Development Report (2002), the incidence of poverty has decreased from 58.8 per cent in 1991-92 to 49.8 per cent in 2000. Despite this 9 per cent decrease, actual numbers of poor remain the same at 63 million due to a high population growth. Similar concern is reported by Unicef (2003), which pointed out that despite the considerable decline in infant and under-5 child mortality, the under-5 mortality rate is still very high and about 900 children die every day due to various diseases, malnutrition and accidents, in particular, drowning. According to the same report, around 26,000 women die every year due to pregnancy-related complications. The maternal mortality rate (MMR) in Bangladesh during 1998 to 2001 was in the range of 320 to 400 per 100,000 live births. This rate is, according to the International Food and Nutrition Center report on Bangladesh Integrated Nutrition Project (2003), “nearly 200 times higher than in the United States, and more than 10 percent of children die before their fifth birthday.” Unicef (2003) repeats that less than 50 per cent of women use antenatal facilities and more than 90 per cent of births take place in the home, mostly attended by untrained persons. The nutritional status of women is poor, with high prevalence of iron deficiency anaemia (51 per cent) for pregnant women and (33 per cent) for non-pregnant mothers. The proportion of low birth weight babies is estimated to be between 30 per cent and 50 per cent of live births. About one half of all girls still marry before reaching 18.

From the discussion above, though there has been some limited success evident in some areas, the overall development is outpaced due to higher rate of population growth (World Bank Group Country Brief 2003, Unicef 2003, UNDP Human Development Report 2002, FFYP 1997-2002). All these reports and especially the projections are made on the assumption that the trend of TFR decline would continue but to make the situation worse, for the last 8 years the TFR had a plateau at 3.3 (BDHS 1999-2000). The probable consequence of this stagnation has created huge concern among policy makers.

To understand the factors, which influence fertility behaviour of rural women, is of immense importance to the demographic researchers and policy makers in Bangladesh in order to construct suitable family planning programmes. This may also help other developing countries with similar background to understand and overcome their situation.

1.1.2 Rationale for Focusing on Role of Communication Processes

In developing countries communication processes have been found to promote discussion of family planning, increase clinic visits, and to raise the levels of contraceptive use. In some countries the influence of campaigns on radio and television has helped create an ideational change and to make family planning a 'household word' and a 'community norm' rather than the 'taboo topic' it had been. The mass media as well as the influential elites of the society such as opinion leaders, especially in traditional societies, help create awareness about desired family size, fertility control and the availability of the contraceptive methods while interpersonal, small group and peer group communication directly influences the methods used. It is also evident that couple-communication makes contraceptive use more acceptable and helps to counteract son preference even in a religiously bonded, patriarchal society like Pakistan (Mahmood and Ringheim 1997).

Several communication factors are identified as important in Bangladesh. Notable among these are, the importance of field-worker visits in Bangladesh's family planning programme (see Janowitz *et al* 1999; Kamal and Sloggett 1996; Rob and Cerenda 1992), the impact of outreach on the continuity of contraceptive use in rural Bangladesh (Hossain and Phillips 1996), and the community resource impact on reproductive behaviour (Saha 1994). It is evident from research findings that in rural

Bangladesh visits by a family welfare assistant (FWA) have a circular relationship with contraceptive use (Kamal and Sloggett 1996).

Research by Islam and Mahmud (1995) further indicates that frequent visits by family planning workers greatly improve the contraceptive use rate among adolescents. The research by Rob and Cerenda (1992) on the programme success of International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) Matlab Project clearly depicts the presence of female community workers, most of whom are contraceptive users, as an important component. Janowitz *et al* (1999) suggest that repeated visits not only provide a convenient source of contraceptive supply, but also catalyse latent demand for methods through repeated dissemination of information. Citing works of Phillips *et al* (1993, 1996) and Hossain and Phillips (1996), they argue that demand for contraceptives would effectively collapse without the stimulus provided by repeated exposure to home visits. In the FFYP (1997-2002), the Bangladesh government also recognised the importance of IEC (Information, Education, Communication) programme in transforming societal conservative attitudes towards family planning in the mid-seventies to the present level of almost universal support for it.

Started in 1989, the follow-up survey results of *Jiggasha* project in Bangladesh show that in villages with family planning field workers as well as *Jiggasha*, the contraceptive prevalence rate (CPR) increased from 38 per cent to 56 per cent and in villages with field workers but without *Jiggasha*, the CPR rose from 26 per cent to 32 per cent (Population Reports 2001). The approach used in the *Jiggasha* (a Bangla word for ‘to inquire’) project includes village discussion groups composed of either men or women who meet separately. Trained field workers collaborate with male and female opinion leaders in the village to teach about contraceptive methods, answer questions, distribute contraceptives, and make referrals. In a recent work, using the 1993-1994 BDHS data and in-depth interviews of 40 women, Marten (2002) indicated the effect of social interaction on desired family size and contraceptive use among women in Bangladesh. Thus once considered a supportive service, communication is now being perceived as not only effective but also as crucial in creating awareness, increasing knowledge, building approval and influencing behaviour. So, the main area of interest pursued in this thesis is to understand how communication processes work to increase family planning use and influence small family norm amongst the women in rural Bangladesh.

Since Bangladesh is still a developing country that could achieve only a minimal change in social-economic measures (discussed in sub-section 1.1.1), is predominantly a Muslim country with strong religiosity and continuation of strong son preference, the ideas of socio-economic development or wealth-flow arguments, or the ideas of secularisation-modernisation-westernisation do not appear to be appropriate to explain fertility reduction or the increased modern contraceptive practice in rural Bangladesh. Thus the argument to be pursued in this thesis is that key elements causing greater uptake of contraception is an ideational shift to a small family norm (according to BDHS 1999-2000, the mean ideal family size among married women is 2.5 children since 1993-1994, compared to 4.1 in 1975) and communication has been instrumental in achieving this.

As discussed earlier in this section, a number of studies have been conducted on the influence of family planning field workers in contraception practice. Mainly the role of government/non-government change agents on contraceptive practice were addressed in these studies, mass media influences were ignored. Amongst the studies that addressed the role of interpersonal communication in fertility behaviour in rural Bangladesh, the work of Kincaid *et al* (1993) is most prominent. In the *Jiggasha* project by Kincaid *et al* (1993), how social network approach affects contraceptive behaviour has been tested in 12 villages in the Trishal 'thana' of Mymensingh district from 1989 to 1992. The data collected from the replication of 'Trishal' project in seven new 'thans' by the Ministry of Health and Family Welfare in early 1994 was also analysed by Kincaid (2000). In both the cases data were collected using snowball sampling. According to Kincaid (2000: 220), "The snowball sample suffers from the non-coverage of women who are unlikely to be in the social networks of potential volunteer link persons. Thus, technically speaking, the results only generalize to women who are likely to be within the social networks of centrally located women identified by FWAs trained in the social network approach". Thus despite its huge merit the *Jiggasha* project results represent the contraceptive behaviour from only one district and only of the women who are likely to be within the social networks of centrally located women identified by FWAs. In the work of Marten (2002), importance of social interaction on contraceptive behaviour has been analysed using BDHS (1993-94) data for testing mass media influence and the in-depth interview of only 40 women for testing the influence of social interaction. Thus to analyse the

simultaneous influences of mass media, interpersonal communication and more specifically communication networks that include central actors as well as isolates is yet to be investigated. Here lies the importance of the present research.

A comprehensive analysis of the influence of various communication factors on women's fertility behaviour using conventional statistical methods and communication network approach, while controlling for other socio-economic-cultural determinants, is used to ascertain the central argument of the thesis.

1.2 Research Aims

The prime aim of this research is to find out whether communication has any influence on fertility behaviour of the women in rural Bangladesh. If there is any, then the next aim is to find out what type of communication has the greatest influence on the fertility behaviour of the women in rural context of Bangladesh as not all forms of communication are equally effective for changing fertility behaviour in every context. Rogers (1981:29) argues, "Mass media channels are relatively more useful in creating awareness-knowledge about an innovation, while interpersonal channels are better able to persuade individuals to form favourable attitudes about an innovation". A further aim is to determine the magnitude of the influence of various communication processes while controlling for other socio-economic-cultural variables that may also have influence.

Thus the aim of this research is to examine at the micro level whether the communication network structure influences the decision to choose a family size and at the macro level, whether society's other relational components (such as economic, social, cultural and religious) influence the decision. These aims are to be achieved by testing a set of hypotheses.

1.2.1 Key Hypotheses to be Tested

Hypothesis 1: Communication has a significant impact on the number of children a woman has via the decision to use contraception;

Hypothesis 2: Communication has more impact than demographic variables on fertility behaviour;

Hypothesis 3: The influence of communication on fertility behaviour is greater than that of socio-economic variables;

Hypothesis 4: Interpersonal communication plays a greater role than mass media in fertility decision-making;

Hypothesis 5: The social connectedness of women is an important influence on fertility.

These hypotheses are supplemented by a set of sub hypotheses, which are elaborated in chapter 3, (all the hypotheses are listed in Appendix 1).

1.3 Research Method

This research adopts a quantitative approach and the data were collected from the women of seven villages of Bangladesh using a structured questionnaire.

1.3.1 Study Design and Data Collection

Bangladesh has a long experience of data collection especially for decennial census enumeration since 1872 and there have been a number of national demographic surveys that include: the National Impact Survey (NIS), a retrospective fertility survey conducted in 1969; the Bangladesh Retrospective Survey of Fertility and Mortality (BRSFM) conducted in 1974 and the Baseline Demographic Survey (BLDS) conducted in 1980. The Bangladesh Bureau of Statistics (BSS) and Contraceptive Prevalence Surveys (CPSs) are conducted regularly. There is also a vital registration data station Demographic Surveillance System (DSS) in Matlab that has been collecting data since 1966. Two other important nation-wide surveys are: the Bangladesh Fertility Surveys (BFSs) conducted in 1975-76, 1989; and the Bangladesh Demographic and Health surveys (BDHS 1993-94; BDHS 1996-97 and BDHS 1999-2000). Despite the existence of these data sources, the specific nature of the research has required collecting data from the field. This was required mainly in order to understand the communication network amongst rural women.

1.3.1.1 Women are the Sample Population: In Bangladesh, among total practitioners of family planning methods, women contribute around 90 per cent (BDHS 1999-2000). Thus as women are the main practitioners of family planning devices, they are the target sample of this research.

1.3.1.2 Sample Areas: As around 80 per cent of the total population of Bangladesh live in rural areas, data were collected from rural areas. Six villages were selected from the six administrative divisions of Bangladesh. The villages are representative of the varied characteristics of the six divisions. One more village was sampled to measure the variance in family planning practice on religion basis.

1.3.1.3 Questionnaire Design and Data Collection: To address the demographic, socio-economic-cultural perspectives and sociometric conditions of the women of Bangladesh, a structured questionnaire was developed. Then data were collected interviewing women with this structured questionnaire. The researcher collected these data with the help of trained interviewers who were mainly university students. Once compiled this gave a useable data set of 724 cases.

1.3.2 Data Analysis

Demographic, socio-economic-cultural data were analysed to measure the influence of economic, cultural, social, religious and informational components using various statistical modelling (regression, logistic regression and structural equation modelling). Sociometric data were analysed to measure the impact of communication network structure on the functioning of the group and/or the influence of this structure on determining individual's fertility behaviour within the network. The social network analysis approach was used to analyse sociometric data and generate sociometric variables that were then used in further statistical modelling.

1.3.2.1 Software Used: To undertake descriptive statistics and statistical modelling including bivariate and logistic regression SPSS was used. AMOS-6 was used for the structural equation modelling. For sociometric data processing and analysis, visual basic-6 and UCINET -6 were used. To persuade graphical presentation of cliques and network structure, Netdraw was used.

Displayed in the flow chart in figure 1.3.1-1 is the organisation of the research.

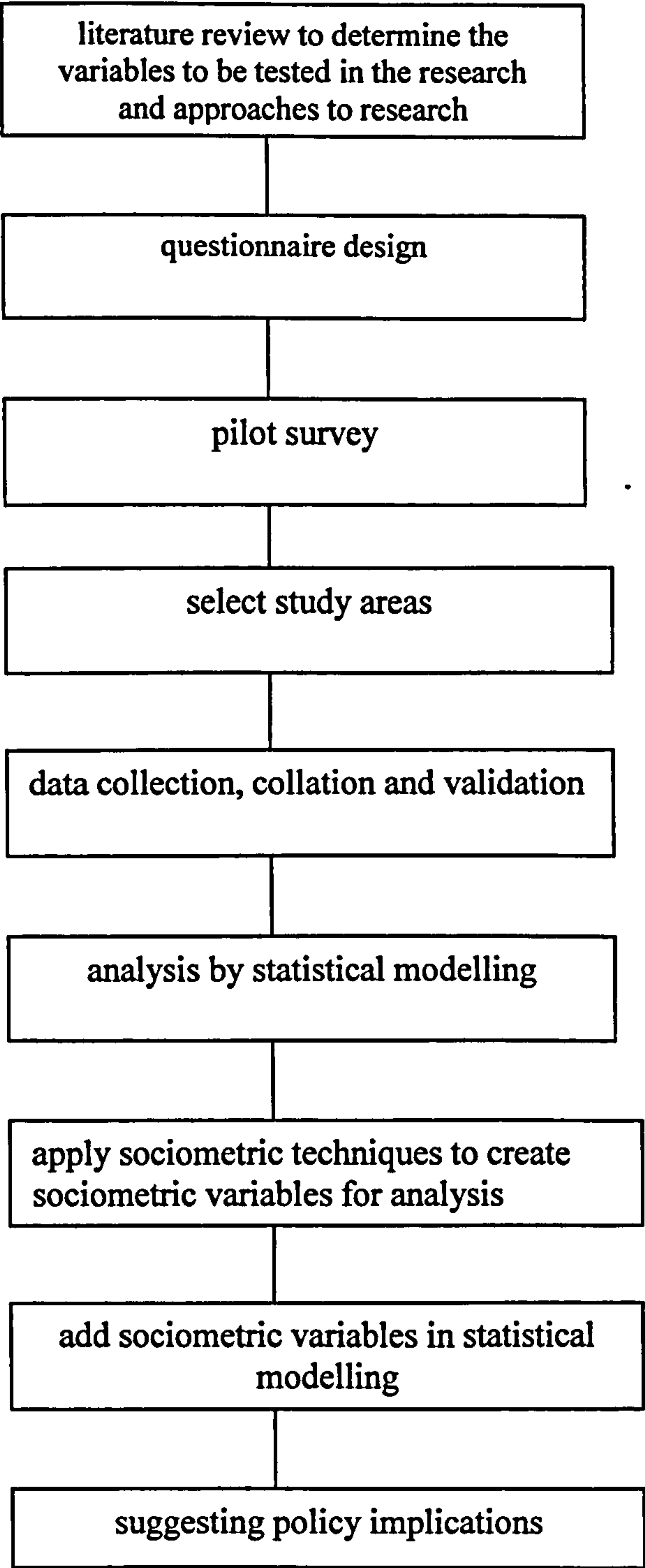


Figure 1.3.1-1: Flow-chart of the Organisation of the Research

1.4. Organisation of the Thesis

This thesis is comprised of nine chapters including this introductory chapter. Chapters 2, 3 and 4 are mainly literature review chapters that helped develop the analytical framework, described in chapter 5 are the data collection procedures and analysis

methods, the main analytical chapters are 6, 7 and 8 in which the hypotheses are tested and chapter 9 is the concluding chapter. The chapter wise organisation is described below.

1.4.1 Chapter 1: The research background, research design, data collection and research methods to be used are outlined in this chapter. The organisation of the thesis is also outlined in this chapter.

1.4.2 Chapter 2: Theories of communication are reviewed in this chapter to determine the role of these communication models and theories in personal decision-making in general and fertility behaviour in particular. The idea of communication network analysis as a practical device to research human interaction in a system whose underpinning theory is the convergence model of communication is also introduced in this chapter.

1.4.3 Chapter 3: The concepts of communication network analysis are outlined in this chapter. Various network properties, their usage, difference of this approach to other conventional research methods, and the particular relevance of this research approach to understand the fertility behaviour in rural Bangladesh is then discussed. Also presented are network properties that are to be tested in this research.

1.4.4 Chapter 4: Various concepts and theories on fertility transition are reviewed in this chapter. Starting from the classical demographic transition concept, various economic, social, cultural and communication (both mass and interpersonal) theories on fertility transition are outlined. Then the variables that are perceived to be important in describing fertility behaviour are discussed and particular reference is made to Bangladesh.

1.4.5 Chapter 5: The survey design, developing the questionnaire, pilot survey, sampling the population, the study areas and the data collection procedure of this research are described in this chapter. In addition, the approach to the analysis of the data is presented.

1.4.6 Chapter 6: The analysis of various demographic, health, socio-economic-cultural and communication variables is the subject of this chapter. Presented first are the descriptive statistics of each variable tested and then the association of these variables with the total number of children and the likelihood of family planning use

using linear regression and logistic regression analysis is given. Finally presented in this chapter are the results obtained applying the structural equation model to show the direct and indirect influences of the variables on the number of children and the use of family planning.

1.4.7 Chapter 7: The development of sociometric matrices, the results of sociometric techniques to measure the in-degree centrality, out-degree centrality, betweenness centrality, Bonacich Power Index, clique structure and network structure to reveal the pattern of communication in each of the surveyed areas are presented in this chapter. The sociometric variables created from the various centrality measures are detailed in this chapter.

1.4.8 Chapter 8: In this chapter the sociometric variables created in chapter 7 are added to the statistical models formed in chapter 6 to get the final models of the explanatory variables to explain the variance of number of children and the family planning practice among the women interviewed. The association between the sociometric variables and the type of family planning method(s) used are also presented in this chapter.

1.4.9 Chapter 9: Discussion of the findings in this research is the main focus of this chapter. Also discussed in this chapter are the limitations of the study, contribution of the study, and the recommendation for policy implications. Finally recommendations for future research are given.

Chapter 2

Reviewing Communication Processes

Introduction

The quest of the present research is to measure the influence of communication on the fertility decision-making in rural Bangladesh. In this chapter an attempt has been made to understand what communication is, how it works, the type of role(s) communication can play in different situations and to inform of a suitable approach to conducting communication research to explain the fertility behaviour of the women in rural Bangladesh. To evaluate the probable effects of communication models in personal decision-making in general and on fertility behaviour of the women in rural Bangladesh in particular. This chapter is organised in *four* sections:

Section 1: definition and taxonomy of communication;

Section 2: functions of communication;

Section 3: review of models of personal decision making processes;

Section 4: review of communication models and the relevance of these models in explaining both personal decision making processes and fertility decisions in rural Bangladesh;

Section 2.1: Definition and Taxonomy of Communication Processes

2.1.1 Defining Communication

According to Wikipedia (2003), the Latin root word of communication is *communicare*, which has three possible meanings:

- i) “to make common”;
- ii) *cum+munus*, i.e. having gifts to share in a mutual donation;
- iii) *cum+munire*, i.e. building together a defence, like the walls of a city.

Communication can be thought of as sharing and efforts to reach a “commonality”. Like the root word *communicare*, communication has also been perceived and defined in many diversified ways. For example, in the simplistic *transmission model*, communication is defined as “the process by which an idea is transferred from a source to a receiver with the intent to change the receiver’s behaviour” (Rogers and Kincaid 1981: 32), whereas the *constitutive model* defines communication as an ongoing

process that symbolically forms and re-forms people's personal identities, their social relations, their common world of meaningful objects and events, their ideas and feelings, and their routine ways of expressing these socially constructed realities (Craig 2000). Communication is multidisciplinary and the "diversity of communication ranges from the mass media and popular culture, through language to individual and social behaviour" (Fiske 1982: xiii). Thus with changing perspectives, definition of communication also changes. Dance (1970) identified 126 published definitions. Some of these are linear in nature, some are interactive, and some are transactional. The broad categories of defining and perceiving communication are discussed in this chapter with reference to their relevance in understanding the fertility behaviour.

2.1.2 Taxonomy of Communication Processes

Communication has been classified in various ways as it takes a wide variety of forms, from two people engaged in a face-to-face conversation, to gesture, to messages sent over global telecommunication networks and so on. According to the *setting*, communication has been classified in *three* broad categories:

Intrapersonal communication - the form of communication that a person has with one's own-self and is perceived as the basis and foundation of all other forms of communication.

Interpersonal communication – involves communicating with people immediately present, such as one-to-one and group conversations. It is also defined as communication that occurs between people who have known each other for some time. Importantly, these people view each other as unique individuals, not as people who are simply acting out social situations (Dennis *et al* 1994). This covers the sociological, psychological, speech and rhetorical theories of communication. This form of communication is useful to understand the influence of social interaction in fertility behaviour.

Mass communication – refers to the process by which a complex organisation with the aid of one or more machines produces and transmits public messages that are directed at large, heterogeneous, and scattered audiences. Message transmitted through radio, television, cinema, newspaper, magazines are the forms of mass communication. This is relevant to understand the effectiveness of national or state family planning messages.

However, based on these three basic concepts, communication theory emerged as a distinct intellectual topic only in the mid-twentieth century. The term, *communication theory*, was first used in the 1940's by electrical engineers with reference to the mathematical analysis of signals. Shannon and Weaver's *The Mathematical Theory of Communication* (1949) and Wiener's *Cybernetics* (1948), many argue, created the dawn of a new science of communication. The technical vocabulary of information transmission and feedback entered the common language and was taken up by social scientists, especially in the booming interdisciplinary field of communication research. Ideas from physical science and engineering, linguistics, anthropology, sociology, psychology, and philosophy were absorbed and reinterpreted as theories of communication.

According to Craig (2000), currently, at least *seven* major traditions of communication theory can be distinguished:

Rhetorical tradition: refers primarily to the theory and practice of public and persuasive communication. From the very beginning of the family planning programme in Bangladesh, the target is to persuade people about the economic and health benefits of having fewer children resulting from practicing family planning. Examples of this are displayed in Appendix 2.

Semiotics tradition: is the study of signs. In the rural setting of Bangladesh where women can neither read nor write, some signs and symbols related to family planning are of use. For example, according to the National Media Survey 2002, a high awareness rate was found among respondents about various family planning and child-health related logos. 84.6 per cent of the respondents, who came across these logos, could understand at least one correct meaning of the *Smiling Sun*, 85.5 per cent the *Green Umbrella* and 86.1 per cent Social Marketing Company (SMC) logos.

Phenomenological tradition: perceives communication as the experience of self and other in dialogue. Many dyadic and small group communication theories evolved from this tradition. The approach used in *Jiggasha* project (Kincaid 2000), or focus group discussions on various family planning issues, are examples of this theoretical tradition's practical use.

Cybernetic tradition: conceptualises communication as information processing to measure the impact of mass media messages on human behaviour and society. It

downplays the differences between human communication and other kinds of information processing systems. Family planning messages transmitted through mass media were found to have influence to increase awareness about family planning use in the context of Bangladesh.

Social psychology tradition: describes communication as social interaction and influence. In traditional societies like rural areas in Bangladesh, social interaction and social influence were found to have important consequences on family planning behaviour (Kincaid *et al* 1993; Marten 2002)

Socio-cultural tradition: emphasises communication as a symbolic process that produces and reproduces shared meanings, rituals, and social structures. For example, family is the centre of all social activities in rural Bangladesh. Keeping this social structure intact, communication reproduces the new meaning of “happy family” transforming it into a “small family is a happy family”. The logo of two-child happy family thus upholds the symbolic process of communication that emphasises on traditional social structure and at the same time introduces the new way of rebuilding that structure (see Appendix 2).

Critical tradition: defines communication as a reflexive, dialectical discourse essentially involved with the cultural and ideological aspects of power, oppression, and emancipation in society. The argument of small family norm against big family, argument of equal status of children irrespective of sex, playing up the arguments on behalf of contraception use against religious restrictions, are some examples of ways the critical tradition of communication is used to influence the family planning behaviour in Bangladesh.

These seven traditions that include the most prominent intellectual sources of present day communication theory, are hard to define independently. For example, the persuasive characteristic of Rhetorical tradition is common in all the other traditions. Thus ideas from across the traditions of communication theory can be mixed in different combinations to serve the particular functions of influencing family planning behaviour in the particular context of rural Bangladesh.

Section 2.2: Functions of Communication

Persuasion or social influence, socialisation, social support, information processing, conflict, decision-making, and entertainment are a few of the more widely studied

functions of communication (Craig 2000). The distinctions between these functions are not always very sharp as found in the discussion of various traditions of communication theory. Communication intended to be persuasive can also be entertaining. For example, *Sukhi Sangsar* (Happy Family) is a popular weekly radio programme on family planning in Bangladesh that transmits family planning messages through songs, interviews with celebrities and small dramas on the benefits of having fewer children. Another TV serial *Sabuj Chhaya* (Green Shade), which promotes awareness about family planning and health service, became very popular in Bangladesh.

As an alternative to manipulative uses of communication, research focused on the promotion of more humane and therapeutic functions of communication such as interpersonal bonding, group cooperation, and conflict resolution. Rather than searching the bare “hypodermic needle action” like the influence of media messages, emphasis has been given to the mutual sharing and influence in interpersonal relationships and group behaviour, along with other components of the society, to understand the interactive influence of the variables in a communicative situation. Whatever might be the shift in research methods and the philosophy behind it, how communication processes influence human behaviour and personal decision making process is always the prime objective of human communication.

2.3 Communication and Personal Decision Making

In this section the decision-making procedure in reference to key decision-making models are discussed and the effects of communication in the decision-making process is evaluated.

Decision-making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. According to Harris (1998:1), “making a decision implies that there are alternative choices to be considered, and in each case the aim is not only to identify as many of these alternatives as possible but to choose the one that best fits our goals, desires, lifestyle, values, and so on”. Harris (1998) argues that decision-making is the process of sufficiently reducing uncertainty and doubt about alternatives to allow a reasonable choice to be made from among them. Thus, every decision involves a certain amount of risk.

Janis and Mann (1977: 171-178) explained *five* sequential stages of decision-making as:

Stage 1: Appraising the Challenge.

Key Question: Are the risks serious if I don't change?

Stage 2: Surveying Alternatives

Key Question: Is this (silent) alternative an acceptable means for dealing with the challenge?

Stage 3: Weighing Alternatives

Key Questions: Which alternative is the best? Could the best alternative meet the essential requirements?

Stage 4: Deliberating about Commitment

Key Question: Shall I implement the best alternative and allow others to know?

Stage 5: Adhering Despite Negative Feedback

Key Questions: Are the risks serious if I don't change? Are the risks serious if I do change?

Almost the same steps are involved in the conflict model of the decision-making process by Janis and Mann (1977) and Harris (1998). Janis and Hovland (in Sereno and Mortensen 1970) however explained the influence of communication in decision-making process.

According to Janis and Hovland (in Sereno and Mortensen 1970), whenever an individual is influenced to change their beliefs, decisions, or general attitudes, certain identifiable external events occur which constitute the *communication stimuli*, and certain changes in the behaviour of the person take place, which constitute the *communication effect*. Communication stimuli include not only what is said, but also all of the intentional and unintentional cues, which influence a member of the audience, including information as to who is saying it, why he is saying it, and how other people are reacting to it. Thus communication is at the core of the personal decision-making process. The model of *Attitude Change* by Janis and Hovland (1957) clearly presents the effect of communication in decision-making processes and shows how communication, can lead to a change of attitudes.

Presented in figure 2.3-1 is a schematic outline of the major factors that according to Janis and Hovland (1957) enter into attitude change. The importance of communication is clearly apparent in this figure.

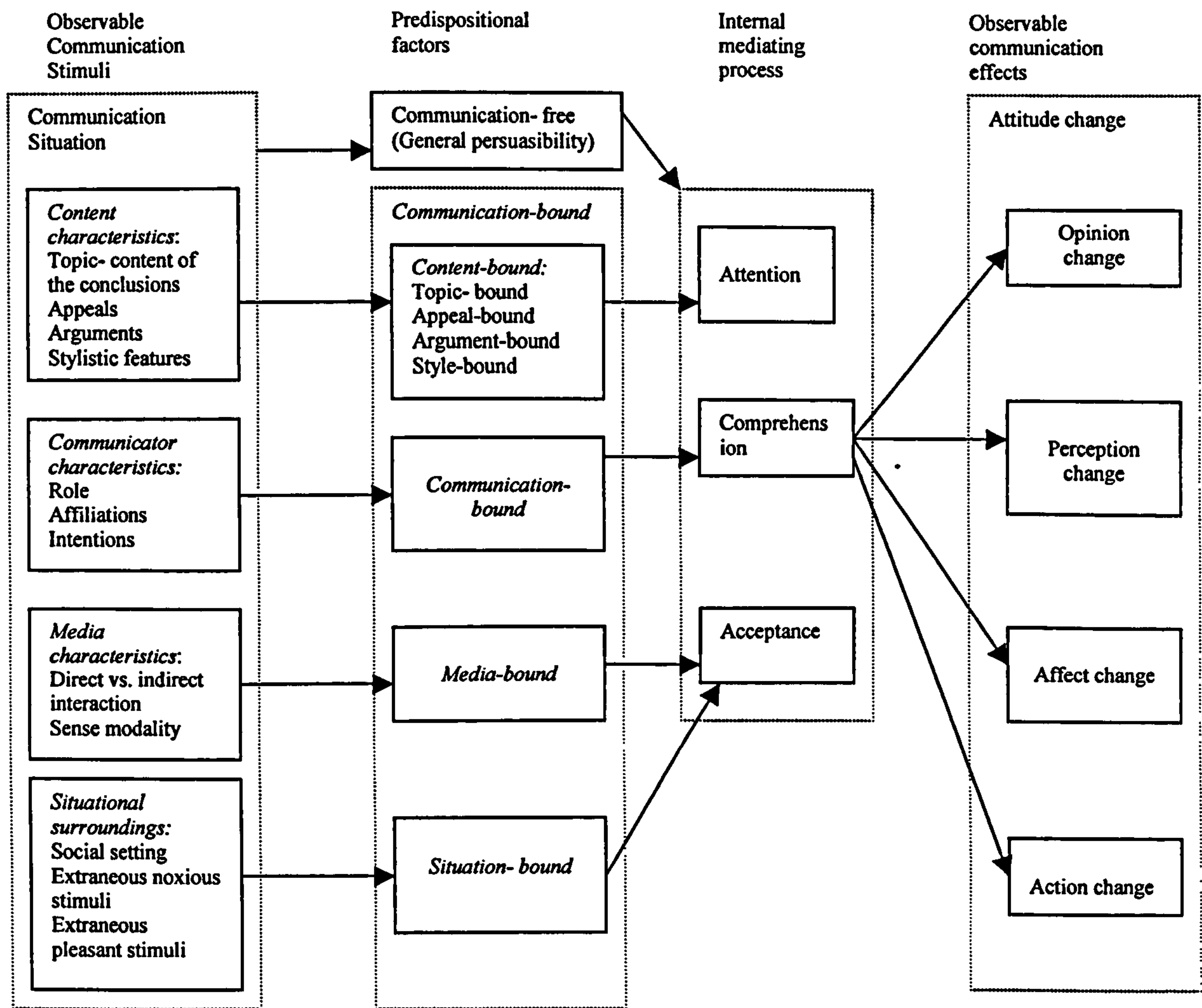


Figure 2.3-1: Janis and Hovland Model of Attitude Change.
Major Factors in Attitude Change by Means of Social Communication.
Source: Sereno and Mortensen 1970: 22

The *observable communication stimuli* and the *observable communication effects* are represented as the two end-points of the communication process. These are the antecedent and consequent events that are observable; they constitute the empirical anchorage for two main types of constructs that are needed in order to account for the interrelationships between the communication stimuli and observable effects the *predispositional factors* and the *internal mediating process*. Predispositional factors are used to account for individual differences in observable effects when all communication stimuli are held constant. This allows internal, or mediating, processes to be identified in order to account for the differential effects of different stimuli on a given person or group of persons. In other words, internal-processes constructs have

been formulated primarily to account for the different effects attributable of *different types of communications* acting on the *same people*; whereas, predispositional constructs are needed to account for the different effects observed in *different people* who have been exposed to the *same communications*.

For a more general discussion, if the Janis model is considered, at stage 1, the probability that a person will respond positively or negatively to a given challenge depends partly on factors such as the perceived trustworthiness of the communicator, the explicitness of the message, and the personality predisposition and mood of the person at the time he receives the challenging message (for details see McGuire 1968; Triandis 1971). The process begins at getting a favourable or unfavourable message.

At stage 2, the number and content of the alternatives generated depend partly on factors determining the intensity of memory search and the efficiency of retrieval, such as the presence of cues that remind the person of previously learned means-end relationships (for details see Lindsay and Norman 1972). There is also an observable dependence on mass communication media.

In stage 3, the cognitive processes are involved in evaluating many pieces of information in order to arrive at a final selection of the best alternative and these are undoubtedly influenced by such factors as the decision maker's prior training in skills that affect her/his ability to calculate probabilities accurately. Such skills and related factors that influence judgement and choice are discussed in the literature on statistical theory, social-judgement theory, and information-integration theory (for details see Anderson 1971; Kaplan and Schwartz 1975; Tversky and Kahneman 1974).

In stage 4, the decision maker's deliberations about commitment are likely to be influenced by the salience of persons and groups with whom s/he is affiliated and other such factors investigated in research on interpersonal attraction and group relations (for details Argyle 1969; Rubin 1973).

Observation further reveals that in any type of personal decision-making process, one identifies some common stages:

- to be informed of any challenge to the status quo, idea, or view;
- make a decision whether or not to be responsive to it;
- evaluate alternative ways to respond to the problem;

- select a particular alternative and implement it;

Thus at each stage of the decision making process different types of communication play different roles.

According to McLuhan (1968/2000), the *Medium is the Message*. To have a clear idea of what message, through which medium, can create what type of influence in personal decision making in general and fertility decision in particular, can be better understood through reviewing communication processes presented in different models. This is because a model shows the main elements of any structure or process and the relationships between these elements (McQuail and Windahl 1981: 2). Also models represent the philosophy and the procedure of a particular communication process at a time.

2.4 Models of Communication

Communication models differ widely in terms of *how* they represent human communication. For a better understanding, models of communication have been discussed in this chapter in *three* broad categories: i) linear models, ii) interpersonal (psychological/social psychological) models; and iii) convergence models. Other intermediary models are also discussed. All these models are discussed with reference to the suitability of understanding personal decision making processes and the fertility behaviour of women in rural Bangladesh.

2.4.1 Linear Models of Communication

Linear models are the models of communication that represent the image of communication as a linear process of transmitting information from an active source to a passive receiver with the intent to change the receiver's behaviour (Rogers 1973; Rogers and Kincaid 1981; McQuail and Windahl 1981). More precisely, "the source wants to alter the receiver's knowledge of some idea, create or change his attitude toward the idea, or persuade him to adopt the idea as part of his regular behavior" (Rogers 1973: 26).

Models of Lasswell (1948), Shannon and Weaver (1949), Osgood and Schramm (1954), Gerbner (1956) and Berlo (1960) are some of the most important models of this type, which are analogous to the electronic transmission of information. According to these models, communication implies a sender, a channel, a message, a receiver, a

relationship between sender and receiver, an effect, a context in which communication occurs and a range of things to which ‘messages’ refer. Sometimes, but not always, there is an intention, or purpose to ‘communicate’ or to ‘receive’ (Theodorson and Theodorson 1969; Osgood *et al* 1957; Gerbner 1967).

Presented in figure 2.4.1-1 is a linear model of communication with the basic components source, message, channel, receiver, effect and feedback and depicts that the active source (S) encodes a message (M) and transmits it through channel (C) to passive receiver (R). Receiver decodes the message and sends feedback (F) with effect (E). Sometimes there is another component in linear models i.e. noise. The basic philosophy of these models is persuasion by a source to a receiver.

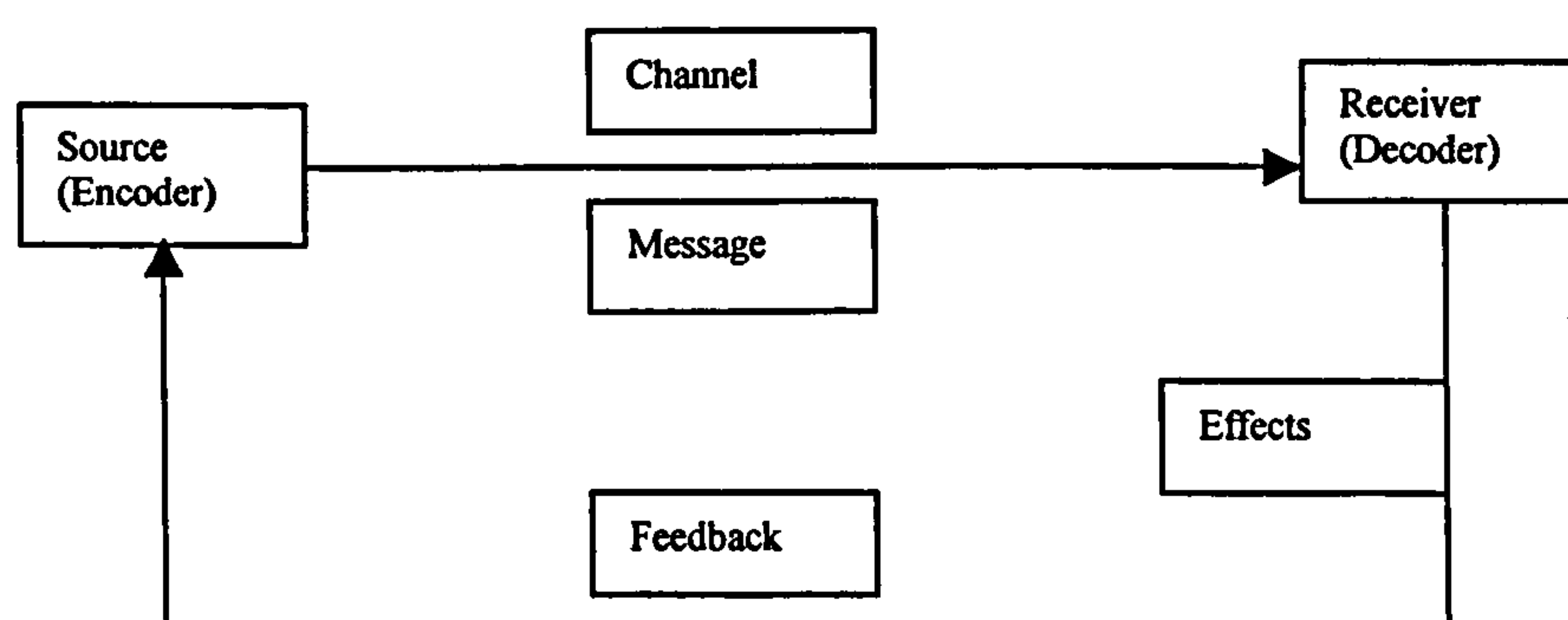


Figure 2.3.1-1: Linear model of the communication process
Source : Rogers 1973: 45

These models of the 1950s and 1960s have been justified in the study of propaganda and persuasion, especially when such messages were transmitted by the mass media. A great deal of communication research has been conducted in light of these linear models. While conducting the research, the usual approach has been to gather data from a sample of receivers, information about the effects of communication on their knowledge, attitudes, or overt behaviour. Source variables, message variables, channel variables, and/or receiver variables are perceived as independent variables by the researchers, in order to relate them to the dependent variables of communication effects. Usually the individual receiver is the unit of analysis, as well as the unit of response. It was then perceived that impact of mass media message is immense like a *hypodermic needle* or a *magic bullet*.

But these types of models were contradictory to the basic concept of communication as a process. Writing seventeen years after the original statement of the Source-Message-

Channel-Receiver (S-M-R-C) model, Berlo (1977: 12) accepted the criticism of his model that “our view of research (focusing on communication *effects*) and our view of communication (as a *process*) have been contradictory” (Smith 1972). Rogers and Kincaid (1981: 38) identified seven biases with linear models that were:

- i. A view of communication as a linear, one-way act (usually vertical), rather than a cyclical, two-way process over time.
- ii. A source bias based on dependency, rather than focusing on the relationship of those who communicate and their fundamental interdependency.
- iii. A tendency to focus on the objects of communication as simple isolated physical objects, at the expense of the context in which they exist.
- iv. A tendency to focus on the messages per se at the expense of silence, and the punctuation and timing of messages.
- v. A tendency to consider the primary function of communication to be persuasion, rather than mutual understanding, consensus, and collective action.
- vi. A tendency to concentrate on the psychological effects of communication on separate individuals, rather than on the social effects and the relationships among individuals within networks.
- vii. A belief in one-way mechanistic causation, rather than mutual causation, which characterises human information systems that are fundamentally cybernetic.

These seven biases are interrelated and cumulative. When communication is perceived as one-way and vertical, and when one takes the point of view of sources as subjects who use communication to produce a change in receivers as objects, biases toward psychological effects and mechanistic causation are created. Despite severe criticisms, Rogers and Kincaid (1981: 77) comment, “we do not feel that linear models of communication have zero utility in the future. Undoubtedly, communication scholars will choose to conduct effects-oriented research in certain situations where communication is indeed linear, direct, and simple”.

Various research has proved that rather than ‘hypodermic-needle’ or ‘magic bullet’ like effects, mass media plays a limited effect in decision- making process. As the mass media transmits messages through mechanical channels towards an anonymous, heterogeneous audience, they seldom can create consensus between source and receiver. But mass media can disseminate well any idea, thought, or information and so creates awareness. So, the linear models of communication fit well in describing the

beginning of the first stage of decision-making process, i.e. appraisal of challenges, not taking decision.

Analyses of DHS data from Ghana (Olaleye and Bankole 1992), Nigeria (Bankole 1994), and Kenya (Westoff and Rodriguez 1993) show that, among women with otherwise similar socioeconomic characteristics, more exposure to family planning messages in the mass media is linked significantly to more contraceptive use.

But increasingly communication is being perceived as a, “multivariable, dynamic interplay of numerous elements and its complexity can hardly be expressed in a linear model ... (Diaz-Bordenave 1972)”, and there has been a growing interest in conceptualising communication as more than a mere linear process.

Some extensions of linear models such as *Agenda-Setting model* (McCombs and Shaw 1976; McCleod *et al* 1974; McQuail and Windahl 1981); *Dependency model* (Ball-Rokeach and DeFleur 1976); *Spiral of Silence model* (Noelle-Newmann 1980; Scheff 1967) represent the *Effects of Mass Communication on Culture and Society trends*. These show that the interaction between communication, culture and society jointly effect individuals.

The Uses and Gratification model (for details see Herzog 1944; Berelson 1949; Blumber and Katz 1974; Rosengren 1974; Katz *et al* 1974; Katz and Gurevitch 1976); *model of Information Seeking* (Donohew and Tipton 1973) represent the *Audience-centered* trend of communication modelling, which deals with audience’s power on media behaviour

Though the aim of these models was to explain the immense importance of media on individuals, ultimately these were also *effect* studies, which dealt with human interaction with media. These models can be used in explaining and understanding fertility behaviour of rural Bangladesh in a limited way. These models may be used to understand the target audience’s cultural background and social norms and thus to set family planning messages in accordance with the social and cultural setting. But these models fail to address the situation where mass media exposure is either absent or limited and people’s communication is mainly interpersonal, as is the case in many rural parts of Bangladesh.

2.4.2 Interpersonal Models of Communication

Linear models were basically models of mass communication, whereas interpersonal models deal with self, dyadic, and group communication.

Heider's *Balance model* (1946), Newcomb's *ABX model* (1953) and Festinger's *Cognitive Dissonance theory* (1957) are some of the most cited interpersonal models of communication. These models mainly place emphasis on securing balance among participants in a situation where disequilibria arise.

Heider's theory held that in the case of two people who have an attitude of like and dislike towards each other and towards an external object, some patterns of relationship will be balanced (as when two persons like each other and also both like the object) and some will be imbalanced (as when two persons like each other, but one likes the object and the other does not). Where there is a balance, each participant will resist change and where there is an imbalance, attempts will be made to restore a 'cognitive' balance. Here, the motive is to come to a consensus or balance based on mutuality rather than the bare intention of persuading other people's action.

Newcomb's ABX model (1953) is an extension of Heider's earlier work (1946). Heider was mainly concerned with cognitive processes *internal* to either of the two participants and Newcomb's development was to apply the theory to communication *between* two or more people. He postulated a 'strain to symmetry' as a result of which the area of agreement would be widened by engaging in communication. He argues that communication is a 'learned response to strain' and it is likely to find 'more' communication activity (information giving, seeking and exchange) under conditions of uncertainty and disequilibria.

Festinger's (1957) theory of Cognitive Dissonance is the most developed version of the balance theory. In this theory the view is held that there is a tendency for individuals to seek consistency among their cognitions (i.e. beliefs, opinions). When there is an inconsistency between attitudes or behaviours (dissonance), something must be changed to eliminate the dissonance. In the case of a discrepancy between attitudes and behavior, it is most likely that the attitude will change to accommodate the behaviour.

Two factors affect the strength of the dissonance: the number of dissonant beliefs, and the importance attached to each belief. There are three ways to eliminate dissonance: (1) reduce the importance of the dissonant beliefs, (2) add more consonant beliefs that outweigh the dissonant beliefs, or (3) change the dissonant beliefs so that they are no longer inconsistent.

The factors which affect cognitive dissonance is presented in figure 2.4.2-1.

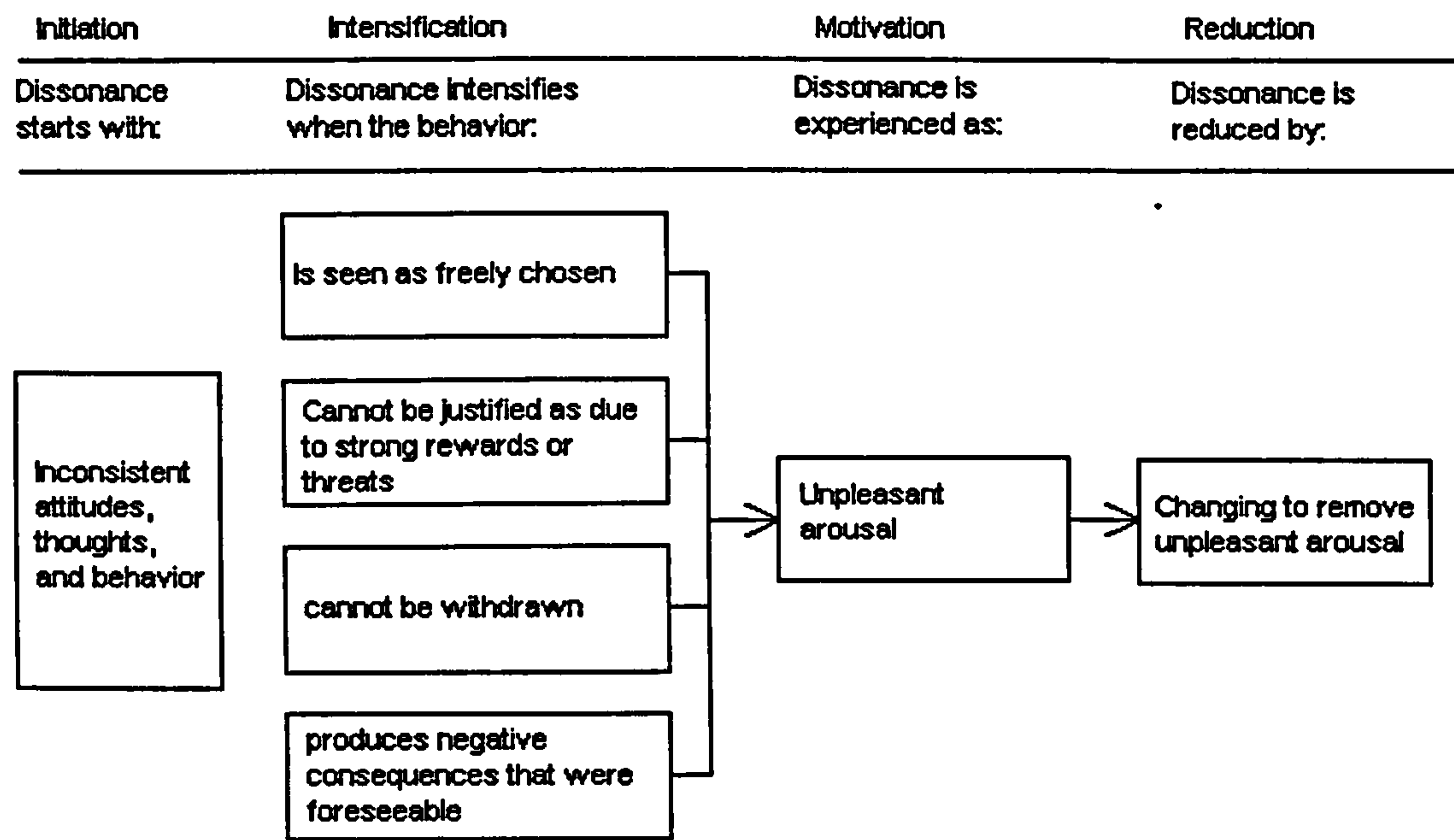


Figure 2.4.2-1: Factors that Affect Cognitive Dissonance Based on the Theory of Cognitive Dissonance by Festinger (1957)
Source: <http://chiron.valdosta.edu/mawhatley/9710/cogdiss.htm>, 23/04/04

Dissonance theory applies to all situations involving attitude formation and change. It is especially relevant to decision-making and problem solving.

In general, the kind of process indicated and predicted by these balance theories as a whole supports the view that people are likely to attend to sources of information, which are in line with their existing positions and look for information, which supports and confirms their actual behaviour. It gives weight to theories of *selective perception* and to the expectation that the most likely effects of communication will be towards the reinforcement of existing opinions, attitudes and behavioural tendencies.

As the main objective of the interpersonal communication models is to attain balance and symmetry in anyone’s psychological state and interpersonal level, decision makers will leave or accept any idea or attitude to create or keep a balance. For that purpose,

they will first try to go through selective processes: *selective exposure* (the tendency to attend to communication messages that are consistent with one's existing attitude and beliefs); *selective perception* (the tendency to interpret communication messages in terms of one's existing attitudes and beliefs); and *Selective recall* (the tendency to remember communication messages as consistent with one's existing attitudes and beliefs). Thus at the first stage of personal decision making, through selective processes individuals try to dismiss the new idea as being untrue, irrelevant, or inappropriate to their own particular circumstances and try to make a balance within themselves. But if they cannot prove the challenging information failure within themselves, they have to leave their existing attitude and beliefs. These interpersonal models of communication interpret well this part of decision-making. But *selective exposure*, *selective perception* and *selective recall* vary from person to person as per their socialisation process, education and social status. These factors are absent in these interpersonal models. At the same time, in this selection process, the person's *selective exposure* and *selective recall* may involve mass media messages and also mass media messages can help create *selective perception*. Thus interpersonal models of communication do not cover the whole process of decision-making.

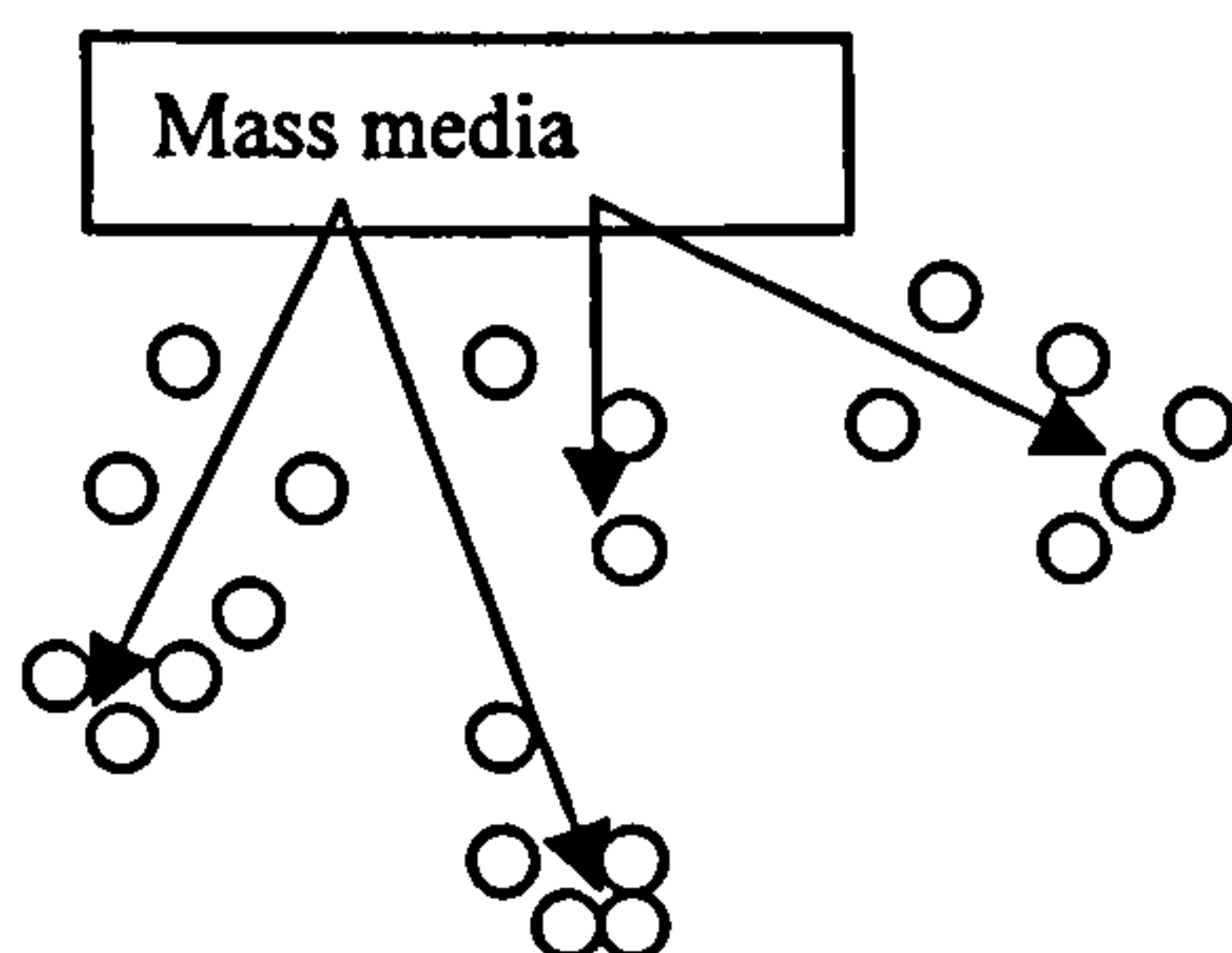
After exposure to new information on family planning, people typically discuss about family planning with friends or relatives to come to a consensus whether this new information is supported by their existing value system and thus practicable, or they make contact with a provider promoted in the mass media, such as a clinic or a FP worker, to make sure whether it is beneficial for them. Thus they try to seek a balance over the imbalance state that the new information created. So, these interpersonal models may be useful to understand the fertility behaviour of women in rural Bangladesh where women are mainly illiterate, less exposed to mass media, and support from their kith and kin and immediate social relations are vital to secure their balance (accept or reject, either way) after exposure to the new information of family planning. But the total absence of mass media exposure and the socialisation process is the weakness of these models in explaining the influence of communication of the fertility decision of women in rural Bangladesh because both mass media information and socialisation procedure are also important in shaping individual responses to family planning messages.

Both linear and interpersonal models represent the two extreme approaches of communication research to explain influences on human behaviour. Here lies the importance of models, which are a blend of mass communication and interpersonal communication models. The two-step flow model is one of the most important of these models.

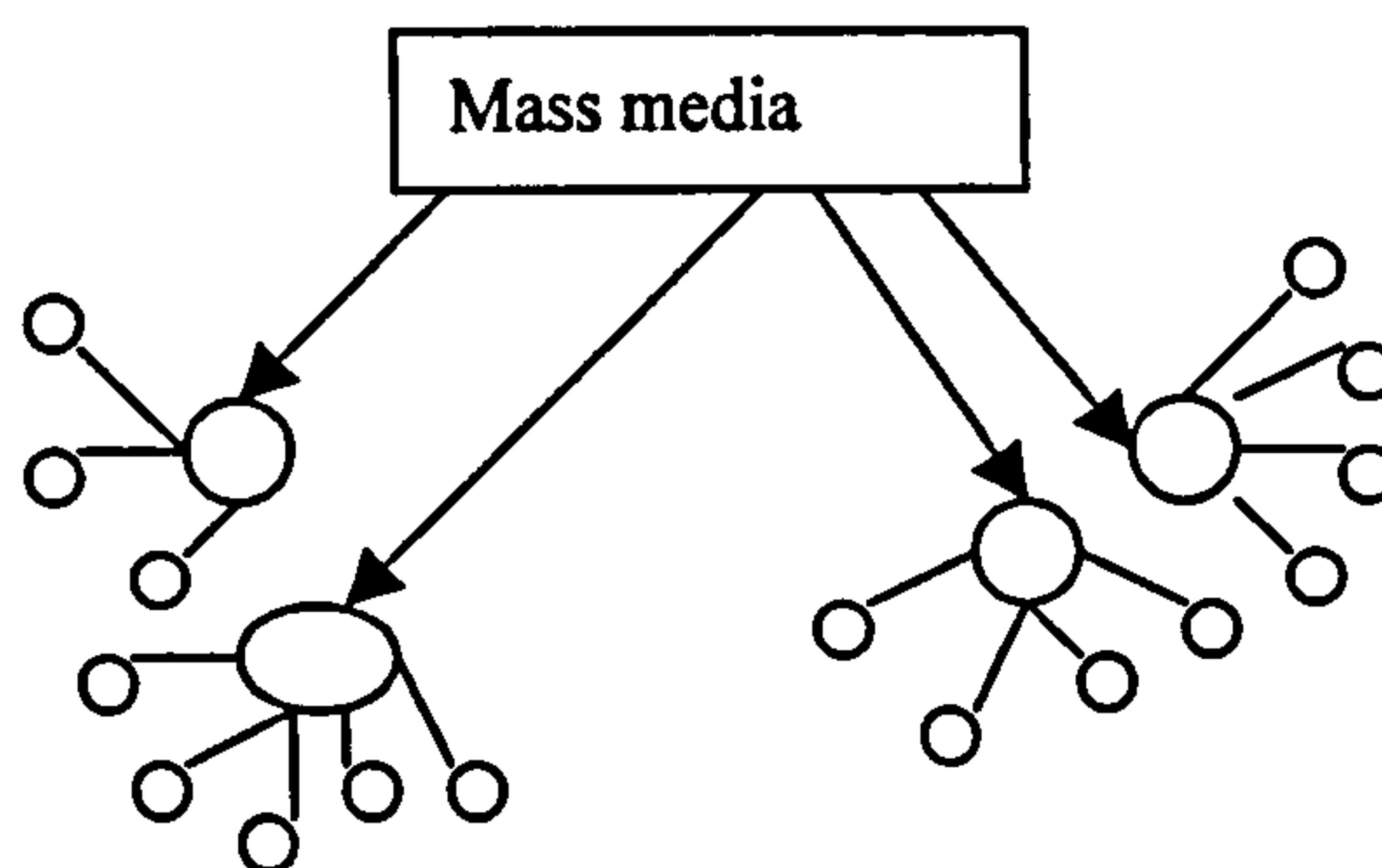
2.4.3 Two-Step Flow Model

Working on the effects of mass communication in the campaign of the United States 1940 Presidential election, Lazarsfeld *et al* (1944) found that aggregate effects of mass media were minimal and the model based on stimulus-response principles was unable to represent adequately the social reality of a mass audience, or the process of political information and opinion formation. The authors revised the model and introduced the idea of a *two-step flow* of communication and the concept of *opinion leaders*. Their findings about the relative failure of mass media compared to influence from personal contact led to the suggestion that ‘ideas often flow *from* radio and print to the opinion leaders and *from* them to the less active sections of the population’. The two-stage model incorporating the influence of mass media is compared with a traditional model of communication in figure 2.4.3-1.

Early mass communication model



Two-step flow model



- = isolated individuals constituting a mass;
- = opinion leader
- = individuals in social contact with opinion leader

Figure 2.4.3-1: Two-step Flow Model of Media Influence Compared with the Traditional Model of Communication. Source: McQuail and Windahl 1981: 49

According to McQuail and Windahl (1981: 50), the model is underpinned by the following main assumptions that:

- individuals are not social isolates, but members of social groups in interaction with other people;
- response and reaction to a media message will not be direct and immediate, but mediated through, and influenced by, these social groups in interaction with other people;
- two processes are involved, one of reception and attention and another of response in the form of acceptance or rejection of the influence or information attempt;
- individuals are not all equal in the face of media campaigns, but have different roles in the communication process and, in particular, can be divided into those who are active in receiving and passing on ideas from the media and those who mainly rely on other personal contacts as their guides;
- occupants of the more active role (opinion leaders) are characterised by more use of the mass media, higher levels of gregariousness, a self perception as influential on others and as having an attributed role as source and guide.

Though communication research has profited greatly from this more realistic version of the mass communication process, the model has proved to be in some respects incomplete and in others potentially misleading:

First, the model is based on a clear dichotomy into either active or passive roles rather than interchangeable roles. The original evidence of Katz and Lazarsfeld (1955: 32) shows that some individuals may be “followers” on some subjects and “leaders” on others.

Second, both ‘leaders’ and ‘followers’ may also be thought of as sharing the same or similar characteristics and in varying degrees different from a third category of people, who neither attend to mass media nor discuss with those who do. Again, those who are not leaders are not necessarily followers. Research has shown that opinion leaders are also receivers of information.

Third, there may be more than two stages in the process of influence, as subsequent research has shown (Menzel and Katz 1955). Change can occur in several stages affecting a few influential individuals first, then those integrated into relevant social circles, and then later affecting the more isolated or less integrated.

Fourth, influence can still be direct from the media to the individuals exposed and it is not necessary for the opinion-leader stage to be gone through.

Fifth, this model assumes a situation where mass media channels are the primary or only source of ideas of information. It may be that non-media channels provide the primary source of ideas of knowledge (e.g. work organisations, local political or economic experience).

Sixth, the model is most appropriate to a developed society under normal social conditions. It would apply less to a traditional society with few media, or to circumstances of crisis and uncertainty in developed societies. In these circumstances there is likely to be a longer reliance on passing information and influence from person to person. The idea of a chain of contact may be more appropriate than the cluster represented.

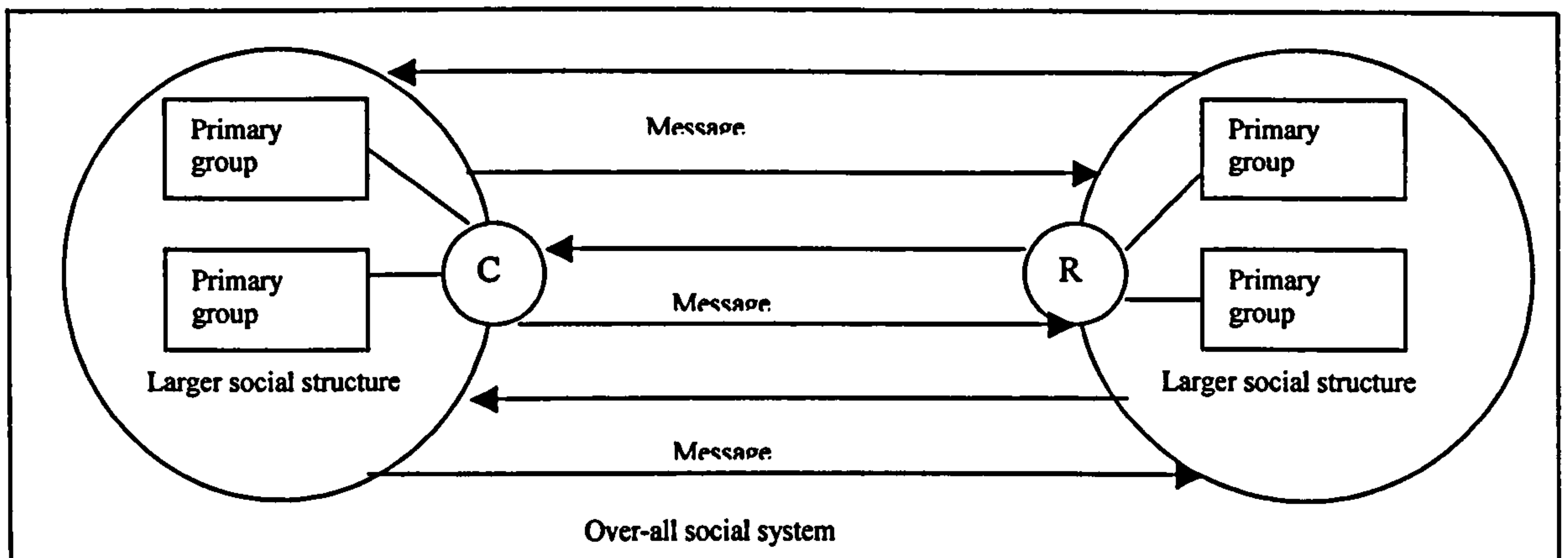
However, in decision-making processes it is common that the decision makers are responsive to the new idea, when they survey and weigh the alternatives. At each stage they are influenced by mass media messages and interpersonal contacts who are conversant of the message. The *two-step flow* model is especially relevant in decision-making processes in traditional societies, where exposure to mass media is relatively low. In these societies *opinion leaders* play a vital role in disseminating information among less-exposed people to mass media. But the ‘follower – leader’ approach is not always workable because some individuals may be ‘followers’ in one subject and ‘leaders’ in other and some may be isolates.

This model may be relevant to understand the fertility behaviour of the women of rural Bangladesh, as some women may be influenced by the fertility behaviour of the village elites who have more exposure to mass media or other communication sources and who can be described as information rich. But at the same time, husbands, immediate relatives and friends greatly influence women’s fertility decisions and this is absent in this model as is societal influences.

2.3.4 Social System Theory: Riley and Riley Model

Parsons’s (1951) *The Social System* is the basic philosophy upon which this model has been developed. The emergence of a symbolic culture on the basis of interaction between human actors is the core of this model.

Instead of “leader-follower” dichotomy, Riley and Riley (1959) in their article “Mass Communications and the Social Systems” pointed to the role played in the communication process by primary groups and reference groups. *Primary groups* are distinguished by inmate relations among their members. A family is a typical example. A *reference group* is a group with the help of which individuals may define their attitudes, values and behaviour. They do not need to be the members of the group, but its norms will nevertheless guide them. *Primary* groups close to the individual often serve as *reference* groups for them.



C = Communicator R = Receiver

Figure 2.4.4-1: Riley and Riley Model: the communication system framed by a social system.
Source: McQuail and Windahl 1981: 35

As communicators or receivers in the communication process, the primary group influences individuals. As communicators, they may be influenced to select and shape their messages in a special way, as receivers they may be guided by these groups in how to select, perceive and react to messages. The primary groups do not function in a social vacuum; rather they are part of larger social system. The primary groups are influenced in their attitudes and behaviour partly by each other, and partly by this larger structure, which may also influence the individual directly.

Rogers and Kincaid (1981:46) states that system theory is holistic: it assumes that the complex interactions among the parts of a given system would be destroyed by the dissection of the system through atomistic research procedures. Communicative behaviour of an individual is thus frequently adaptive and functionally related to the social environment and to other actors. Also this model assumes greater equality of the participants in the communication event recognising the receiver power in a

transaction. Source manipulation of a receiver thus may be counterbalanced by receiver influence on the source (Rogers 1973).

According to Mendelsohn (1963), this model contributed to new ways of looking at communication effects in that they focus on the mediating role of other psychological factors in influencing the impacts that the mass media can produce on individuals and groups.

But, Lilienfield (1978) criticised this systems theory as “an ideology rather than a set of techniques”. Rogers and Kincaid (1981: 47) commented, “there have been two main obstacles to adoption of the systems approach in the study of human communication: 1) the lack of a model of communication which could adequately represent the independent relationships among parts, and 2) the lack of suitable research methods to study the communication relationships.”

In the decision-making process, the decision makers count on the approval of the people in their social network who are not directly implicated – family, friends, business associates, casual acquaintances and the like. At this stage, they even may re-think the whole matter from the beginning if these relations vehemently oppose them. Philosophically this model describes well the interrelated role of primary groups and larger social structure in personal decision-making but the problem of this model is that there has been a lack of suitable research methods to study the communication relationship.

Though the theoretical base of thinking any problem at its societal perspective could be important to understand the women’s particular fertility behaviour in rural Bangladesh, as there is a lack of suitable research approach, validation will be illusive. Consequently this model is not directly utilised in this research.

2.4.5 Dance’s Helical Model

Dance’s (1967) helical model states that the communication process moves forward and what is communicated now will influence the structure and content of later communication. The dynamic nature of communication illustrated on figure 2.3.5-1 describes the communication process, like all social processes, this contains elements, relations and environments that are continuously changing. The helix describes how

different aspects of the process change over time. In a conversation, for example, the cognitive field is consistently widening for the parties or actors involved. The actors get continuously more and more information about the actual topic, and about the other's knowledge.

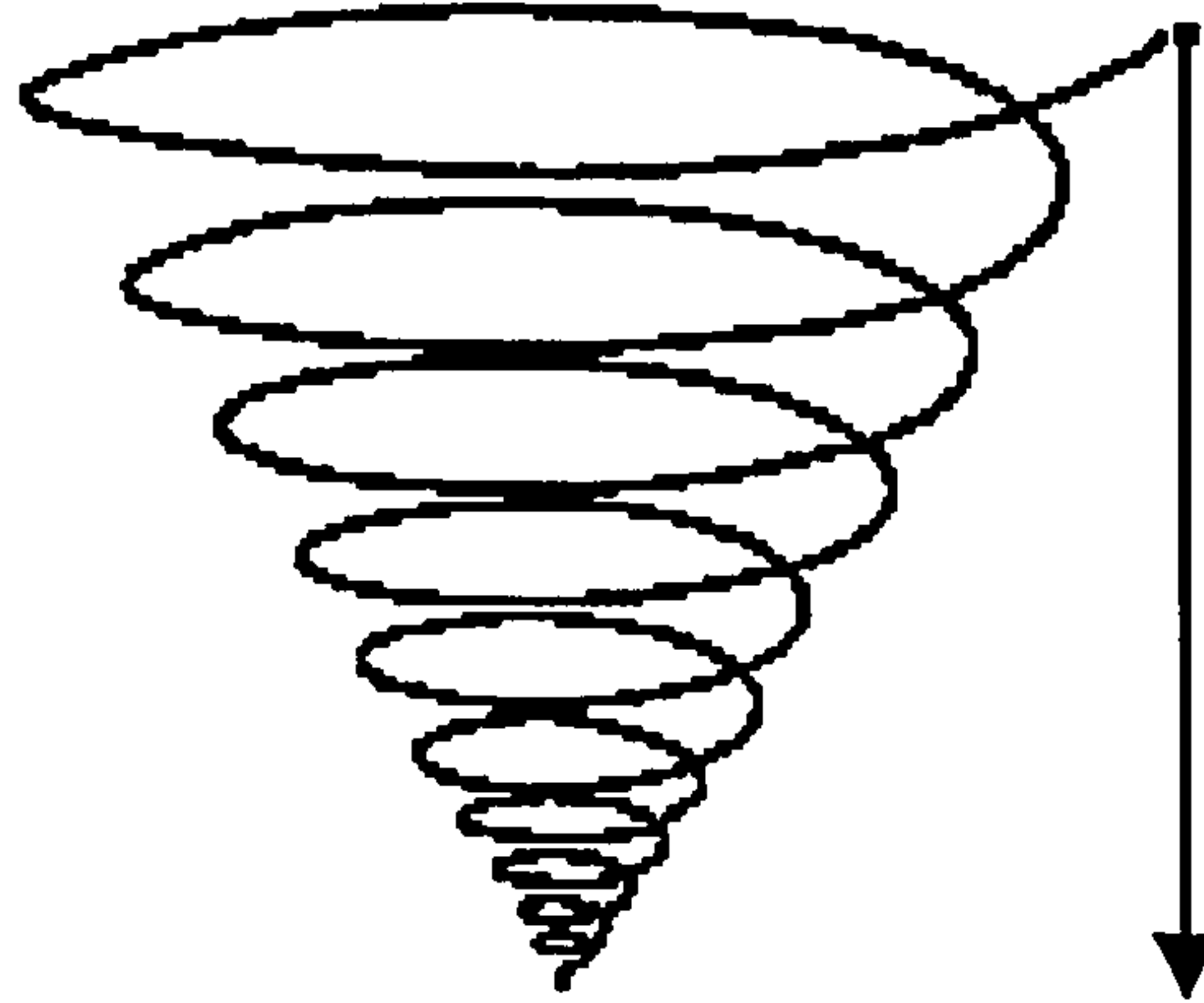


Figure 2.4.5-1: Dance's helical model, shows the dynamic nature of the communication process, 1967. Source: <http://www.comm210.com/mlc1tpc3.htm>, 8/12/2003, 23:15

In the figure 2.4.5-1, the helix takes on different shapes in different situations and for different individuals. For some, the helix tends to widen very much, because of prior knowledge of the topic, whereas for others with little basic knowledge, the helix expands moderately. This model is useful to illustrate the thesis that knowledge creates more knowledge. According to McQuail and Windahl (1981: 16), "The most distinguishing feature of this model is that man, when communicating, is active, creative and able to store information, whereas many other models depict the individual rather as a passive creature."

According to the Helical model, "at any and all times, the helix gives geometrical testimony to the concept that communication while moving forward is at the same moment coming back upon itself and being affected by its past behavior, for the coming curve of the helix is fundamentally affected by the curve from which it emerges. The communication process, like the helix, is constantly moving forward and yet is always to some degree dependent upon the past, which informs the present and the future" (Dance 1967 in Sereno and Mortensen 1982: 105). Thus the helical model offers a flexible and useful geometrical image for considering the communication process. Dance's helical model helps to remember that the communication process is ever changing, circular, expanding, and building upon the past.

This model is similar to the majority of interpersonal communication models, which emphasis that the pattern of responding to any new stimuli depends on people's frame of reference, i.e. selective perception, selective retention and selective recall. But the shortcoming of this model is that it suggests that communication comes back, full circle, to exactly the same point from which it started. But in the real world, the situation may have moved on. For example, if a women had no previous exposure to FP information, if she comes across such a message either through mass media or FWAs, this may change her view without past reference.

From the first stage of decision-making, it is observed that people start taking decisions with some selectivity, which is based on prior knowledge of the topic. While taking the decision, thoughts oscillate at each step to adjust courses of action. This never happens in the way the model suggests that communication comes back, full circle, to exactly the same point from which it started. Also the model stresses only the cognitive process, but decision-making is also a social process and this is not recognised in the model.

Like Riley and Riley's system model, it also lacks any research approach and this way it is difficult to use this model to understand the fertility behaviour of rural women in Bangladesh.

2.4.6 Rogers and Shoemaker's Model of Innovation Diffusion

In the 'innovation-diffusion' model Rogers and Shoemaker (1973) pointed *four* steps of diffusion of an idea that is perceived new. These steps are:

Knowledge: the individual is exposed to an awareness of the existence of the innovation and gains some understanding of how it functions.

Persuasion: the individual forms a favourable or unfavourable attitude towards the innovation.

Decision: the individual engages in activities that lead to a choice to adopt or reject the innovation.

Confirmation: the individual seeks reinforcement for the innovation decision s/he has made, but s/he may reverse the previous decision if exposed to conflicting messages about the innovation.

In a later version, Rogers (1983) identified five key steps: awareness, persuasion, trial, adoption and consolidation. Rogers and Shoemaker (1973) model identified *three* main stages of the whole event of diffusion process: *antecedents, process and consequences*.

Antecedents refer to those circumstances of the event or characteristics of the people involved which makes it more or less likely that an individual will either be exposed to information about an innovation or will experience needs to which the information is relevant.

Process is one of learning, attitude change and decision.

Consequences of the diffusion event refer to the later outcomes of use or disuse, if adoption takes place.

Figure 2.4.6-1 presents the innovation-diffusion model of communication.

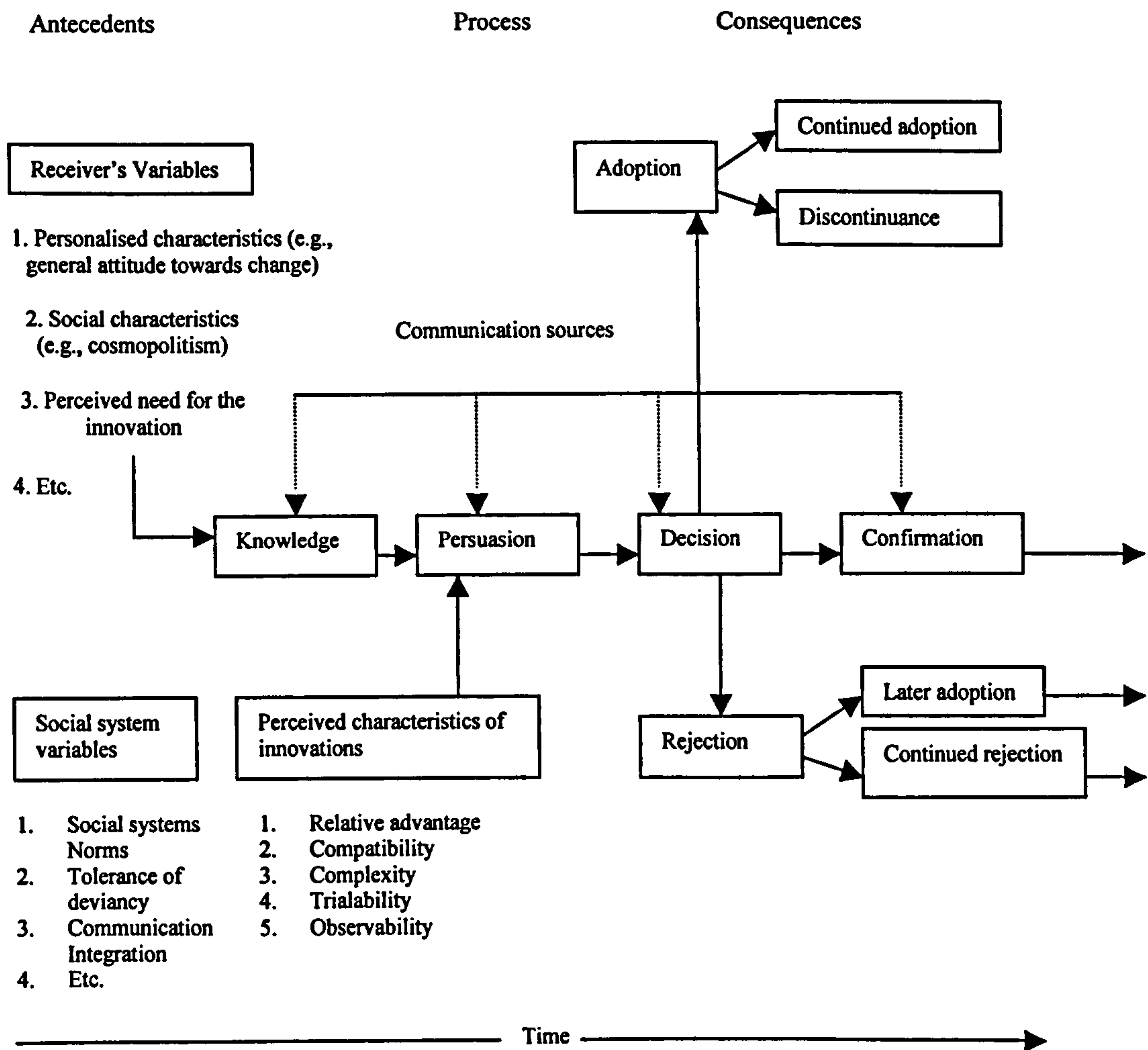


Figure 2.4.6-1: Rogers and Shoemaker's model of the innovation-decision process, indicating the four steps of knowledge, persuasion, decision, and confirmation.
Source: McQuail and Windahl 1981: 53.

The idea is that diffusion of innovation normally involves different communication sources – general mass media, advertising or promotional materials, official agencies of change, and informal social contacts. Different sources may be important at different stages and for different functions. Thus mass media and advertising may produce awareness and knowledge, official agencies at the local level may persuade, personal influence may be important for the decision to adopt or not, and experience of use may provide a later source of confirmation or disconfirmation.

This model is relevant for both to developing and to more advanced societies, since there is a continuing need, under conditions of social and technological change, to replace old methods by new ones.

Though the model is a distillation of a large amount of experience in the applications of mass media and other agents for purpose of planned change, popular criticisms of this model outlined by McQuail and Windahl (1981:54) are:

- it is designed from the perspective of an external or superior agent of change, which decides what is beneficial and proceeds to promote it by mobilising other sources.
- it presupposes a linear, rational sequence of events, planned in advance and with criteria of rationally determined externally.
- here, persuasion or attitude change is located between ‘knowledge’ and ‘decision. It is not always true. There are other bases for decision-making than the formation of a judgmental attitude and there is much debate about the notion that attitude change normally precedes a related behaviour.
- in real life, there is great randomness and there are many elements of chance in decision-making. It is possible that an innovation may be adopted with little knowledge, or prestige, or in imitation of another.

The innovation diffusion model describes well the overt conditions of personal decision-making. One of the main problems of this model is that it does not acknowledge the selectivity of cognitive process in decision-making. Another weakness of this model is that it pre-supposes a linear, rational sequence of events, planned in advance and with criteria of rationally determined externally. But according to Harris (1998: 2), “decision-making is a nonlinear, recursive process”. Most decisions are made by moving back and forth between the choice of criteria and the identification of alternatives. In real life, there is much randomness and many elements

of chance in decision-making. Rather than the structured steps of innovation diffusion model, it is possible that any new decision may be adopted with little knowledge, or in imitation to another. These aspects are absent in this model.

Despite these criticisms, as the theory implies that if there is sufficient knowledge and a positive enough attitude then the individual will decide to adopt the innovation, this model has been used in family planning programmes of many developing countries. The approach was found to be important also in Bangladesh by Kincaid *et al* 1993; Kincaid 2000. But the model fails to address the fact that individuals who are isolates or on the periphery of local social networks (for example, within villages, communities, organisations) are less likely to hear about an innovation, or will hear about it much later and so will not have as much opportunity for social comparison (Festinger 1954; Suls 1977) nor exposure to social influences from others (Kincaid 1987, 1994; Latane 1981; Moscovici 1986; Nowak *et al* 1990). “Social network theory has been used to extend the classical diffusion of innovation theory in response to criticism that it is predominantly an individual, psychological approach to behaviour change” (Kincaid 2000: 218) and this approach will be used in this thesis.

2.3.7 Convergence Model and Communication Network Analysis

According to Rogers and Kincaid (1981:78), “a convergence model of communication states a process of convergence in which information is shared by participants in order to reach a mutual understanding”. According to this model all are participating in a specific information system to achieve a common consensus to go for an action. The proponents of this model mentioned *three* basic characteristics of this model.

Process of Mutual Understanding: According to this model, communication is always a joint occurrence, a mutual process of information sharing between two or more persons. Rather than an act of mere sending and receiving between the participating individuals this model includes interaction with one another in a system to achieve a common consensus to achieve an action.

Iterated Cyclical Process: Although mutual understanding is the purpose or primary function of communication, it is never reached in any absolute sense due to the inherent uncertainty of information-exchange. Several cycles of information sharing about a topic may increase mutual understanding, but not complete it. Generally,

communication ceases when a sufficient level of mutual understanding has been reached and the participants shift to a new topic of discussion.

Dynamic Process: Convergence and divergence are two aspects of the same process. Rogers and Kincaid suggest that communication always has the potential for creating misunderstanding, disagreement, and divergence. Thus the model compels study relationships, differences, similarities, and changes in these relationships over time rather than only indicating convergence.

Information and mutual understanding are the dominant components of the convergence model of communication.

Information processing at the individual level involves perceiving, interpreting, understanding, believing, and action, which creates new information for further processing. When two or more participants share information, information processing may lead to mutual understanding, mutual agreement, and collective action. The components of the convergence model are displayed in figure 2.4.7-1 at three levels of 'reality', or levels of abstraction: the *physical level*; the *psychological level*; and the *social level*.

Once the interpretation and understanding of information is raised to the level of shared interpretations and mutual understanding, what once could be considered as individual information processing, becomes human communication among two or more persons who hold the common purpose to understand one another. Collective action requires the action of two or more individuals, built upon a foundation of mutual agreement and understanding. When two or more individuals believe that the same statement is valid, it becomes true by consensus or mutual agreement with a degree of mutual understanding. Rogers and Kincaid suggest, each component implies that its opposite may also result: misconception, misinterpretation, misunderstanding, disbelief may reduce mutual understanding, and so lead to disagreement, and conflict.

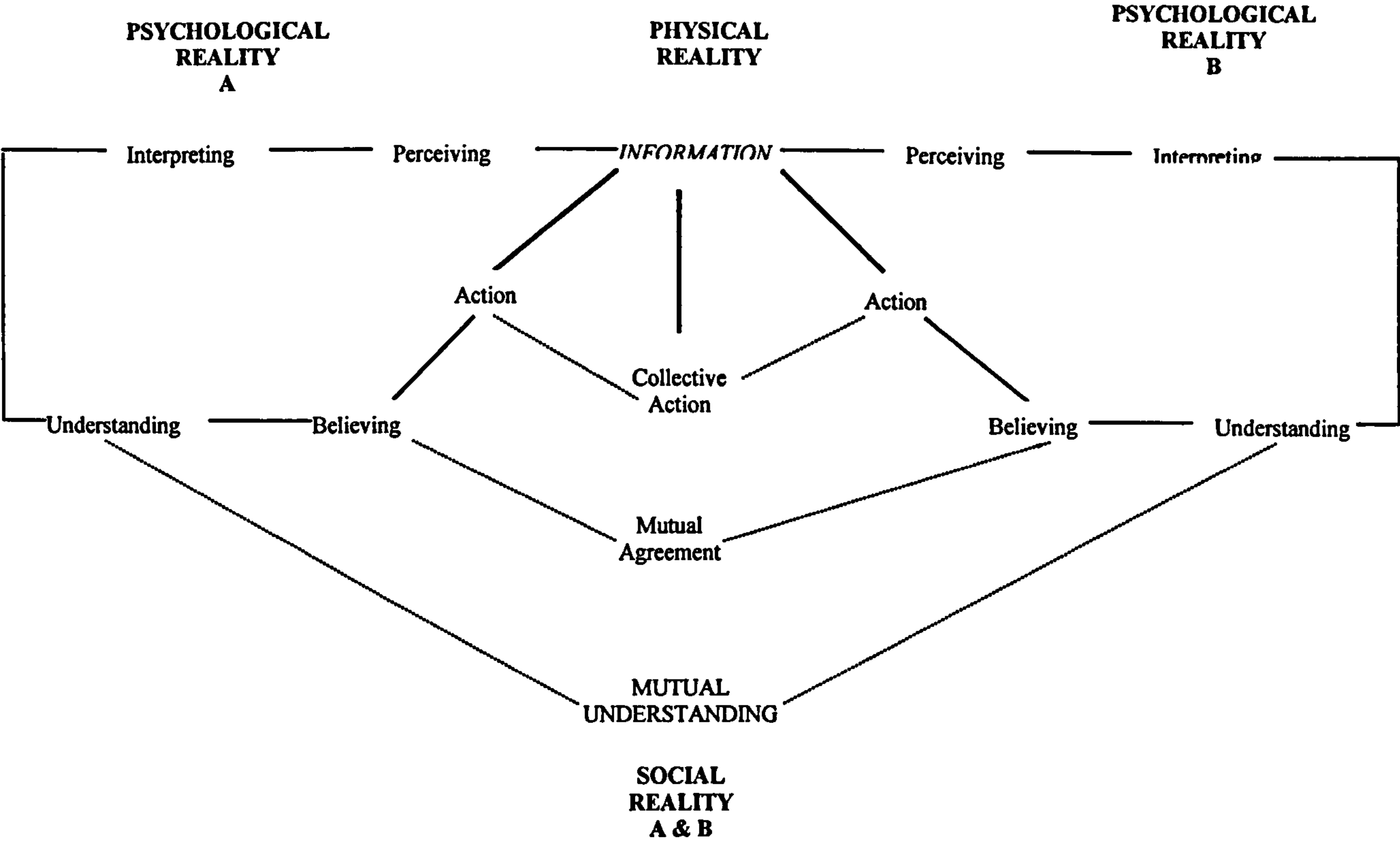


Figure 2.4.7-1: Basic Components of the Convergence Model of Communication. The unity of information and action indicated by the three bold lines. All information is a consequence (or physical trace) of action, and through the various stages of human information processing, action may become the consequence of information. A similar unity underlies the relationships among all of the basic components of the convergence model.
Source: Kincaid (1979), Quoted in Rogers and Kincaid 1981: 55.

The convergence model represents human communication as a dynamic, cyclical process over time, characterised by mutual causation rather than one-way mechanistic causation and emphasises the interdependent relationship of the participants. This model is useful to study human behaviour in that one of its research approaches is communication network analysis. Communication network analysis describes the linkages created by the sharing of information, and their interrelationships, in the interpersonal communication structure. A communication network consists of interconnected individuals who are linked by patterned communication flows.

The normal procedure of communication network analysis consists of:

- i) identifying cliques within the system;
- ii) identifying specialised communication roles (liaison, bridges, and isolates) in the communication structure; and
- iii) measuring various indexes of communication structure (for example, connectedness) for individuals, personal networks, cliques, or system.

Keeping the theoretical essence of the convergence model as well as social interactions (Mead 1934) and the group dynamics model of interpersonal communication (Katz and Lazarsfeld 1955) at the core, network analysis is used to uncover the pattern of people's interaction.

According to Harris (1998:2), "every decision is made within a decision environment, which is defined as the collection of information, alternatives, values, and preferences *available at the time of the decision*. An ideal decision environment would include all possible information, all of it accurate, and every possible alternative."

The decision environment is of the utmost importance in the decision-making process. This environment is the structure within which the person gets aroused by any new idea or thought. The way they respond to the new idea or thought or message, also depends on their frame of reference. Bateson (1972, quoted in Rogers and Kincaid 1981: 46) states, "There is not a mind, but rather an ecology of mind, for the *mental characteristics of the system are immanent, not in some part, but in the system as a whole*." When the person tries to prove the challenging idea untrue, or become convinced with the new thought, they seek some support on behalf of their particular decision. They search for alternatives to justify the new position. This state depends on factors determining the presence of cues that remind the person of previously learned means-end relationships. Selecting the best from alternatives involves the person's judgmental capability that has been evolved within the social-psychological environment. Whatever decision they take, they have to consider the approval and disapproval of interpersonal and group relations. If the disapproval is very strong, they may even have to re-think from the very beginning. As a whole, the 'individuals' exist only as part of a cybernetic (information) system, in which their behaviour is determined by behaviour at a previous time and the relationship with the structure.

Here lies the importance of the convergence model of communication and the network analysis approach.

The convergence model of communication considers the full matrix of relationships in which communication participants exist, and this functions as the context in which human communication occurs. Shared understanding and agreement by means of communication is a prerequisite for the 'takeoff' point in the rate of adoption of any perceived new message in a system. What others think and do through mutual understanding and collective action has important consequences on how each individual member of a system reacts.

Network analysis is used to identify this communication structure, and thus helps to understand the 'big picture' of human interaction in a system. As "the behavior of an individual is partly a function of the communication networks in which the individual is a member" (Rogers 1981:90), knowledge of individuals' network links allows interpretation of their behaviour. People become aware of any idea through interpersonal and mass media communication but interpersonal and group communication strengthens their belief system and influences their changing behaviour and decision-making. So, the convergence model and network analysis approach is the best discipline of personal decision making processes.

Thus it is considered that this model is very useful to understand communication in traditional societies of rural Bangladesh where the majority of the women can neither read nor write, have very little access to electronic mass media, and depend on their interpersonal interactions to gain mutual understanding and mutual consensus about family planning information and their decision to practice it. More importantly, as communication network analysis is one of the research approaches of this model, the pattern of communication flows among village women and their impact on each other is identifiable through network analysis. Thus the convergence model of communication and social network analysis can help understand both theoretically and methodologically the influence of interpersonal communication on the fertility behaviour of women in rural Bangladesh. This model will provide the main theoretical underpinning of the research methods used in this thesis.

The limitation of this model is however it only explains the interpersonal and group communication in a system and their influence on personal decision-making, but

people get information and become influenced not only through interpersonal communication but also through the mass media, which is absent in this model. Thus the earlier models also have importance in this study.

2.5 Summary

“Interest in smaller families and in family limitation does not necessarily appear suddenly as an ambiguous rational decision of large masses of people”, observed Freedman and Freedman (1992: 44-50). Rather, interest in family planning spreads from one socioeconomic group to the next and from cities to the rural areas throughout a country, depending on available communication channels. These patterns suggest the importance of mass media and communication campaigns in promoting the diffusion of new attitudes about reproduction and thus in speeding reduced fertility. Again though family planning use depends on people’s private decisions and actions, these decisions involve individuals, couples, families, and even peer groups, especially in traditional societies (Rogers 1973). This implies that not all forms of communication are equally effective for changing fertility behavior in every context, which was found to be relevant for the overall decision-making process. Reviewing the nature and effect of communication processes as well as decision making processes, an idea of what type of communication processes might have influenced the fertility behaviour of the women of Bangladesh has been formed. Rogers’s generalisation (1973: 29), that “mass media channels are relatively more useful in creating awareness knowledge about an innovation, while interpersonal channels are better able to persuade individuals to form favorable attitudes about an innovation” further casts light to help to understand and select the research procedure to reveal the influence of communication.

Considering the rural setting of Bangladesh where women are mostly illiterate and only have a little access to mass media of radio and television, it is hypothesised that interpersonal communication has a great influence in creating the ideational change of shifting from a large family to a small family norm and interpersonal contacts have greater influence than mass media in this process. To test these hypotheses besides measuring the role of the mass media in this ideational change, special emphasis will be given to uncovering the pattern of communication networks among the village women of Bangladesh and the influence of these relational ties on their fertility behaviour. For that reason, the communication network analysis will be used as a

research approach to measure the interpersonal influence whereas the convergence model is the theoretical underpinning of that approach.

A discussion of communication network analysis is given in the next chapter to give further insight into the research approach adopted and the sociometric variables to be analysed.

Chapter 3

Communication Network Analysis

Introduction

Social network analysis is “a technique used to analyze the pattern of interpersonal communication in a social system by determining who talks to whom. Network analysis can be used to understand the flow of personal influence by enabling researchers to define who influences whom in a social system”. (Valente 1995: 2).

This methodology is an implementation of the convergence model of communication and can be applied to understand the fertility decision making of women in rural Bangladesh. The aim of this chapter is to present the concepts and processes of network analysis along with the desired plan to use this approach in the present research, which is organised in the following *five* sections:

Section 1: definition and some basic characteristics;

Section 2: network properties and some key concepts;

Section 3: theoretical motivation and historical development of network analysis;

Section 4: network analysis method;

Section 5: relevance of network analysis approach in the proposed research;

Section 6: summary;

3.1 Definition and Basic Characteristics

3.1.1 Definition

According to Rogers and Kincaid (1981: 75), “communication network analysis is a method of research for identifying the communication structure in a system, in which relational data about communication flows are analyzed by using some types of interpersonal relationships as the units of analysis”.

Any given individual in a system is likely to contact certain other individuals, and to ignore many others. As these interpersonal communication flows become patterned over time, Rogers and Kincaid (1981) observe that a “communication structure” (or network) emerges that is relatively stable and predictive of human behaviour. By analyses of communication structures one can understand the outcomes of human

interaction and its impact on individual behaviour in a system. Works of Snidjers and Baerveldt 2003; Huisman and Snidjers 2002; Snidjers 2001; Snidjers and van Duijn 1997 further show the dynamic evolution of networks over time and the impact of it on particular behaviour.

3.1.2 Basic Characteristics

Rogers and Kincaid (1981) pointed out two basic characteristics of this approach:

3.1.2.1 Relational Ties are the Building Blocks

A network is generally defined as a specific type of relation linking a defined set of persons, objects, or events (Mitchell 1969). Scott (1991) defines, a social network as a set of actors (or points, or nodes, or agents) that may have relationships (or edges, or ties) with one another.

The most distinguishing feature of communication network analysis is that it focuses on relationships among social entities and on the patterns and implications of these relationships (Wasserman and Faust 1994: 6). Types of networks depend on the different types of relations. Network analysis takes account of both the relations that occur and those that do not exist among the actors and the configuration of “present” and “absent” ties among the network actors reveals a specific *network structure*.

According to Rogers and Kincaid (1981: 97), “The structure of *relations* among actors and the *location* of individual actors in the network have important behavioural, perceptual, and attitudinal consequences both for the individual units and for the system as a whole. Without knowing the existing *relations* among the units or members in a system, no type of network analysis is possible”.

3.1.2.2 Simultaneous Micro-Macro Level Analysis

Network analysis examines at the micro level the dyads, triads, other small subgroups, and ego-centred networks. At the same time it allows at the macro level the examination of configurations of entire networks and the identification of structural positions and components of the network. Change at dyadic level can change the overall network structure and Wasserman and Galaskiewicz (1994: xii) emphasise, “One can understand how changes at one level of social organization (for example, the dyadic) affect another level (for example, the network as a whole), which in turn

affects the institutional order. Thus social network analysis provides a ready framework for linking the micro- and macro-orders”.

3.2 Basic Network Properties and Some Key Concepts

According to Hannemann (2000), *Connection* and *distance* are the two root components that are fundamental to communication network analysis and from these properties key concepts of the network approach have evolved.

3.2.1 Connections

According to Hannemann (2000), differences among individuals in how connected they are can be extremely important for understanding their attributes and behaviour. More connections often mean that individuals are exposed to more, and receive more diverse information. Highly connected individuals may be more influential, and may be more influenced by others. Thus differences in connections can give a picture about the stratification order of social groups.

3.2.1 Distance

Another important approach to capture the embeddedness of the individuals in a network is to examine the *distance* that an actor is from others. Some actors may be able to reach most other members of the population with little effort: they tell their friends, who tell their friends, and "everyone" knows. Other actors may have difficulty in reachability. They may tell people, but the people they tell are not well connected, and the message cannot go far. Here, distance refers not simply to geographical distance but to social and economic distance.

The macro-characteristic *distance* of a network controls the pattern of *information flow*, *cohesion*, and *influence* among individuals within a society. When distances are large, it may take a long time for information to diffuse across a population. The variability across the actors in the distances that they have from other actors may be a basis for differentiation and even stratification. Those actors who are closer to more others may be able to exert more power than those who are more distant.

3.2.3 Key Concepts

The size, density, degree, reachability, reciprocity, and transitivity of *connectedness* in a network and *distance* between individuals and group(s) in network perspective created several concepts at the heart of network analysis. These concepts are: actor,

relational tie, dyad, triad, sub-group, group (cliques), relation, isolate and network.

Wasserman and Faust (1994) discussed these in details.

Actor- is the social entity. They may be discrete individuals, corporate, or collective social units. People in a group, departments in a corporation, public service agencies in a city, nation-states in the world system may be the examples of actor(s) in a communication network.

Relational tie - is the unit of analysis in a network approach. It establishes the linkages among actors in the network. Some common examples of ties are: evaluation of one person by another (expressed friendships, liking, or respect); association or affiliation (jointly attending a social event, belonging to the same social club); behavioural interaction (talking together, sending message); formal relations (authority); biological relationship (kinship or descent).

Dyad – is a relationship between two actors. It is frequently the basic unit for the analysis of social network. Dyadic analysis focuses on the properties of pairwise relationship, such as whether ties are reciprocated or not, or whether specific types of multiple relationships tend to occur together.

Triad- is a subset of three actors and the possible ties among them. A triad is often treated as the minimum requirement for forming a clique or a sub-group in a network.

Subgroup- is any subset of actors. Dyads and triads indicate a subgroup of actors and all ties among them. Sub-groups are often termed cliques.

Relation- is the collection of ties of a specific kind among members of a group. For example, the *set of friendships* among pairs of children in a class-room.

Isolate –is the actor in a network who has no connection with any other actors in the defined system.

Social Network- is consists of a finite set or sets of actors and the relation or relations defined on them.

Figure 3.2.3-1 represents a communication network with related concepts.

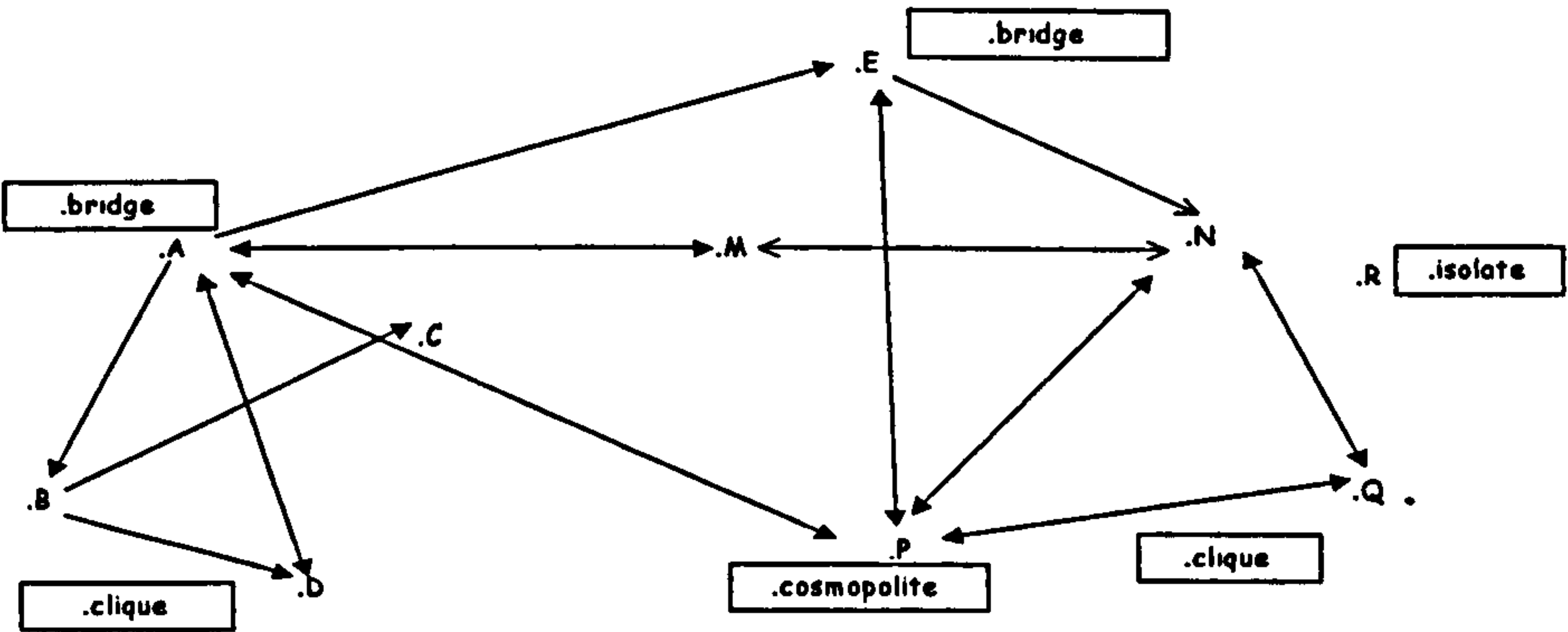


Figure 3.2.3-1: A Simple Communication Network and the Related Concepts

Figure 3.2.3-1 is a graphic representation of a communication network system comprised of 10 actors. A, B, C, D, E, M, N, P, Q, and R are the *actors* in this network. They are connected with *relational ties*. Here, AD, AM, AP are some examples of *dyadic* relationship. PQN is a *triad* (a set of three) and also a *clique*. In this system, ABD is also a *triad* but not a *clique*. A *clique* is a *subgroup* in a network where relational tie is intense among the members. PQNE is another *clique*, which is bigger than ABD. In a social network many cliques may remain. A and E are the *bridges* between two cliques. *Bridge* is a member of a clique who keeps relation with other cliques and exchanges information and ideas within the cliques. M is the *liaison* between the cliques. It is not a member of any clique but mediates and exchanges information and views of cliques. A liaison keeps a two-way relation. P is the *cosmopolite* or opinion leader. Cosmopolite is the entity that has intense relation with the overall network. Cosmopolites may possess the most influential power on overall network members. R is an *isolate*. An *isolate* is a member of the network but has little influence. If A, E or P is withdrawn from this network, the whole system may be changed whereas R's withdrawal will not change the network structure very much. If a social network is studied, it becomes possible to understand the nature of information

flow within the system and identify the influential elite. This helps one to decide the appropriate communication strategy for the system as a whole.

To measure the influence of network on individual behaviour, communication network analysis emphasises various *Structural* and *Locational* property measurements. These are also determined by *Connections* and *distances*. Some of these properties are *Centrality* and *Prestige*, *Cohesive Subgroups*, *Affiliations* and *Overlapping Subgroups*, *Structural Equivalence* etc (for a detailed definition and discussion of these properties see Wasserman and Faust 1994).

The importance of measuring *actor centrality* and *actor prestige* is to identify the prominence of actors in a system and the importance of measuring *group centralisation* and *group prestige* is to identify any sub-group(s) prominence and power. If any actor receives many ties, they are often said to be *prominent*, or to have high *prestige*. Again, actors who have high out-degree centrality are often said to be *influential* actors. They are the *cosmopolites*. Thus “betweenness” centrality can be seen as *liaisons*, *bridges*. In measuring “closeness”, “betweenness” and “degree” through standard statistical analysis, network analysts can determine the *centrality* of any actor in a network and instead of power, *network centrality* is used to assign prestige on an individual or any group or sub-group.

The idea of *equivalence* is another central property of network approach, which is also derived from network positions and social roles. Two actors have the same “position” or “role” to the extent that their pattern of relationships with other actors is the same. Measuring “structural equivalence” and “regular equivalence” network approach identifies the social position of actor(s). Two actors are equivalent if they have the same relationships with all other actors. If A likes B and C likes B, then A and C are structurally equivalent (whether A and C like each other does not matter, because A and C have identical patterns of ties either way).

Explicit mathematical statements of structural properties, with agreed formal definitions, have provided clear definitions of social concepts, and facilitated development of testable models and these social concepts with mathematical definitions have emerged as the fundamental properties of the network analysis approach.

Following are six measures used in the network analysis approach:

Density – is the percent of ties that exist in a network out of all possible ties. A density of 1.0 implies that every actor is connected to every other actor. A density of 0 implies that no actor knows any other actor.

Degree Centrality – is a measure of the number of direct ties. An actor is highly degree central to the extent that he or she is directly connected to many other actors. A network is highly degree central if there is wide variability of point degree centrality among actors. A network where one actor is the intermediary for all other actors, would be 100 per cent centralised. A network where all actors have the same number of ties within the network would have graph degree centrality of 0.

Closeness Centrality – is a measure of independence from the control of others. This is a similar concept to degree centrality, except that it focuses on the path rather than direct ties alone, so an actor is still considered to be connected (reachable) through intermediaries. A single actor is highly close central if that actor is connected by short paths to many other actors. Like degree centrality, 100 per cent centralisation implies a star network and 0 implies that all actors have the same number of ties. Closeness Centrality measures cohesion.

Betweenness Centrality – is a measure of information control. A single actor is highly between central to the extent that the actor lies on many geodesics (shortest paths) between actors. In this sense they act as a bridge between actors, and thus potentially control information. Again, 100 per cent centralisation of the entire network implies that one actor is a bridge to all others, and betweenness centralisation of 0 implies that no actor is any more a bridge than any other actor. Betweenness centrality also measures cohesion.

Clique - is a set of actors who are all directly tied to each other. There can be overlap between cliques: that is an actor can be a member of more than one clique. Therefore the number of cliques that exist in a network is a measure of the number of subgroups that exist.

Components - is a set of actors in a personal network who are connected to one another directly or indirectly. Unlike a clique, the members of a component do not have to be

connected to everyone else in the subgroup. A network with many components implies a compartmentalised network.

3.3 Theoretical Foundations and Historical Development of Network Analysis

The main development of the field took place in the 1930's by several groups in different traditional fields working independently. The pioneers of social network analysis came from sociology and social psychology (for example, Moreno 1946 1934; Cartwright and Harary 1956; Newcomb 1953; Bavelas 1950) and anthropology (Barnes 1969; Mitchell 1969).

According to Wasserman and Faust (1994), *three* motivations are at the core of development of social network analysis— Empirical Motivation, Theoretical Motivation, and Mathematical Motivation.

3.3.1 Empirical Motivation

Three scientists Kurt Lewin, Jacob Moreno, and Fritz Heider working in the Gestalt tradition contributed significantly in the development of network analysis as a research approach.

German sociologist George Simmel was one of the first to recognise the theoretical significance of networks in understanding behaviour change, whereas Moreno with Jennings first provided the basic methodological tools *Sociograms* to measure network variables in 1934. Moreno used *sociograms* to identify social leaders and isolates, to uncover asymmetry and reciprocity in friendship choices, and to map chains of indirect connection. This *sociogram* marked the beginning of *Sociometry*.

3.3.2 Theoretical Motivation

Balance Theory by Heider (1946) and Newcomb (1953) led to the network concept of *Structural Balance*. Lorrain and White (1971) used the mathematical property of *Structural Equivalence* to express the social concept of role in a formal mathematical procedure. One of the biggest emphasises in social anthropology in the twentieth century was on social relations. Radcliffe-Brown and Nadel perceived social structure as concrete relations among individuals. Rogers and Kincaid (1981) cast light on

communication network analysis as the research method of convergence model of communication.

3.3.3 Mathematical Motivation

Three major mathematical foundations of network methods are *Graph Theory*, *Statistical and Probability Theory*, and *Algebraic Models*.

Early sociometricians like Moreno, Jennings, Criswell, Harary, and Cartwright discovered *graph theory* and distributions of random graphs.

Statistical Models are used to test theoretical propositions about networks. These models allow the processes (which generate the data) to show some error, or lack of fit, to proposed structural theories. For studying *reciprocity*, *mutuality*, *balance*, and *transitivity*, statistical theory became important in that inferences can now be conducted. Simple Log Linear models of dyadic interactions and probability distribution for relational data are now used for analysing a wide variety of social network data (for details see Hannemann 2000; and Wasserman and Faust 1994).

Algebraic Models have been widely used to study *multirelational* networks. These models use algebraic operations to study combination of relations (for example, “is a friend of”, “goes to for advice”, and “is a friend of a friend”) and have been used to study *Kinship Systems* (White 1963; Boyd 1969) and network *role structures* (Boorman and White 1976; Breiger and Pattison 1986; Boyd 1990; and Pattison 1993). For a detailed discussion on the development of social network analysis, see Freeman, 2004.

3.4 The Network Analysis Method

In network analysis, link or relation is the component on which the formulation of research questions, research design, data gathering and analysis, and statistical inference are made. How these links are measured to understand the influence pattern in a system is the subject of the communication network approach.

3.4.1 Population, Sample and Boundary

As the network method focuses on relations among actors, actors cannot be sampled independently to be included as observations. If one actor is selected, then also all

other probable linked actors need to be included. As a result, network approaches tend to study whole population by means of census, rather than by sample.

Laumann *et al* (1989) describe *two* different approaches to boundary specification in social network studies.

The first way is the *realist* approach that focuses on actor set boundaries and membership as perceived by the actors themselves. For example, a street-corner gang is acknowledged as a social entity by its members and the membership of the gang is the collection of people the members acknowledge as belonging to the gang. All the members of a classroom, organisation, club, neighbourhood, or community can constitute a population. These are naturally occurring clusters, or networks. So, in a sense, social network studies often draw the boundaries around a population that is known, *a priori*, to be a network.

The second way, according to Laumann *et al* (1989) is the *nominalist* approach, which is based on the theoretical concerns of the researcher. A network analyst may take a more “demographic” or “ecological” approach to defining population boundaries. For example, a researcher may be interested in studying the flow of computer messages among researchers in a scientific specialty. In such a study, the list of actors might be the collection of people who published papers on the topic in the previous five years. Both of these approaches to boundary specification have been used in social network studies.

Classrooms, offices, social clubs, villages, and even, occasionally, artificially created and manipulated laboratory groups all are the examples of clearly defined actor set boundaries where some other network studies of actors such as elite business leaders in a community (Laumann and Pappi 1976) have less well-defined boundaries. (for details see Wasserman and Faust 1994).

When boundary is unknown, special sampling techniques such as *snowball sampling* (Goodman 1949, 1961; Erickson 1978) and *random nets* (Rapoport 1963; recently resurrected by Fararo 1981, 1983; and Fararo and Skvoretz 1984) can be used to define actor set boundaries.

Most network studies focus on well-defined, completely enumerated sets, rather than on samples of actors from a larger population. Selecting a specific sampling technique depends on the nature of the research and specific network properties.

Rogers and Kincaid (1981: 103) mention four techniques of sampling survey network links.

3.4.1.1 Sampling Intact System

All of the members of the each system are respondents, or at least all the members that meet certain qualifications. For example, Rogers and Kincaid prepared a socio-metric data-set from all of the 1,003 married women of reproductive age in a representative sample of 24 Korean villages with mothers' clubs purposively selected from a random sample of 24 rural counties.

This approach is particularly advantageous for socio-metric measurement because data about the characteristics of both the respondent and the respondent's dyadic contacts are available because everyone is interviewed. It gives a complete picture of relations in the population. Here the unit of analysis may be individuals, personal communication networks, dyadic links, cliques, or the entire network.

However, obtaining data from every member of a population, and having every member rank and rate every other member can be very challenging in any but the smallest groups. The task is made more manageable by asking respondents to identify a limited number of specific individuals with whom they have ties.

3.4.1.2 Quasi-Sociometry

Quasi-sociometry is a random sample of individuals in which the respondent is asked a sociometric question, but the individuals that s/he names are not also respondents. The units of sampling are individuals, and the associated personal communication networks attached to each such individual that is sampled. The unit of analysis is usually the individual respondent's personal communication network. This method is popularly known as ego-centred networks.

The main problem with this method is isolates are ignored because individuals only name the people who are connected with them. Also the tendency not only to "know

whom he knows” but also to “know whom those he knows know” is limited to a fairly small system in which a great deal of interaction takes place.

3.4.1.3 Snowball Sampling

An original sample of respondents is asked to name their sociometric peers, who then become respondents in a second phase of data-gathering, their sociometric contacts thus nominated become respondents in a third phase, etc. Thus the sample grows like a snowball rolling downhill. Snowball sampling follows a multistage design in which respondents at each phase determine who the respondents are at the following stage. The unit of analysis can be the individual or the chain, but it is usually the dyad.

This method can be particularly helpful for tracking down “special” populations, such as business contract networks, community elites, deviant sub-cultures, kinship networks, and many other structures can be effectively located and described by snowball methods. It may not be as difficult to achieve closure in snowball “samples” as usually perceived. The limitations on the numbers of strong ties that most actors have, and the tendency for ties to be reciprocated often make it fairly easy to find the boundary.

Hannemann (2000) observes two major limitations and weaknesses of snowball methods. First, actors who are not connected (i.e. “isolates”) are not located by this method. The presence and numbers of isolates can be very important feature of populations for some analytic purposes. Second, there is no guaranteed way of finding all of the connected individuals in the population. Where does one start the snowball rolling? If it is started in the wrong place, there remains a possibility of missing the whole sub-sets of actors who are connected.

3.4. 1.4 Non-Sampling

Most laboratory experiments in social sciences follow this alternative of simply not worrying about formal sampling techniques and generalisability. Every member of a single intact system (an organisation, a village, etc.) is a respondent. The unit of analysis can be the individual, the personal communication network, or the clique, but not the network.

3.4.2 Data Collection

There are varieties of ways of collecting network data. Rogers and Kincaid (1981) mentioned *three* distinctive ways of collecting data.

3.4.2.1 Survey Sociometry

Sociometry is a means of obtaining and analysing quantitative data about communication patterns among the individuals in a system by asking each respondent to whom s/he is linked. For example: “With whom in this village do you talk most frequently about topic ‘X’?”

Survey sociometry can comprise two techniques of data collection: Questionnaire and Interview.

Three different question formats are generally used in survey sociometry.

- Roster vs. Free Recall

In a *roster* questionnaire, each actor is presented with a complete list, or *roster*, of the other actors. For example, while collecting data on friendship among members of a university class Krackhardt and Stern (1988) had each person rate their friendship with every member of the class on a five-point scale.

In a *free recall* questionnaire, the researcher does not present a complete list of actors in the network to the respondent on the questionnaire. It is common simply to ask respondents to “name those people with whom you discuss (about X)” For example, Rapoport and Horvath (1961) studied friendships in two junior high schools. Students were asked to list their best friends, but were not presented with a roster.

- Free vs. Fixed Choice

If actors are told how many other actors to nominate on a questionnaire (for example, to name a specific number of “best friends”), then each person has a fixed number of “choices” to make. Such designs are termed *fixed choice*.

If actors are not given any constraints on how many nominations to make, the data are *free choice*.

- **Ratings vs. Complete Ranking**

To measure the intensity of strength of ties, in some network design actors are asked to rate or rank order all the other actors in the set for each measured relation. *Rating* requires each respondent to assign a value or rating to each tie. *Complete Ranking* requires respondent to rank their ties to all other actors. Full rank-orders and rating scales with multiple response categories produce *valued* relations.

Where questionnaires are not feasible, *interviews*, either face-to-face or over the telephone, are occasionally used. Also sometimes data may be collected interviewing through a structured questionnaire.

3.4.2.2 Observation

This method has been widely used in field research to study relatively small groups of people who have face-to-face interactions and also in the study of interactions of animals. The main advantage of observation over direct questioning of respondents about their communication relationship is that the observed data are usually assumed to have greater validity. But this method has the two disadvantages of being *time-consuming* and *obtrusive*. It is also open to observer bias that may compromise the validity of the research.

3.4.2.3 Unobtrusive Method

Here, researchers measure relational ties from records of interactions. Ties are measured from archival records, diary, record of telephone conversations, appointment calendars, and such. This method has the advantage of providing network data about individuals or organisations that are not available in surveys or observations such as individuals who refuse to be interviewed, people who are dead, corporations that are dissolved, and so on. Problem with this method is it tends to reflect the formal dealings only.

3.4.2.4 Other Methods

Some other special data collecting procedures are: *Cognitive Social Structure Design* (an extension of sociometric data to include actor perceptions of the network); *Experimental Studies* (network data are collected under controlled situations); and

Small World (an attempt to determine how many actors a respondent is removed from a target individual based on acquaintanceship).

3.4.3 Data Analysis

As discussed earlier, the major difference between conventional and network data is that conventional data focus on actors and attributes; network data focus on actors and relations. These special purposes and emphases of network research do call for some different considerations. For instance, according to Wasserman and Faust (1994), one cannot use multiple regression, *t*-tests, canonical correlation, structural equation models, and so forth, to study social network data or to test network theories. Rather, a social network analyst considers data on ties among the units where attributes of the actors may also be included. The analysis of network data is discussed in two parts here: data presentation and data measurement.

3.4.3.1 Data Presentation

In network analysis the data structure is of the measurement of links (L) between respondents. So the data input is of an L x L structure. Whereas, conventional statistical analysis uses M variables for N respondents giving an N x M table. For example, table 3.4.3.1-1 represents a conventional rectangular data array. The rows of the array are the cases, subjects, or observations. The columns consist of scores (quantitative or qualitative) on attributes, or variables, or measurements.

Table 3.4.3.1-1: Conventional Data Array

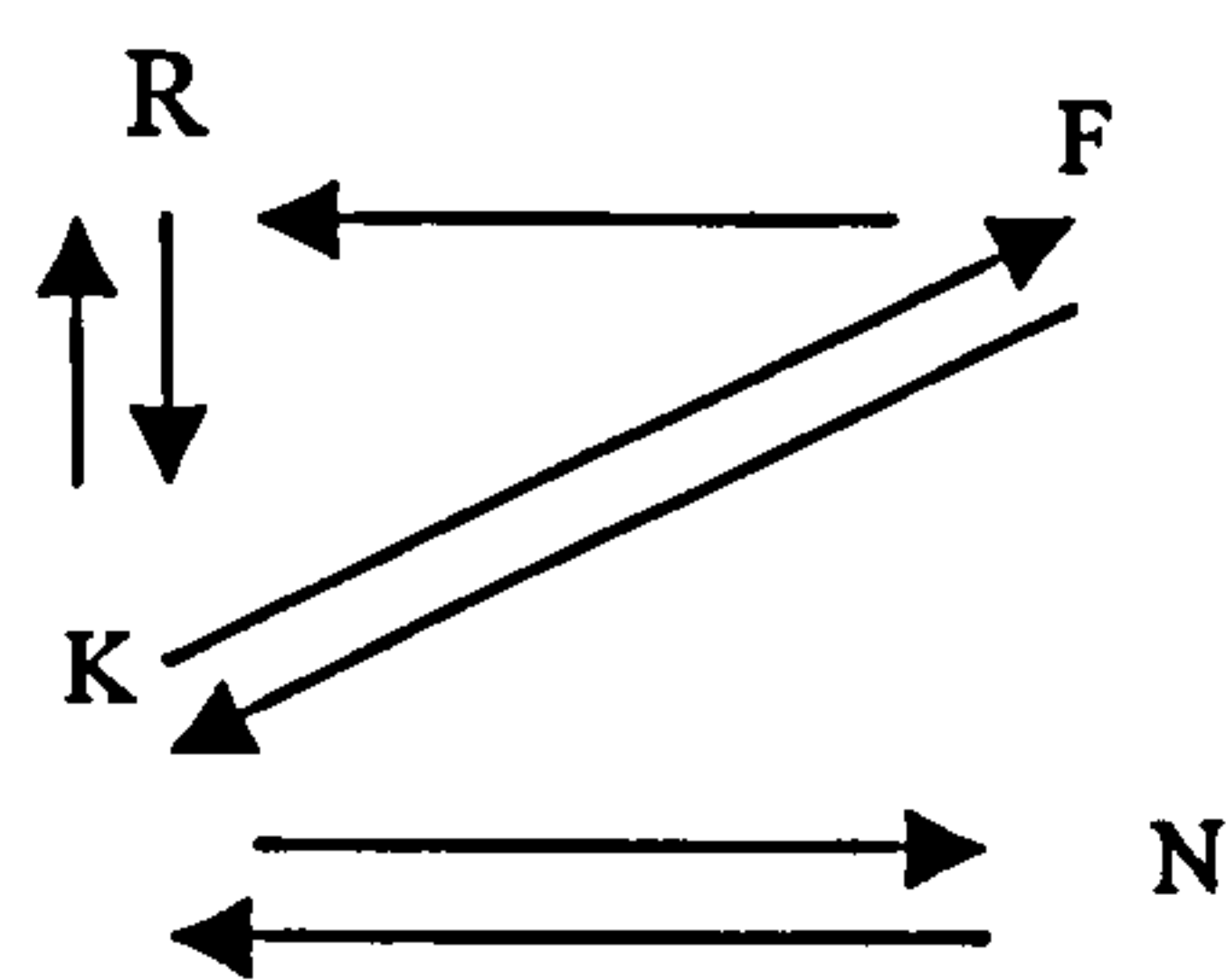
NAME	SEX	AGE	IN-DEGREE
Rahim	Male	32	2
Fatema	Female	27	1
Karim	Male	29	1
Nahid	Female	28	3

Table 3.4.3.1-2 represents network data (in their purest form) and consists of a square array of measurements. The rows of the array are the cases, subjects, or observations. The columns of the array are the same set of cases, subjects, or observations. Each cell of the array describes a relationship between the actors.

Table 3.4.3.1-2: Network Data Array

WHO REPORTS LIKING WHOM?				
	CHOICE:			
CHOOSER:	Rahim	Fatema	Karim	Nahid
Rahim	---	0	1	1
Fatema	1	---	0	1
Karim	0	1	---	1
Nahid	1	0	0	---

Two kinds of tools from mathematics are used to represent information about patterns of ties among social actors: graphs and matrices. A graph or sociogram of the aforementioned relational ties may look something like:



The matrix for these four actors is presented in table 3.4.3.1-3.

Table 3.4.3.1-3: Network Data in Matrix

	Rahim	Fatema	Karim	Nahid
Rahim	0	1	1	0
Fatema	0	0	1	0
Karim	1	1	0	1
Nahid	0	0	1	0

3.4.3.2 Data Measurement

Unit of observation, modelling unit, and the quantification of relations are the *three* basic components of data measurement. Network data are observed and analysed at a number of different levels: the individual actor, dyad, triad, subgroup, or the network as a whole. Two properties of relations are important for their measurement: whether the relation is directional or non-directional and whether it is dichotomous or valued. To quantify the relations, statistical approaches are used in network analysis and these are now discussed.

3.4.3.3 Statistics in Network Analysis

In one way, there is little apparent difference between conventional statistical approaches and network approaches, observes Hannemann (2000). Univariate, bivariate, and even many multivariate descriptive statistical tools are commonly used in describing, exploring, and modelling social network data. Algorithms from statistics are commonly used to describe characteristics of individual observations (e.g. the median tie strength of actor X with all other actors in the network) and the network as a whole (e.g. the mean of all tie strengths among all actors in the network). Statistical algorithms are commonly used in assessing the degree of similarity among actors, and in finding patterns in network data (e.g. factor analysis, cluster analysis, multi-dimensional scaling). Even the tools of predictive modelling are commonly applied to network data such as correlation and regression.

But the point at which network approach differs with conventional statistical methods is inferential statistics. Often the inferential question is of little interest to social network researchers. Reason may be in many cases, studies are conducted on a particular network or set of networks, and therefore there is little or no interest in generalising to a larger population of such networks. The other major use of inferential statistics in the social sciences is for testing hypotheses and the estimation of standard errors by well-validated approximations. These approximations are made normally when the observations are drawn by independent random sampling. But Network observations are almost always non-independent, by definition. Consequently, conventional inferential formulas do not apply to network data (though formulas developed for other types of dependent sampling may apply). Thus network data tend to differ from more "conventional" survey data in some key ways: network data are often not probability samples, and the observations of individual actors are not independent. These differences are important for both the questions of generalisation of findings, and for the mechanics of hypothesis testing. Wasserman and Faust (1994) discussed the inferential side of network analysis in detail.

3.5 Relevance of Network Analysis in Proposed Research

To identify the influence of communication in fertility behaviour of the women in rural Bangladesh, the role of both mass media and interpersonal communication will be analysed. In this section, first the relevance of this approach in fertility behaviour

analysis in general and then the relevance of this approach in the proposed research in particular will be discussed.

3.5.1 Relevance in Fertility Behaviour Analysis

According to Rogers (1979), the distinctive about family planning communication is that it deals with relatively taboo and strongly held topics and at the same time it is

- “i) predominantly interpersonal, rather than mass media; and
- ii) mainly between highly homophilous source-receiver dyads”.

Reviewing early studies on adoption of family planning innovations, Rogers further made the generalisation, *Family planning diffusion is almost entirely via interpersonal channels* (Rogers 1979: 261). Some early studies like Simons (1969), Palmore (1968) found that mass media channels only helped the respondents creating awareness-knowledge of contraceptives and again only a very low proportion of respondents mentioned this particular role of mass media. The studies of Liu and Duff (1971), Lam (1968), Balakrishnan and Matthai (1966) found that friends and relatives were the most important communication channels not only for family planning adoption but also for forming family planning ideas.

Interpersonal communication, especially from homophilous peers like friends and neighbours, is essential to persuade or convince the average receiver about an innovation. Rogers concludes with support from investigations of different types of innovations, “this persuasion task can best be accomplished by word-of-mouth channels; they have safety credibility” (Rogers 1979: 267). For the same reason, Rogers argues, peer channels are most important in reinforcing the adoption decision, once it has been made. Quoting several demographic experts Kincaid (2000: 217) states, “The conclusion from historical and contemporary demographic research are indirect and are based primarily on an inference that spatial pattern of fertility decline (i.e. by country) imply that diffusion of contraceptive practices must be occurring by means of interpersonal communication among individuals (Bocquet-Apple and Jakobi 1998; Rosero-Bixby and Casterline 1993).

Thus it is evident that family planning behaviour, especially the adoption-decision, depends on interpersonal channels. In other words, interpersonal relationships are the sources of persuasion that shapes fertility behaviour. Network analysis is used to

understand the flow of *personal influence* by enabling researchers to define ‘who’ influences ‘whom’ in a social system. Thus, communication network analysis may reveal the interpersonal pattern of persuasion of fertility behaviour discovering the patterning of human interaction within a system and here lies the relevance of the network analysis approach in analysing fertility behaviour.

3.5.2 Relevance in the Proposed Research

The proposed research deals mainly with the factors that affect fertility behaviour. The idea of network effects on behaviour has been around for a long time. Empirical support for an association between one’s own behaviour and that of one’s peers can be found throughout the behavioural literature. For Simmel (1964: 140), the essential question for understanding behaviour change is “to whom is the individual linked by communication ties?” Not only Simmel, a basic proposition of social psychology, sociology, and social anthropology is that individual behaviour is influenced through relationships of the individual with others. Rogers and Kincaid (1981: 83) argue, “The behavior of an individual is partly a function of communication networks in which the individual is a member”. The communication networks in which an individual is embedded, thus offers a basic explanation for the individual’s behavioural pattern. In fact, network variables themselves explain the uniqueness of network influence on personal behaviour. Following is the discussion of how relevant these variables are in analysing human behaviour in general and fertility behaviour in particular, and how these variables are planned to be used in the proposed research. The discussion focuses on the specific areas that will be investigated in the research. Mainly the:

- i) relation between network exposure and fertility behaviour comparing the behaviour of connected actors with isolates;
- ii) role of central actors in fertility behaviour;
- iii) role of group influence;
- iv) influence of structural equivalence;
- v) strength of weak ties in family planning decision;

3.5.2.1 Comparison of Isolates and Non-isolates

One type of evidence for the importance of network variables on individual behaviour is to compare certain behaviours of the individuals in a system who have no network links (isolates) with the individuals who are linked to others.

Rogers and Kincaid found in their 24 Korean villages of study that the identified 85 isolates (and isolated dyads) among the 1,003 female respondents were markedly different from the 918 non-isolates. The isolates were only about one-fourth as likely to adopt family planning methods. At the same time it was found that the homes of isolates were more likely to be located at the periphery of the villages. Again these 24 villages were divided at the median level of adoption of family planning (35.6 percent) into “low adoption” and “high adoption” villages, in order to determine the effects of connectedness on the adoption of family planning by isolates and non-isolates. It was found that only one among 37 isolates in the low-adoption villages (3 percent) adopted, compared with 17 percent in the high-adopted villages. This difference suggests that the effects of being isolated and living in a low-adoption village, each have an independent effect on adoption of contraception.

Thus one can expect that a woman who talks with others about family planning are more likely to be an adopter of this idea. Comparatively more recent works of Montgomery and Casterline (1998) and Montgomery *et al* (2001) also find strong association of network connectedness and contraceptive use.

In the proposed research, the relation between network exposure and fertility behaviour will be measured identifying isolates in sample villages, and comparing the adoption rate of isolates and non-isolates. The hypothesis to be tested is: isolates use less contraceptives than non-isolates.

3.5.2.2 Effects of Personal Network

According to Valente (2000), personal network exposure is the proportion or number of adopters in each person's network that provide information and influence with regard to some behaviour and each individual's likelihood of adoption increases as the proportion (or number) of users in her/his personal network increases.

Boissevain (1974: 27) observed that a personal communication network “forms a social environment from and through which pressure is exerted to influence (an individual’s) behaviour”. He suggests, “individual with larger personal networks obtain more information from their networks, and hence are likely to respond to this informational input in their behaviour” (1974: 35).

Evidence for the importance of personal communication network variables (individual connectedness, integration, and diversity) in explaining human behaviour comes from research on the diffusion of innovations. The earlier studies of Coleman *et al* (1966), Lin and Burt (1975), Burstein (1976) and Hurt and Preiss (1978) show that communication links act as a mediating influence in determining how particular antecedents affect behaviour change.

Rogers and Kincaid found from their Korean villages study that an individual was more likely to adopt family planning if a larger proportion of her personal network consisted of individuals who had adopted previously. The study of Valente *et al* (1997) in Cameroon found that friendship ties were associated with contraceptive choices. All these studies demonstrate the effect of personal networks in determining individual behaviour change.

In the proposed research, the effect of personal network exposure will be determined. Three hypotheses to be tested here are: i) individuals with larger personal networks use more contraception than those who are with smaller personal networks; ii) contraception use is higher among individuals if a larger portion of her personal network consists of individuals who also use contraception; and iii) contraception use is higher among individuals if a larger portion of her personal network consists of individuals who approve of family planning.

3.5.2.3 Effects of Cliques (Subgroups)

Numerous network studies show that if membership in the clique is important to the individual, the clique has potential for influence on the individual’s decisions and actions. Studies of Lazarsfeld *et al* (1948), Katz and Lazarsfeld (1955), Coleman *et al* (1966), Bearman and Brückner (1999), Alexander *et al* (2001) found strong clique effects on human behaviour. Again the studies of Rogers and Kincaid (1979), Valente *et al* (1997) found that perceptions of friends’ behaviour, and in particular perceptions

that these friends encouraged contraceptive use, were significantly associated with their contraceptive behaviour.

In the proposed research, the effects of cliques on fertility behaviour will be measured testing two hypotheses: i) actors who are members of a clique are more likely to use contraception than the actors who are not members of any clique; ii) members of more than one clique use contraception more than the members of isolated cliques;

3.5.2.5 Effects of Opinion Leaders

Opinion leaders are the individuals with the highest number of nominations in a network and are considered to be a significant influence on the rate of adoption. They are perceived to be the earlier adopters and it is postulated that they then pass on information to opinion followers. This pattern of opinion leaders being early adopters and then passing on information about the innovation to opinion followers is originated from the *two-step flow* theory (Katz 1957; Weimann 1982).

The argument behind this is that the individuals wait until the most influential members of the group adopt an innovation. When the opinion leaders adopt a decision, risk and uncertainty about the innovation decrease and the opinion followers are more likely to adopt the innovation. Studies of Coleman *et al* (1966), Katz and Foulkes (1962), Katz *et al* (1963), Rogers and Beal (1958), Rogers and Kincaid (1979) correlated innovativeness with opinion leadership. The study of Entwisle *et al* (1996) found that contraceptive choices made early adopters contribute significantly to the contraceptive choices made by later adopters. Kincaid's (2000) most recent study on the impact of social network approach to family planning communication in Bangladesh found that discussions with opinion leaders on family planning issues has a significant indirect impact on modern contraceptive use through its effect on ideation.

It is assumed, as Valente (1995: 36) explains, "individuals who receive a lot of nominations are more influential and act as a role model for others. At the same time, because individuals tend to nominate those of higher socio-economic status and higher socio-economic status is associated with earlier adoption, the correlation may be of a spurious effect". The diffusion network model, as Valente (2002) observes, further posits that initial contraceptive choices would be made by some women based on their innovativeness and exposure to outside sources of influence such as their

cosmopolitanism, media use, or greater need for the innovation. The new idea, and its practice, then spread through the network as users persuade non-users to adopt either by exhortation, entreaty, enticement, or example. Several studies (Soumerai *et al* 1998; Latkin *et al* 1998; Sikkema *et al* 2000; Kincaid 2000) identified opinion leaders using network data, and had these leaders implement successful behaviour change programmes. It is worth mentioning here that the nomination pattern depends what the nominations are about.

In a country like Bangladesh with the norms of agrarian cultural society and with less exposure to mass media, the impact of role models' advice and practice may be immense. As sociometric studies can determine whether structural positions such as centrality are associated with adoption, identification of opinion leaders and an analysis of how much these opinion leaders affect the fertility behaviour of other women in the network, can be measured. In the current research, identification of opinion leaders and the role of opinion leaders in fertility behaviour of the women of Bangladesh will be examined through testing two hypotheses: i) central actors/opinion leaders are more likely to use contraception than the women who are less connected; ii) central actor's fertility behaviour has a significant influence on the contraceptive behaviour of other women of the network.

3.5.2.6 Strength of Weak Ties

The strength of weak ties theory based on works of Granovetter (1973) and Liu and Duff (1972) states that weak ties, individuals loosely connected in a network, are the bridges that serve to join unconnected groups (or cliques), and act as important links in diffusion process. The basic idea is homophily and individual integration among network members facilitates effective communication, but it acts as a barrier to prevent new ideas from reaching individuals. So within interlocking networks, informational strength is weak, some heterophilous ties from external sources are needed to give the interlocking ties openness. These weak ties then enable information to flow from clique to clique via liaison and bridges. Valente (2002) explains, "...weak ties are bridges, not weak because their strength is low, but because they connect otherwise disconnected individuals".

Fine and Kleinman's study (1979) found that sub-cultural norms emerge through the maintenance of weak ties. The study of Liu and Duff (1972) on the network analysis of

the diffusion of the IUD in the Philippines showed that the innovation spread easily within interlocking cliques, among housewives of very similar socio-economic status. But heterophilous flows were necessary to link these cliques. Usually these weak ties connected two women, for example, who were not close friends, and enabled the innovation to travel from a higher-status to a somewhat lower-status housewife.

In Bangladesh, numerous non-sociometric studies revealed that home visits of Family Welfare Assistants (FWAs) contributed hugely in the success of country's national family planning programme. These FWAs are not clique members, not member of immediate peer groups, they may even not be network members in spatial sense but they may be the weak links who convey new ideas and practice about family planning, health and family welfare among the communities. Again, some development workers, NGO-persons, who are not necessarily peer members, but are contributing at the ideational level about family planning, can be considered as weak ties within the network. In the proposed research, the correlation between the influence of these weak ties and the adoption of family planning will be measured. For that purpose, data were collected by the multiple choice sociometric question asking, besides the five persons the respondent refers as her close friends, whom she considers the most influencing person for her on this issue. The strength of weak ties in fertility behaviour of women in rural Bangladesh will be analysed testing the hypothesis: FP workers have significant influence on contraceptive practice of rural Bangladesh.

3.6 Summary

Throughout the discussion, it is clear that the communication network analysis approach with its properties and analytical techniques can be a very suitable methodology to understand the interpersonal nature of influence on fertility behaviour. The proposed research is an attempt to use this network approach in understanding the impact of interpersonal communication on fertility behaviour in rural Bangladesh. How the network analysis techniques will be used to reveal the pattern of influence on the fertility behaviour of the women of Bangladesh has also been discussed in this chapter. Analysis of network variables will be integrated at three levels simultaneously, i.e. individual, clique and system level, testing some hypotheses. Some components of both relational and structural network models will be used. Analysis of the relational models like opinion leadership, group membership and personal network

exposure will help understand the interpersonal influence flows through direct ties. Whereas analysis of structural network models like centrality, and threshold effect models may help understand the effects of interpersonal influence as a function of an individual's position in her/his social structure. Thus the proposed research ties together many interdependent parts that constitute micro and macro social orders of a system that hopefully will answer the questions of how interpersonal communication influence the fertility behaviour of rural Bangladeshi women. All the sub-hypotheses developed for this purpose in this chapter will be tested in chapter 7.

In the next chapter there is a review of literature on demographic change and how this applies in Bangladesh.

Chapter 4

Theories of Fertility Change

Introduction

Though the main focus of the research is to find out the degree of influence that communication processes have on fertility behaviour, a general understanding of the other factors perceived to influence fertility behaviour might be helpful to distinguish the relative importance of communication in explaining the fertility decision in the specific situation of rural Bangladesh. A review of the major theories and observations pertaining to fertility change and fertility behaviour is presented in this chapter in following *six* sections:

Section 1: the classical demographic transition model;

Section 2: the 'theory' of proximate determinants;

Section 3: economic theories on fertility transition;

Section 4: socio-economic-cultural theories;

Section 5: ideational change theories;

Section 6: factors identified from empirical research and their relation to Bangladesh;

Section 7: summary

To measure the relevance of these theories and observations in the Bangladesh perspective, the factors that will come out from the review of these models and theories will then be included in the questionnaire for data collection. This will be elaborated on in the next chapter.

4.1 Demographic Transition Models

The demographic transition has it that there is a change from high fertility to low fertility and in the twentieth century transition, which characterised Europe, this was led by a fall in mortality. Early theorists such as Dumont (1890) argued that the change in fertility arose first among social elites and was then copied by others. Thompson (1929) further formulated the ideas and its relation to economic development. This was developed by Notestein (1945). Then Davis (1945) forwarded the idea of the classical demographic transition theory the kernel of which is the observation that in Western

societies, fertility and mortality were extremely high in the pre-industrial era, and that in contemporary industrial societies they are extremely low: the demographic transition occurred in between (Demeny 1974).

Though there are many versions of demographic transition model (Mason 1997), there is some consensus that it involves *four* general stages of variation in death and birth rates and population growth.

Stage 1 involves high and relatively equal birth and death rates and little resulting population growth;

Stage 2 is characterised by a declining death rate, especially concentrated in infancy and childhood. The fertility rate remains high, leading to at least moderate population growth;

Stage 3 involves further declines in mortality, usually to low levels, and initial sustained declines in fertility. Population growth may become quite high, as levels of fertility and mortality increasingly diverge;

Stage 4 is characterised by the achievement of low mortality and the rapid emergence of low fertility levels. Population growth becomes low or negligible;

The stages are exhibited in figure 4.1-1.

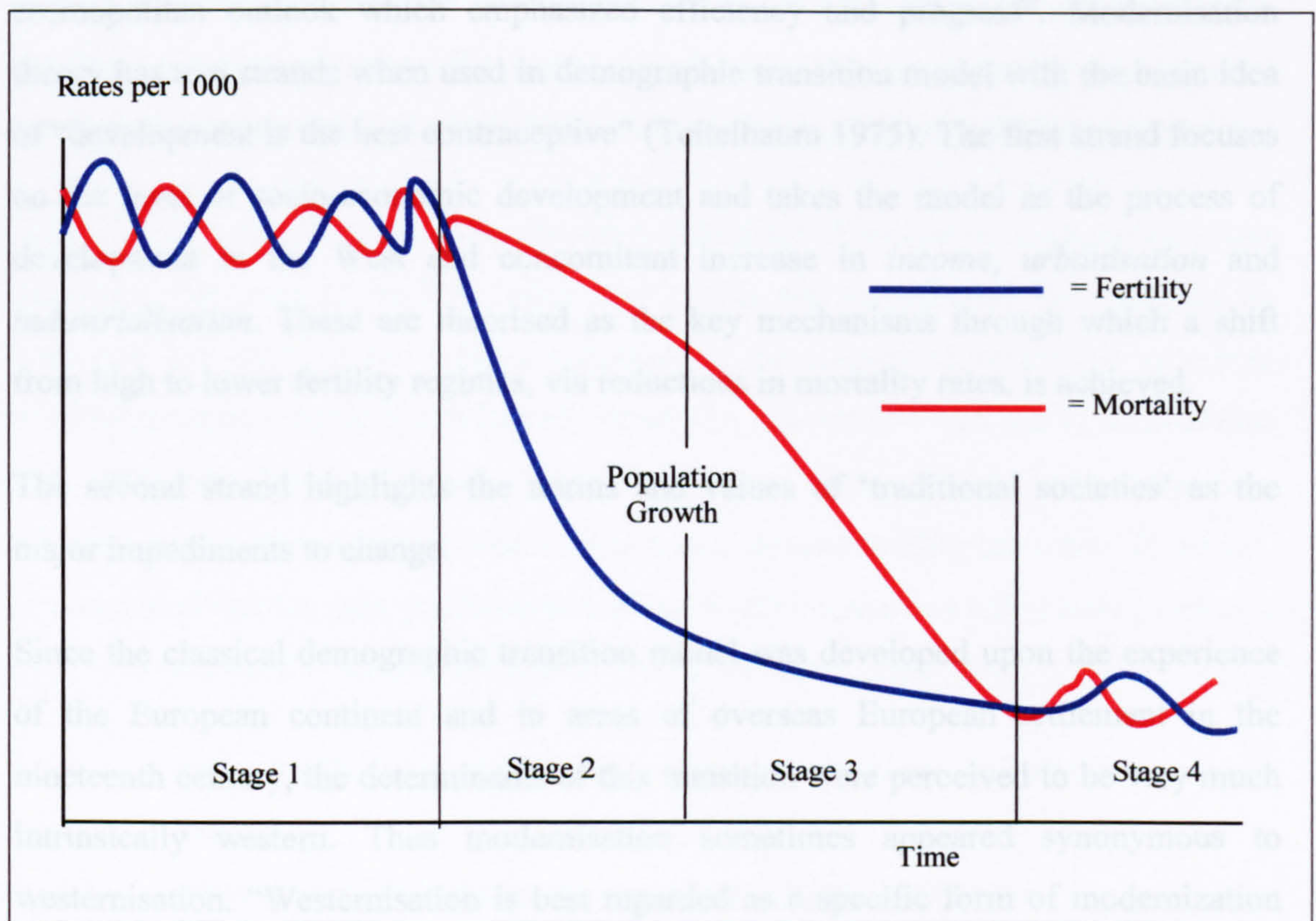


Figure: 4.1-1: The Demographic Transition

Modernisation and *westernisation* are perceived as the two basic determinants of fertility transition within classical demographic transition model that are comprised of many structural and cultural sub-determinants. These include economic development, technology, modern education, improved health conditions, the advent of a technological civilisation, rationality, ‘growing individualisation’, ‘rising levels of popular aspiration developed in urban industrial living’, the freedom from ‘older taboos’ and *promoting the health, education, and material welfare of the individual child...etc.* For Notestein 1945, these older taboos are the *religious doctrines, moral codes, laws, education, community customs, marriage habits, and family organisations that are all, focused toward maintaining high fertility.*

From this was developed the notion of modernisation, which according to Cowgill and Holmes (1972: 312), “is the transformation of a total society from a relatively rural way of life based on animate power, limited technology, relatively undifferentiated institutions, parochial and traditional outlook and values, towards predominantly urban way of life based on inanimate sources of power, highly developed scientific technology, highly differentiated institutions matched by segmented social roles, and a

cosmopolitan outlook which emphasized efficiency and progress”. Modernisation theory has two strands when used in demographic transition model with the basic idea of “development is the best contraceptive” (Teitelbaum 1975). The first strand focuses on the level of socio-economic development and takes the model as the process of development in the West and concomitant increase in *income*, *urbanisation* and *industrialisation*. These are theorised as the key mechanisms through which a shift from high to lower fertility regimes, via reductions in mortality rates, is achieved.

The second strand highlights the norms and values of ‘traditional societies’ as the major impediments to change.

Since the classical demographic transition model was developed upon the experience of the European continent and in areas of overseas European settlement in the nineteenth century, the determinants of this transition were perceived to be very much intrinsically western. Thus modernisation sometimes appeared synonymous to westernisation. “Westernisation is best regarded as a specific form of modernization and modernization as a specific form of social change”, observes van de Kaa (1996: 400). So, combining modernisation and westernisation as the desired way of social change through which fertility transition can occur, the demographic transition model was considered as almost a panacea for explaining fertility decline.

However, as Mason (1997) indicates, this model was used extensively, and also was criticised harshly (e.g Cleland 1985; Cleland and Wilson 1987; Coale and Watkins 1986; Knodel and van de Walle 1979; McDonald 1993). The criticisms mainly stemmed from one of the central conclusions of the classical model, “in regard to demographic matters the different countries of the world may be considered as on a single continuum of development” (Kirk 1944 quoted in van de Kaa 1996: 398). But the works of Coale (1973), Coale and Watkins (1986) in Europe and the works of Bongaarts and Watkins (1996) in the developing countries found only a weak correlation between the level of urbanisation or industrialisation and the decade in which nations or provinces first experience a fertility decline.

The first phase of transition that occurred in the west approximately 100 years before the second phase of transition occurred in Asia and Latin America fits more with the history of urbanisation, industrialisation, and mortality decline in this region of the world. But several countries in Asia, for example, Bangladesh (Amin *et al* 1995) and

in the Caribbean, for example Haiti (Cosio 1996), that are currently undergoing the fertility transition are primarily agrarian and underdeveloped, giving an apparent contradiction to the idea that development and modernisation bring fertility decline.

Coale (1973) found the correlations between indicators of economic modernisation and the date of the onset of fertility decline to be weak and inconsistent. For example, he cited, the late onset of the fertility transition in the country in which the industrial revolution began (England) and its early onset in a country that was late to industrialise and urbanise (France). Coale discredited any ideas about industrialisation, urbanisation, or other forms of modernisation as causes of fertility transition. However, he concluded that the only generalisation about fertility transition left standing was that fertility would decline when three preconditions were met. These are:

- i) when fertility was within the realm of conscious calculation for most individuals;
- ii) when most of them knew some method to limit fertility; and
- iii) when they perceived there to be an advantage to doing so;

Other systematic reviews of the demographic histories in Europe also revealed that fertility decline in Europe occurred in the context of widely differing social, economic, and demographic conditions (see for example, Leasure 1962; van de Walle and Knodel 1967). These new questions gave birth to some new formulations of the classic demographic transition model incorporating various new determinants such as *secularisation* (Lesthaeghe 1977; Leasure 1982), *mass education* (Caldwell 1980), and *similar culture* (Watkins 1991).

However, some fundamental differences in demographic transition between LDCs and MDCs led some demographers to a reformulation of this model; for example, Berelson's (1969) demographic transition model for less developed countries. Based on the experience of Zambia in particular, Berelson included two distinctive features in his model for LDCs:

- “i) the birth and death rates in stage 1 are higher in LDCs than that in MDCs; and
- ii) stage 2 seems to have taken a much shorter time that it took with the MDCs”;

These are illustrated in figure 4.1-2.

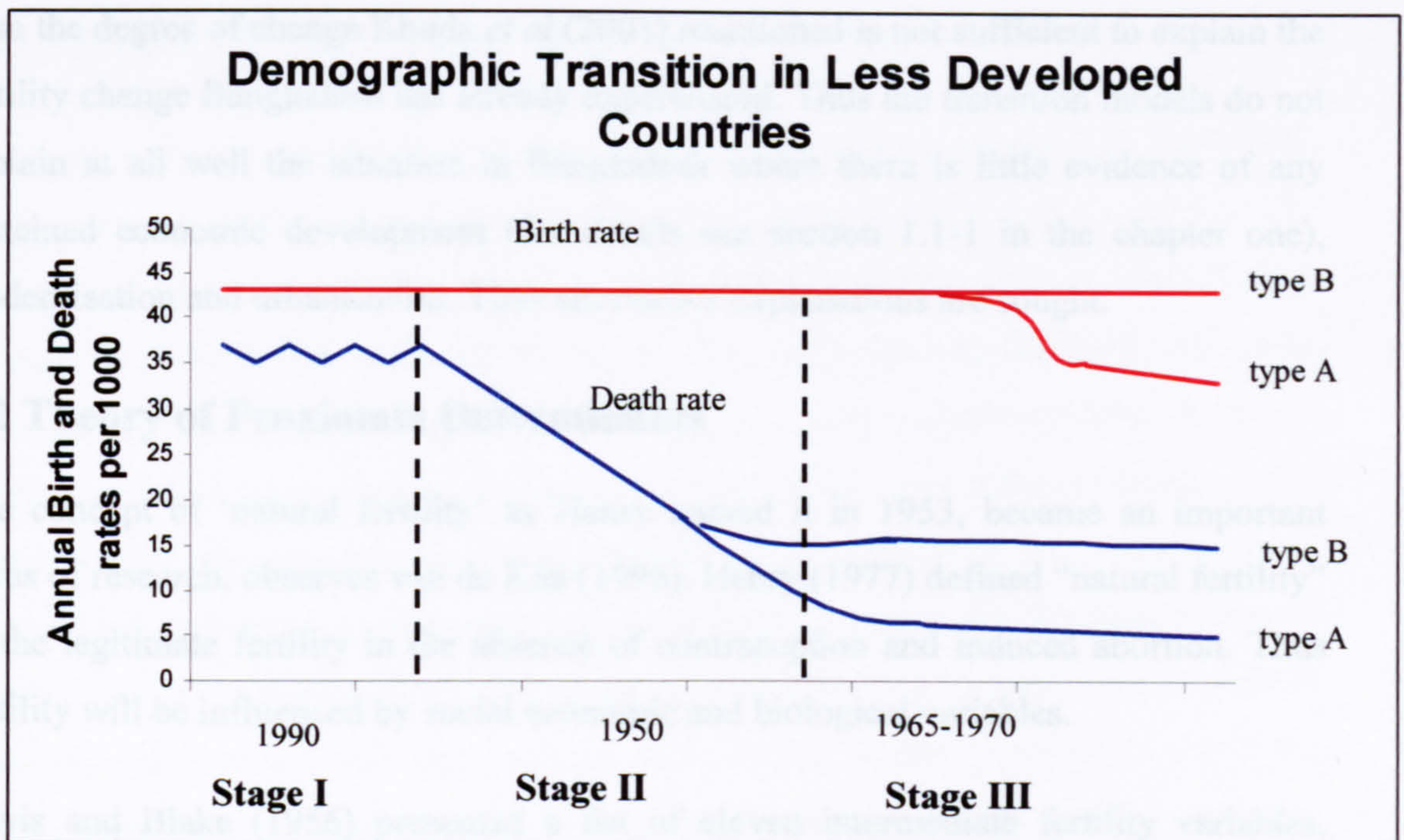


Figure 4.1-2: Three-stage demographic transition model in less developed countries by Bernerd Berelson.

He suggests that there are three clear stages rather than four, and LDCs fall into two categories, Type A and Type B. Type A countries are those that have experienced economic development and have seen a fall in their birth rate together with a decline in their death rate in Stage three. Type B countries, typical of many low income LDCs such as Zambia, have maintained a high birth rate with a death rate that is levelling off albeit at a higher rate than type A countries.

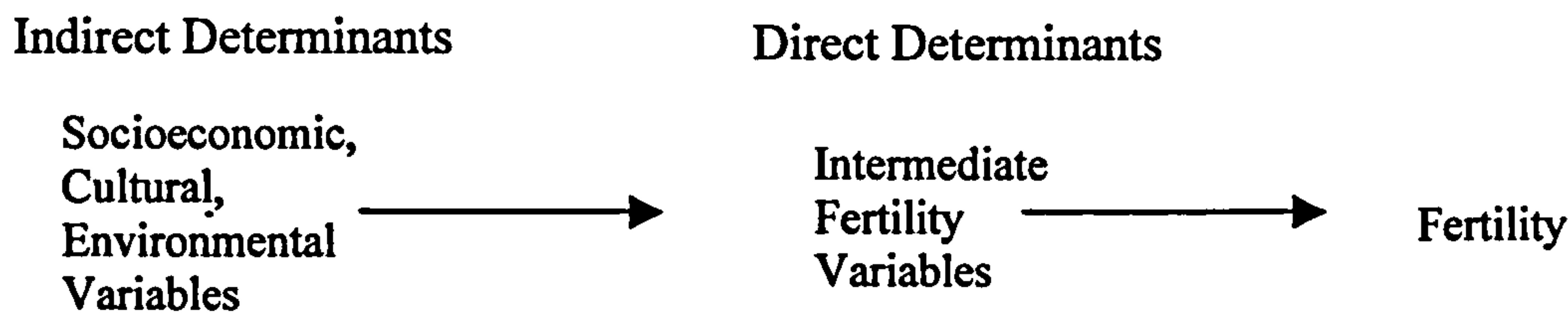
In Bangladesh, Duza and Nag 1973, Rob 1988, Khuda and Howlader 1990, and Khuda *et al* (2001) all pointed to socio-economic change as determinants to fertility transition in Bangladesh. Khuda *et al* (2001: 379) argue, “Poverty may have been little mitigated, but life has changed”. Between 1973 and 1992, primary school enrolment more than doubled for girls and secondary enrolment increased threefold (Khuda and Hossain 1996). In the decade up to 1986, the number of electrified villages multiplied by four, the number of doctors trebled, even tube wells increased by 53 per cent (Khuda and Howlader 1990). Khuda *et al* (2001) identified these types of change as socio-economic change and argued its impact on fertility transition though the impact of these changed infra-structural variables is not supported by research, except education.

In a previous piece of research Khuda *et al* (1990) found no significant relation between development and contraception in rural Comilla in the period 1967-1985. Also the degree of change Khuda *et al* (2001) mentioned is not sufficient to explain the fertility change Bangladesh has already experienced. Thus the transition models do not explain at all well the situation in Bangladesh where there is little evidence of any sustained economic development (for details see section 1.1-1 in the chapter one), modernisation and urbanisation. Thus alternative explanations are sought.

4.2 Theory of Proximate Determinants

The concept of ‘natural fertility’ as Henry named it in 1953, became an important focus of research, observes van de Kaa (1996). Henry (1977) defined “natural fertility” as the legitimate fertility in the absence of contraception and induced abortion. Thus fertility will be influenced by social economic and biological variables.

Davis and Blake (1956) presented a list of eleven intermediate fertility variables, which acted on the number of children born. In 1976 Bongaarts refined this to a model defining the relationship between intermediate fertility variables (IFV) and fertility. Intermediate fertility variables are biological and behavioural factors through which socio-economic, cultural and environmental variables affect fertility. Bongaarts argued that differences among populations and trends in fertility over time can always be traced to variations in one or more of the IFVs. The system works as follows:



According to the model, differences in fertility among populations are due to the four determinants: marriage, post-partum infecundability, contraception and induced abortion (Bongaarts 1982). Thus the TFR can be determined by the following equation:

$$TFR = TF \cdot C_{\mu} \cdot C_i \cdot C_{\chi} \cdot C_{\alpha}$$

Where, TF is the total fertility, C_μ is an index of marriage, C_i is the index of post-partum infecundability, C_x is the index of contraception, and C_a is the index of induced abortion. The value of these indices lies between zero and one.

This model became appealing and as the necessary data became available in the World Fertility Survey (WFS), it has been widely used (see Compton and Coward 1989; Stoeckel and Chowdhury 1980; Islam and Khan 1995; Balakrishnan *et al* 1980). Using the same WFS-data and following the same logic as Bongaarts, Hobcraft and Little developed an individual-level approach based on exposure analysis in 1994. But these two models (Bongaarts model and Hobcraft-Little model) gave different results when applied to the same Shanghai population. Reinis (1992) compared and evaluated both the models and concluded that both models performed well under the assumption of random use of contraception and induced abortion but “under more realistic conditions, the models did not perform well at all”. Reinis (1994:314) urged the development of a method to handle the complexities of human fertility because, “Bongaart’s method does not lead to an estimate of what fertility would be in the absence of each of the proximate determinants”.

The most important criticism of this model is that it may give unreliable estimates if the information (especially post-partum amenorrhoea and induced abortion) is unreliable or biased in nature. Also the theory is not suited to societies where birth may occur outside of marriage. But Bongaarts and Watkins (1994) while working on the determinants of fertility in sub-Saharan Africa gave a more comprehensive list of proximate determinants where age at marriage and women of reproductive age irrespective of marital status were included. Therefore the list comprised: proportion of women married or in sexual unions, frequency of intercourse, postpartum abstinence, lactational amenorrhoea, contraception, induced abortion, spontaneous intrauterine mortality, natural sterility and pathological sterility.

Among the proximate determinants, apart from contraception, three other components are not in a suitable state to explain the fertility change in Bangladesh. Women get married at a very early age of around 15 years, abortion is not legal and is very much abhorred socially. Though breast-feeding is universal (97 per cent), the mean duration of ‘exclusive breast-feeding’ and ‘breast-feeding with water’ are only 3.8 months and 5.5 months respectively (BDHS 1999-2000). Again the situation in Bangladesh,

because of its persistence of low economic development, is not well described by this approach.

4.3 Economic ‘Theories’ of Fertility Transition

Starting from Malthus (1798-1817) to the Brezis model (2001), numerous economic explanations for fertility transition have been provided both at macro and micro levels.

Malthus provided a systematic analysis of population size and growth. Marx is another major economist who also provided a model of family and fertility. Their famous debate and opposition of ideas regarding population and wages in the 19th century, according to Brezis and Young (2001: 7), “has been projected on to the development of recent theories on demographic transition” and “leads today to two different ways of modelling demographic transition”. In particular, demographic transition and Malthusian growth has been the focus of interest amongst scholars such as Becker *et al* (1990), Galor and Weil (1996, 2000) and Dahan and Tsiddon (1998), whereas the Brezis model (2001) is based on Marx’s views regarding child labour and the family and supports Marx’s descriptive writings of the period.

Despite the differences in the views of Malthus and Marx regarding family, they share some common points in that they both perceived *fertility rates to be affected by income*.

4.3.1 Malthusian Models of Family and Fertility

Flew (1970) summarises Malthus’s theory as that if population growth is not checked it will increase by more than food production and a disequilibrium will arise. When the population of a nation reaches the limit of its food production possibilities, there are only two ways to maintain equilibrium: *positive checks* or *preventive checks*, or both. The preventive checks are all actions that reduce the fertility rate (late marriage, birth control), while the positive checks are those that increase the mortality rate. “If the positive checks to population had been unusually small, the preventive checks must have been unusually great” (Malthus 1970: 261).

Malthus further explained the positive relation between wages and fertility in that this mainly operated through the age of first marriage. When incomes were high, people

married early and hence the number of births increased. When times were hard, people married later, hence the number of births declined.

It is difficult to argue for the relevance of the Malthusian model to the culture of Bangladesh where marriage is universal and tends to be at a young age regardless of access to land.

The Malthusian model was highly criticised by Marx, particularly on the view that the “laws of nature” dictate that workers will have as many children as possible, so a higher real wage will lead to an increase in population. The main assumption of Malthus’s theory is that the decisions of men are driven by nature. But for Marx, man *controls* nature: “Man therefore is able to control nature consciously and make his own history. It is this ability that allows him to produce beyond subsistence and which guarantees that he will not be subjected to the dilemma that Malthus has described.” (Marx 1976b: 109).

Another major criticism is that the Malthusian model could not predict the effect of the industrial revolution, in which incomes rose and fertility declined. Today, fertility and income appear to be negatively correlated which is contrary to classical Malthusian theory of a positive correlation between the two.

Despite huge criticisms, the Malthusian model of fertility rates has been developed by Leibenstein (1957), Becker (1960), and Galor and Weil (1996, 2000). The Malthusian laws of nature are incorporated into these models by assuming that the number of children enters in a positive way into an individual’s *utility function* (Brezis and Young 2001). These models argue that there is a trade-off between quantity and quality of children.

At the base of the theory is the proposition that children are a special type of capital good. They are relatively long-lived assets, which produce a flow of services over time, and which involve initial acquisition and periodic upkeep costs. Their value derives from the flow of services they produce, which in turn produces utility for the parents.

Becker (1960) argues that this explains the European demographic transition of fertility falling as income increased. Because the demand for the child-services were

inversely related to income, this made children an “inferior good” with a low or even negative income-elasticity of demand. Such goods are inferior in the sense they are chosen only when income is very low and all competing goods exceed the consumer’s budget constraint. If income increases, the other “superior goods” are chosen instead.

Becker (1981) tried to solve this conceptual problem by adding the notion of “child-quality”. According to Becker (1981), child-quality is “all those qualities of a child which make it more valuable to the parents”. Razin and Sadka wrote (1995:13), “the improvement in the quality of a child can be done in a variety of ways such as: spending on the current consumption of a child, investing in the child’s health or education (investing human capital) and providing for the child’s future consumption (bequest)”. Child quality is understood to include the well being- present and future, of the child, as well as the utility this creates for the parents (Robinson 1997, see also Cigno 1994).

In the first phase of this model, due to an increase in income, the fertility rate increases. The decrease in fertility that takes place later on is due to the fact that when education is needed, parents prefer to have fewer children who are educated, rather than less educated children.

Schultz (2001) extends these ideas by pointing out that women’s labour force participation and real wages have risen over time, and thus the cost of the relatively time-intensive child-quality has increased sharply. So the cost per child has risen and then the number of units demanded fallen. In an environment where the opportunity cost of female (i.e. mother’s or child-care giver’s) time is higher, fertility is expected to be lower, other things being equal (Schultz 1981).

Again these extensions are not relevant to Bangladesh where population remains predominantly rural and poor. Women are not involved in jobs outside the home. Even for the women who are employed outside the home, their wage rates have not increased sufficiently to support the concept of opportunity cost. Nor are children appreciating as capital goods as there is little post-primary school education in rural Bangladesh. Finally, the socio-cultural cost of not having children is more than that of having children.

Though this Becker/Chicago School demand theory has become dominant in explaining fertility transition, it has many critics such as Michael and Willis 1976, Polloak and Wachter 1975, Bulatao and Lee 1983, Easterlin and Crimmins 1985, and Cleland and Wilson 1987. The theory was mainly criticised for giving an unusual complexity of child services that are related with child quality. Human activity that produces children is frequently not undertaken in a rational effort to produce children at all. Robinson (1997: 70) argues, “children may be born simply because it is too costly for parents to avoid them. And a large part of this cost consists of non-economic socio-psychological elements.”

These criticisms led to a reformulation of the theory which resulted in economic explanations of fertility dividing into two “schools”: the Chicago School, represented by Becker, Willis, Rosenzweig, Schultz, Nerlove and others who accepted Becker’s fundamental assumptions and approach; and the “Pennsylvania School”, comprising Easterlin, Wachter, and others, who reject the “narrow” economic approach, and employ more diverse variables and methods. Thus it is more of a “socio-economic school”, Robinson (1997: 71).

Important among the ideas of the Pennsylvania/second school are Easterlin’s “Relative Income Theory”, which is a direct extension of Malthus’s ideas. Easterlin (1978, 1987) in his *relative income* theory demonstrated that cohort size and intergenerational ambition act to cause fertility fluctuations. Social and economic aspirations are formed during a child’s upbringing and they will aspire to meet and better the social and economic conditions of their parents. Their ability to achieve this depends on the size of the cohort into which they were born. In that if they are born into a large cohort due to competition effects and lower relative wage rates it is hard to meet aspirations so marriage and having children will be delayed. Consequently children of large cohorts will have reduced fertility compared to those of small cohorts. Although this explained well the situation of post Second World War America it has no relevance to rural Bangladesh where the labour market is not developed and economic opportunities within agriculture are limited.

Also parts of the Pennsylvania school’s ideas are Cain’s “Old-age Risk Theory” and Caldwell’s “Wealth Flows Theory” (1976). As these are more than Malthusian ideas they will be discussed later.

4.3.2 Marx's Views on Family and Fertility

In the view of Marx and Engels, decisions about fertility are related to the modes of production: "In fact every special historic mode of production has its own special laws of population, historically valid with its limits alone. Since the decisions about fertility are related to the modes of production, there should be a difference in family decisions between the social classes – the bourgeois and the proletariat." (Marx 1976a: 784).

Regarding the bourgeoisie, children are a means for continuing the family business. In other words, the capitalist orientation of the bourgeoisie will determine the optimal number of children that are the legal heirs of the business.

For the proletariat, as the individual workers do not get enough to be able to exist and reproduce themselves, there is a need for the work of children in order to ensure the family's survival. Though Marx made no explicit remark on the optimal number of children from the point of view of the worker, he claimed: "In fact...the absolute size of the families stands in inverse proportion to the height of wages" (Marx 1976b: 796-7). Quoting Laing, Marx also comments, "Misery up to the extreme point of famine and pestilence, instead of checking, tends to increase population" (Marx 1976b: 797).

In recent times the Brezis model (2001) distinguished the utility function of workers from that of the bourgeoisie. Her model showed that a decrease in real wages leads to an increase in the fertility rate of the proletariat, because children are an investment good, their wages are necessary for the family and become even more necessary when wages decrease.

The predominant attitude of desiring more children, especially male children, among rural poor people of Bangladesh can be well explained by the Marxian view that for the family maintenance children wages are necessary so that leads to the birth of more children. But Marxian explanation does not appear relevant to Bangladesh at the point that fertility has undergone a dramatic decline despite the need of children's wages for sustaining the family.

4.3.3 Supply-Demand Theory and Easterlin Hypothesis

By analysing micro-level data for Sri Lanka and Colombia, and macro-level data for Taiwan and a number of Indian states, Easterlin and Crimmins (1985) found that the

motivation for birth control was consistently and significantly related to the use of contraceptive devices. From this finding they argued for the excess of supply over demand for contraception. They also found that both supply and demand contributed to motivation to use contraception, and during the early stages of the transition supply may have been the more important of the two.

Cleland and Wilson (1987) argued that the recent developments in various parts of the world provide ample evidence that 'demand' has no future. Rather supply of contraceptives created the demand for family planning practice. These ideas may well be the reason why family planning programmes in Bangladesh have been perceived as successful.

4.3.4 Cain's Old-age Risk Theory

The term "risk" refers to events that pose threats to a person or a family. According to the "Old-age Risk Theory", "risk" is a major incentive to high fertility (Cain 1981; Robinson 1983). Based on Liebenstein's (1974) utility function of children and the working experience in Bangladesh and some parts of India, Cain formulated the "Old Age Risk" theory (Cain 1981, 1983a, 1983b; Cain and Lieberman 1983). He argued that the motivation for wanting more children in developing countries is not very clear in economic theories and suggested that one of the main reasons of high fertility is the desire for security in old age. Cain specified Liebenstein's utility function arguing that the value of children as an insurance source would be "highest" in situations with a harsh environment, and where more effective forms of insurance do not exist. For Cain, the lower the level of old age security, the higher the level of women's risk of increasing family size. For Cain (1983a), the feeling of security in old age is one of the main reasons for high fertility in Bangladesh. Therefore children are treated as insurance that will help them from any risk or crisis such as floods or natural disasters (Cain and Lieberman 1983).

However, this theory has been criticised severely. Theoretically Cain's ideas were criticised mainly for emphasising the benefit side of children ignoring the cost side of the equation (Ahmad 1981). Robinson (1983) pointed out that the high fertility in Bangladesh was not only for the high benefit but also for the very low cost of child bearing, which was totally ignored in Cain's theory. Empirically the theory was criticised by Robinson (1986) for the miscalculation of risk and insurance, and

children's contribution to it. Robinson refuted the claim of protecting parents in risky environments on empirical grounds in Bangladesh. It is evident that children cannot protect their parents from natural disasters in Bangladesh, as they are also unprotected in such calamities. Also this theory failed to address the reliance of parents on children in terms of a gender perspective. As the society is patrilineal, female children cannot help their parents in risky environment, as they contribute only to their in-law's family. So parents cannot rely on their female children. With the changing pattern of family system (from joint family to nuclear family), old age supports from even male children are becoming less reliable, as has been observed in India by Dharmalingam (1994) and also in Bangladesh by Rob (1988). According to Khuda *et al* (2001: 378), "the security value of sons has declined with falling land-man ratios as the overall population increases, and with increasing nucleation of households, associated with a declining proportion of the workforce working on family land and new ideas of family relations". Increased unemployment rate and insufficient wages earned by day labourers cannot yield a supply to support their parents. Thus Cain's theory is not pursued.

4.4 Socio-economic and Cultural Theories of Fertility Transition

In the initial formation of classic demographic transition theory, Notestein (1964) highlighted the social dimensions. He observed that "in pre-transitional societies, the means of achieving status, the systems of community rewards and sanctions, family organization and the like, were all organized in ways that favoured early marriage and high fertility" (quoted in van de Kaa 1996: 413). Notestein saw fertility starting to decline only after the controlling factors had come within the area of rational choices of the couples involved. Rather than supporting any totalitarian claim of both economic and transition theories, empirical findings, especially in developing countries, has led to a more substantive concern with the household, as the household is the key locus of reproductive decision-making in most societies. Thus, social and cultural factors appeared to be more relevant to explain both the diversified pattern of demographic characteristics and the demographic transition in different societies (for details see, Boserup 1970; Caldwell 1982a and 1982b; Kandiyoti 1985; Sen 1990; Dre'ze and Sen 1995).

The basic premises of these social-cultural theories are that human societies regulate the behaviour of their members through some basic institutional arrangements, called social norms. Society regulates its members to conform to norms by rewarding accepted behaviour while detrimental behaviours are punished. The complete set of norms in a society constitutes the value system, which becomes part of the culture. Childbearing is a social behaviour to which socially defined values are attached.

In the following section the following are discussed:

- i) Caldwell's "Intergenerational Wealth Flow Theory" as a social explanation of demographic transition; and
- ii) empirical based cultural explanations of fertility transition.

4.4.1 Caldwell's "Intergenerational Wealth Flow Theory"

In Caldwell's "Intergenerational Wealth Flow Theory" (1980), the proposition put forward is that the limits of economically rational behaviour are set by non-economic factors. It is in non-economic factors, the social conditions that prevail in society, which prevent fertility from falling below a floor when it would be economically rational to reduce fertility to an ever lower level, and which provides a ceiling when it would be economically rational to have more children (van de Kaa 1996). Caldwell (1967) explained fertility change in relation to changes in family structure and family system. The central point of Caldwell's (1982a) restatement of the demographic transition theory is that fertility decline will not occur before the "wealth flow", which in traditional societies goes from children to parents, has been reversed, a condition which is not expected to occur "before the family is largely nucleated both emotionally and economically". Using the Yoruba of Nigeria as an example, Caldwell outlines three types of society: primitive, traditional, and transitional and shows how societal norms determine fertility behaviour.

In both primitive and traditional societies, children do a great deal of work for their parents not only when young, but also during adulthood. They accept responsibility for parents in old age; eventually bolster the family's political power and give it economic advantages; they ensure the survival of lineage or family name and in many cases undertake the necessary religious services for ancestors. So fertility is high in these societies. Whereas, in transitional societies, people, especially the innovators, are more likely to be educated, more likely to have husbands with non-manual jobs, and more

likely to have had fathers with non-manual jobs. The innovators have been emotionally nucleated from their families, and have a greater concern with their children, and their children's future. Thus fertility decline depends on intergenerational wealth flow, which is dependent on social structure.

“Caldwell's theory may apply to sub-Saharan Africa, where Caldwell conducted much of the field work that generated the theory and where extended families are strong and lineage elders are likely to benefit from high fertility” observes Lesthaeghe (1980, quoted in Mason 1997: 444), but as Freedman (1979) and others have noted, the theory may not work as well in many parts of East Asia including Bangladesh, where fertility has declined with little apparent change in extended family relationships (Thornton and Fricke 1987).

Caldwell (1994) added many other determinants for fertility transition, especially for Asian countries: infant mortality, the impact of government population policy, contraception, education, economic conditions, and national family planning programmes. As Caldwell includes so many demographic and socio-cultural factors in addition to economic conditions, his theory became generally applicable in developing countries. But according to Cleland *et al* (1994), the demographic transition in Bangladesh began despite social, economic and institutional circumstances, which were unfavourable to reproductive change.

Caldwell identified the value of children in regard to the “net economic advantages”, but the value of children cannot be measured solely in economic terms. Children have some other social-demographic and psychosocial values. Following earlier work of Hoffman and Hoffman (1973), Fawcett and Arnold (1975) developed a ‘Value of Children’ (VOC) measurement-instrument which contained nine factors in value orientations: continuity, tradition, security; parenthood satisfaction; role motivation; happiness and affection; goals and incentives from children; social status from children; external controls on childbearing; costs of children; decision mindedness for childbearing. Thus Caldwell's theory has the limitations of existing economic theories and accordingly will not be pursued in the situation of rural Bangladesh. Also in Bangladesh the ‘intergenerational wealth flow’ is always from parents to children, i.e. there is no difference in wealth flow when the fertility rate was very high and when it declined.

4.4.2 Cultural Explanations of Fertility Transition

According to van de Kaa (1996), the strongest case for the presence of ideational/cultural factors in the fertility transition in historical Europe has been argued by Lesthaeghe, who, sometimes with his associates, has explored the underlying dimensions of that change in an important series of papers (1980, 1983, 1986, 1988, 1992).

According to van de Kaa 1996, after analysing the data of large-scale survey programmes, particularly the World Fertility Survey, Cleland and Wilson failed to identify any divergence in fertility between familial and non-familial economic sectors, convincing evidence of a causal link between women's employment and fertility, and found very slender basis to assert that the security motive for high fertility is of major influence on fertility change. Also they found that the evidence on the relationship between education and fertility, particularly for Latin America, supports a cognitive rather than a structural mode of causality. These points led them to argue that 'the influence of new knowledge, ideas, and aspirations...can spread independently of individual economic circumstances' and they claimed, "At least part of the explanations must lie in social or psychological elements, such as aspirations, knowledge, attitudes, or social norms, which are capable of rapid transformation".

For developing countries, Cleland and Wilson (1987) observed, many of the conventional variables associated with high fertility do not appear to have the same relevance. Parts of Africa have higher rates of literacy and survivorship than much of the Indian sub-continent without the expected lower levels of fertility. Similarly, while low densities of population and abundant availability of land in Africa used to suggest that there is little incentive to shift to smaller family sizes, such an argument could equally apply to parts of Latin America without the same apparent fertility effect. Rather, Kabeer (2001) observes that in societies where land has traditionally been held communally by patrilineage groups, where landlessness and wage labour were largely absent and where access to land depended on the availability of family labour, it has been in the interests of families to expand the size of their membership.

Empirical support for the need to incorporate cultural explanations into fertility models comes from the work of Gage and Njogu 1994, Todaro and Fapahunda 1987, Pebley

and Mbugua 1989 and Goody 1989 on Sub-Saharan Africa; Dyson and Moore 1983, Kandiyoti 1985, and Agarwal 1994 on Indian sub-continent; Greenhalagh 1995, Morgan and Rindfuss 1984 and Chamrathirong *et al* 1988 on East and South-East Asia among others.

The main argument of these works is that differences in fertility behaviour are primarily related to cultural differences (see Lesthaeghe 1983). For an example, Greenhalagh (1985) observes, East Asian kinship systems are predominantly patrilineal. Post-marital residence is patrilocal, requiring women to integrate into the affinal family; and there is strong public-private dichotomy, with women largely restricted to domestic and childcare activities and home-based economic activity. In addition, sons are considered essential to the continuity of the patriline within the Confucian culture and this is one of the regions that are characterised by strong son preference. So, by 1980s when most parents in China were expressing preference for two children, most parents wanted at least one son, something that the authorities have recognised. The one child policy was introduced in 1979 but couples were allowed to have a second child if the first was a daughter (Greenhalagh and Li 1995). In contrast, South-East Asia, excluding Bangladesh, is found to have a “favourable cultural setting” for rapid fertility decline. This region is characterised by more egalitarian gender relations, including bilateral kinship patterns, a weak public-private dichotomy and hence considerable public mobility for women, and traditionally high rates of female labour force participation. Throughout the region, newly married couples are as likely to set up independent households or live with the bride’s parents as with the groom’s (see Morgan and Rindfuss 1984; Chamrathirong *et al* 1988). Women have traditionally played a central role in planting and harvesting rice as well as in marketing and commerce. Marriage transactions also centre on the bride price rather than dowry in much of this area. High rates of divorce, often initiated by women and free of social stigma, characterise parts of both Indonesia and Malaysia. Women in this region tend to have greater access to higher education and professional careers, even after marriage, than in other parts of Asia. This is also an area where son preference is either weak or absent (Stinner and Madden 1975; Hirschmann and Guest 1990). So, in Viet Nam fertility was declining long before any serious attempts at family planning programmes.

The essence of this theory is if the society's cultural norms are liberal enough to accept family planning, people practice contraception easily. Thus for specific fertility behaviour "economic, demographic, and political factors all play a role but all within the cultural context" (Kertzer 1999: 23).

Even according to Marxian analysis, any given economic formation generates some norms, values, beliefs, and practices (these are the aspects of what Marx terms superstructure, i.e. manifestation of culture) to which people conform. The significance of these aspects of the superstructure becomes greater than aspects of economy when they prevail for a long time. In some instances, as Nabi (1990) observes, the cultural aspects seem to be stronger than the politico-economic relations of social productions despite its super structural characteristics in the Marxian sense of the term (for example, the role of Muslim religiosity in justifying the high fertility trends in Bangladesh). In an aggregate level causal analysis of 1981 census data, Nabi finds Muslim religiosity to be the only significant determinant of both female age at marriage and fertility in Bangladesh and "when Muslim religiosity was removed from the multivariate model, urbanisation is found to have only an indirect effect on fertility" (Nabi 1990: 29).

According to the discussion above, every society has its own social institutions and cultural norms that determine the fertility behaviour of that society. But these cultural explanations are not relevant to explain the fertility behaviour of the women in rural Bangladesh as it is agrarian, dominantly an Islamic country with strong religiosity and son preference, women are *Purda* fettered that restricts them from any work outside home, women's post-marital residence is patrilocal, and thus procreation of male children ultimately determines the usefulness of women in the family and in the society. The question arises, in societies where social and cultural norms are not favourable to family planning practice such as Bangladesh, what is the explanation of fertility decline, if there is any, in those societies. Other than coercion (as observed in China), "ideational change" theory may explain that situation and this is now discussed.

4.5 Ideational Change Theory Of Fertility Transition

Ideational change is a "psychological shift from, *inter alia*, fatalism to a sense of control of destiny, from passivity to the pursuit of achievement, from a religious,

tradition-bound and parochial view of the world to a more secular, rational and cosmopolitan one” (Cleland and Wilson 1987: 9). Working both on European Fertility Transition data as well as data from 24 developing countries covered by the 1979 World Fertility Survey, Cleland and Wilson (1987) singled out “ideational change” as the main explanation for the shift to smaller family sizes. They think that the implications of such general shifts in outlook for attitudes towards and propensity to use birth control are obvious. Cleland and Wilson argue that the diffusionist approach, with its focus on media, communications and influential “change agents” as critical to the transmission of modern values from external sources, explains the process of ideational change in the field of contraceptive technology. Thus stress is given to the “perceived attributes and advantages of the new discovery, and its compatibility with moral values and social norms” in determining its initial acceptability, and the roles of opinion leaders, social networks and inter-spousal communication in disseminating the new ideas. Government policies and programmes are also considered as particularly important in this dissemination process and a great deal of work points to the success of strong family planning programmes in bringing about fertility decline in the absence of broader socio-economic improvements in standards of living.

What distinguishes the interpretation given to “ideational change” by Cleland and Wilson and the earlier formulations in modernisation theory is the central role ascribed to ideas concerning the acceptability and feasibility of birth control rather than ideas about the economics of family size as the motivating force for fertility decline (McNicoll 1992). There has thus been a shift away from the broader version of transition theory with its emphasis on structural change to a narrower version focusing largely on the diffusion of new knowledge, ideas and attitudes related to contraception (Kabeer 2001). This Ideational Change theory with its intrinsic relation to diffusion of innovation concepts and its emphasis on communication may well explain fertility change in many developing countries including Bangladesh.

4.5.1 Theories of Diffusion of Innovation and Social Interaction

According to Valente (2002: 3), “diffusion of innovation theory attempts to explain how new ideas and practices spread within and between communities”. The premise, confirmed by empirical research, is that new ideas and practices spread through interpersonal contacts largely consisting of interpersonal communication (see for example, Ryan and Gross 1943; Katz *et al* 1963; Beal and Bohlen 1995; Rogers 1995;

Valente and Rogers 1995; Valente 1995). Mason and Sinding (1998) further define the diffusion theory of fertility change as the spread or adoption of new information, ideas, beliefs, or social norms capable of influencing reproduction decisions and behavior that occurs through social interaction and influence, either at the interpersonal level or through impersonal channels such as the mass media.

A large number of diffusion studies were conducted in the 1950s and early 1960s many of which sought to understand how information created in government or otherwise sponsored programs could be disseminated more effectively (Valente 2002). But it was the late 1970s and early 1980s when diffusion theory attracted the interest of several demographers. The results of two major research projects completed in the mid-1980s—the Princeton European Fertility Project and the World Fertility Survey—caused several researchers to conclude that structural and economic changes alone provide an incomplete explanation (Bongaarts and Watkins 1996; Cleland and Wilson 1987; Coale and Watkins 1986). Several interpretations of the European evidence concluded that diffusion processes were major determinants of the observed patterns of change. Support for the diffusion theory arose from research by Knodel and van de Walle (1979) and Watkins (1986, 1990).

Cleland and Wilson (1987) argue that diffusion processes are key to understanding both historical and contemporary fertility transitions. Kirk (1996) and van de Kaa (1996) reviewed theory and research on fertility over five decades and attempted to place diffusion arguments in this larger context. Finally, Mason (1997) also specified “social interaction and influence” as a key mediating factor in a larger framework for fertility transition.

Several researchers published empirical evidence that diffusion dynamics have affected fertility change in developing countries. Bongaarts and Watkins (1996) combined analysis of national level data with qualitative material from Kenya. Entwistle *et al* (1996) blended survey and qualitative interview data in a study of contraceptive method choice that revealed powerful diffusion effects. In an aggregate-level analysis, Montgomery and Casterline (1993) examined the diffusionist pattern of fertility change in Taiwan in the 1960s and 1970s. Finally, Rogers and Kincaid (1981) and later, Montgomery and Chung (1998) used micro-level data from Korean villages to investigate how social networks affect contraceptive decisions. These studies vary in

their theory, methods, and data, but each one illustrates the importance of social interaction processes and their impact on the timing and pace of fertility change (Reed *et al* 1999).

Along with the recent empirical research on diffusion effects on fertility, there has been an effort to develop behavioural models that incorporate these effects. One important concept in this area is the idea of “social learning” or acquiring information through social networks, as presented in work by Montgomery and Casterline (1996) and Kohler (1997). In addition, Rosero-Bixby and Casterline (1993) proposed that social interaction processes could be specified as feedback effects within the conventional fertility determinant frameworks of the 1970s and 1980s. Pollack and Watkins (1993) also tackled the problem of fitting social interaction effects into conventional fertility theory. Some of these recent works draw on the social network and communication theory developed in the 1960s and 1970s, which has been reviewed by Rogers and Kincaid (1981) and Beckman (1983).

The channels through which diffusion may occur fall into two broad categories: social networks and mass communications. Within each of these broad categories, various specific channels can be identified. Social networks exist at the personal level, at the regional and at the national levels, and increasingly, at the international level, and they may involve direct or indirect contacts. For mass communications, the channels include television, radio, internet, as well as print media. Besides these two broad categories, family planning programmes, government, international organisations and the global community (through modern telecommunications such as the internet) are also considered as diffusion channels. Mason and Sinding (1998) suggest that the diffusion created by family planning services is a diffusion of technical knowledge and information about the location of the nearest services. Watkins (1986) stressed the role of international population movement. She suggested that the global networks disseminated and altered population ideologies and influenced Kenyan elites. Another key point is the “mutually reinforcing effects of multiple channels”. Hornik and McAnany (1998) pointed out that through social networks, “the effects of mass media diffuse beyond those who are directly exposed to the content”. Indeed they suggested that people might change their behaviour when many aspects of their environment communicate new messages in a repeated and reinforcing way over time. Sinding (quoted in Reed *et al* 1999:19) drawing from the example of Kenya shows that the

diffusing of fertility control in that country involved a formal Information, Education, and Communication (IEC) programme, speeches by the president, village meetings, calendars, fieldworkers visiting households, and village women gossiping about family planning. Thus, the effect of any one channel cannot be separated; rather, emphasis should be placed on the way in which various channels can collectively encourage the adoption of ideas, values, and behaviours associated with fertility decline.

Ideas can be transmitted through the mass media. These can readily cross international boundaries, but their legitimisation requires that they be confirmed in informal day-to-day communications with significant others, such as relatives, friends, and leaders in the local community. For the activation of family planning, there is a need for close relationships reference between groups and for these to discuss contraception. Interpersonal and group communication can play an effective role in this as Brent (2001) observes that people in groups will alter their behaviour to be more like the group. Thus various types of communications help to change contraceptive behaviour in different ways, which can ultimately help in designing “the sociology of supply”.

But the major problem in studying diffusion is the difficulty of measuring the effects of diffusion on the adoption of fertility control because of an inability to disentangle them from the effects of structural change. For example, a common research finding is that television ownership is often negatively correlated with fertility levels. But television ownership may simply be an indicator of other social and institutional variables that may also be important cause(s) of fertility decline.

However, this theory is appealing to explain fertility change in rural Bangladesh. Khuda *et.al* 2001 clearly singled out ideational shift as the determinant to fertility transition. This ideational shift reflected in a change of *security needs and social obligations* (Caldwell *et al* 1984; Muhuri and Preston 1991), and change in *social and cultural norms* (Arthur and McNicoll 1978; Sabir 1993; Koenig and Simmons 1994). Various motivational programmes disseminated through both mass media (for example, *Sukhi Sangsar* in Radio Bangladesh; *Sabuj Chhaya* in Bangladesh Television; posters like *Chhoto Paribar-Sukhi Paribar*) and interpersonal communication channels (mainly, FWA, community health workers) are perceived as key to the ideational shift including contraception practice in rural Bangladesh (Kincaid *et al* 1993; Kincaid 2000).

This then provides the central thrust of this research that is to determine the effect of communication, both mass media and interpersonal communication (more specifically communication networks), in explaining fertility behaviour while controlling for the other socio-economic variables.

4.6. Factors Identified From Empirical Research

A great deal of empirical research has been conducted based on how social, cultural, and ideational change factors have influenced fertility decisions in both developed and developing countries. This research focused light on the interplay of many variables rather than any single explanation or “theory” of fertility transition and/or fertility behaviour. Some of the factors identified from empirical research are summarised in this section.

Mortality Decline: One of the most obvious propositions in transition theory relates to the role of mortality decline (van de Kaa 1996). Davis (1963) first stressed mortality decline as the central motivation for reducing family size. Scrimshaw (1978) identified four different hypotheses regarding the mechanisms that could play a role in making fertility responsive to a decline in mortality. These hypotheses are, as van de Kaa (1996) elaborated: child survival hypothesis, child replacement hypothesis, reduction in uncertainty hypothesis, and insurance against widowhood hypothesis. Among others, Freedman 1963; Schultz 1976; Bongaarts 1985; Lockwood 1995; Montgomery and Casterline 1996; Mason 1997 observed mortality decline, especially child mortality decline as the centre incentive to fertility decline.

In Bangladesh, works of Khuda *et al* 1990; Ullah and Chakrabarty 1993; Barkat *et al* 1997a, 1997b; Cleland *et al* 1994; Rahman and Da Vanzo 2002 found an association between reduced child mortality and contraceptive use. But still in Bangladesh the under-five child mortality rate is very high, 325,000 every year (Unicef 2003), to explain the volume of fertility change it underwent.

Age at First Marriage: This variable is perceived to have direct influence on fertility transition as older age at marriage can affect cumulative material fertility by shortening the duration of marriage within the reproductive span. Davis and Blake (1956) first drew attention to this variable. Among others, Hermalin 1976; Mauldin and Berelson

1978; Njogu 1989; and Raymundo *et al* 1993 observed desired fertility is inversely related to female age at first marriage.

In Bangladesh, Sadiq 1965; Khuda 1978; Aziz and Maloney 1985; Duza and Nag 1993; and Islam *et al* 1998 found age at marriage as one of the most important determinants of contraception practice in Bangladesh. According to Khuda *et al* (2001), age at marriage among women has risen, on average, from 14 to 17 years over the last 20 years. However, average marriage age 17 is also a very early age (i.e. teenage marriage) and the fertility declined in Bangladesh in spite of this early marriage age.

Duration of Marriage: Gage and Njogu 1989; Raymundo *et al* 1993; Djamba 1993 found that mean number of children ever born was positively related to the duration of marriage. In fact the countries and societies where fertility depends strictly on marital status of women, duration of marriage at reproductive span has a positive effect on fertility.

As Bangladesh is a country where reproduction is entirely marriage based, duration of marriage is thus a significant determinant of fertility behaviour. Works of Khuda 1985; Ahmad 1986; Nabi 1991 found a positive association between number of total children and duration of marriage. But in Bangladesh women get married at an early age and that way duration of marriage is very long, but yet fertility declined in Bangladesh

Breast-feeding and Post-partum Amenorrhoea: According to the WHO (1983), the duration of breast-feeding can reduce fertility by acting as a proxy of contraception particularly in developing countries where long duration of breast-feeding is a social norm. The association of breast-feeding with post-partum amenorrhoea is also supported by Huffman *et al* 1978; 1980; 1987; Bongaarts and Potter 1983; Williamson 1989; Cleland *et al* 1994 among others. This 'biological' factor is also perceived as a dependant variable of some socio-economic conditions of women (Bongaarts 1981; Ping 1990; Tu 1989).

Works of Nag 1983; Islam *et al* 1998 pointed to lactational infecundity and induced abortion having a positive impact on mean total number of children in Bangladesh. But the duration of exclusive breast-feeding and breast-feeding with water are only 3.8

months and 5.5 months respectively in Bangladesh (BDHS 1999-2000). Abortion is illegal and more than that abhorred socially and culturally.

Religion and Religiosity: Notestein (1945) first identified religious doctrines as an important determinant in fertility transition. Though very little statistical evidence exists to support the association between religiosity and fertility, demographers often claim the association of high fertility with religiosity (Maloney *et al* 1981; Krishnan 1990; Ahmed 1993). This notion was supported by much empirical research particularly in developing countries and Muslim countries where religiosity is strong (Khuda and Howlader 1988; Nabi 1991; Ahmed 1993; Khan and Raeside 1994, 1995). Sander (1992) found no association between church attendance and fertility in the USA.

In Bangladesh, Khuda *et al* 2001 identified religion, religiosity and community religiosity as powerful determinants of the level of family planning acceptance. According to Khuda *et al* (2001: 376), “The real bastion of tradition has probably been the conservative interpretation of religion by local Muslim religious leaders” but at the same time they argue, “The Information, Education and Motivation Unit of the Directorate of family Planning has had information courses for leaders at every level, including *imams*. In fact, *imams* have regularly been paid lecture fees for making statements about family planning at the Friday mosque.” Though the impact of *imams*’ statements about family planning in Friday mosque are not evaluated, it is an indication of putting efforts to passing of traditional society through ideational shift, as identified by Cleland *et al* 1994 and Khuda *et al* 2001. However, this ideational shift through all sorts of possible motivation programmes might be the reason why Bernhard and Uddin (1990) found that despite strong religiosity, fertility declined in Bangladesh.

Education: Kirk (1944) first emphasised modern education as part of westernisation that is intrinsic to fertility transition. Thus, from the very beginning of demographic research, education, both husband’s and wife’s, has been perceived as one of the most important social variables that is inversely related to fertility and positively related with the practice of contraception (Schultz 1976; Simmons 1985; Freedman and Freedman 1992; Das Gupta 1990; Dr’eze and Sen 1995; Cleland and Rodriguez 1998). Summers (1993) comments that the education of women is considered as a very strong

fertility reducing variable for a variety of reasons: it increases the opportunity costs of caring for children, expands women's aspirations and choices, delays their age of marriage, and alters their preferences so that they have fewer and healthier children.

Stockel and Chowdhury 1969, Khuda 1975, Hartman and Boyce 1983, Khuda and Howlader 1990; Barkat *et al* 1997; Rahman and Da Vanzo 2002 found a significant positive association between education and contraception in Bangladesh. Sohail 1997 further identified overall household education as the determinant of fertility transition in Bangladesh. But the fertility declined in Bangladesh despite very low literacy rate among women.

Occupation: Occupation of women has been directly related with the status of women and the status of women is positively related with fertility transition, as many empirical studies have indicated (see for example, Boserup 1970; Schultz 2001; Ehtewish 1980; Coward 1986; Hirschman and Guest 1990; Vlassoff 1990; Malhotra *et al* 1995).

Barkat *et al* 1997 pointed out that women's occupation is related to fertility behaviour in Bangladesh. But majority of the women in Bangladesh are housewives and the fertility declined despite this occupational status of women.

Economic Status: Economic status has always been perceived as one of the major determinants of fertility behaviour (Malthus 1798; Marx 1976a; Becker 1960; Easterlin 1978; Leibenstein 1981; Robinson 1983; Winegarden 1984; Razin and Sadka 1995; Galor and Weil 2000 and Schultz 2001). With some exceptions, the general observation is that the higher the economic status, the lower is the fertility. Works of Kojima 1993 show a positive relationship between household possessions and the individual's contraception use.

In Bangladesh, D'Souza and Bhuiya 1982, Khuda *et al* 1988, and Islam and Mahmud 1995 identified a positive relationship between higher economic status and contraception. Also lower economic condition was found to have positive relationship with contraception practice. Khan and Rahman 1997 found that "clinical methods - injectables, IUDs, tubectomies and vasectomies are more used by uneducated or poorer women. Thus economic status is a determinant to fertility behaviour in either way. Husband's occupation is also an important determinant according to Islam and

Mahmud 1995. Again, Alauddin and Faruquee 1983; Sabir and Bhadra 1991; and Sohail 1997 found land ownership as a determinant to fertility behaviour.

Gender Preference and Offspring Configuration: According to Kabeer (2001), strong son preference is most marked in the belt of strong patriarchy, namely the Middle East, northern areas of South Asia and East Asia where fertility rate is high. Moderate or non-existent son preference is the characteristic of South-East Asia excluding Bangladesh, sub-Saharan Africa and most industrialised societies where the fertility rate is lower. Evidence from ethnographic, historical and demographic studies suggest that “Configuration of Offspring” were set based on this preference in pre-transitional setting (Wrigley 1969; Blake 1985; Basu 1986; Bledsoe 1990; Lee *et al* 1994; Skinner 1997).

Researchers such as Williamson 1976, Dyson and Moore 1983, Kandiyoti 1985, Jejeebhoy and Kulkarni 1989, and Dre’ze and Sen 1995 found gender (son) preference has a negative effect on contraceptive use and positive effect on the desire for additional birth(s), especially in strong patriarchal societies where son preference and its effects on fertility behaviour is clearly evident regardless of social classes and educational levels. Gender preference also has lead to female infanticide and abuse of medical technologies, such as the abortion of female foetuses (Narasimhan 1993). This is the reason why despite biologically “normal” patterns elsewhere, the world is missing more than a 100 million women (Sen 1990),

In Bangladesh, the works of Amin and Mariam 1987, Bairagi 1993, Rahman and Da Vanzo 1993, and Ahmaed 1994 found a positive association between strong son preference and total number of children. According to Barkat *et al* (1997), in Bangladesh the contraceptive use rate is higher among the mothers of son of any number than among the mothers of daughters of the same number.

Place of Residence: Kirk (1944) first emphasised the relevance of the place of residence to fertility behaviour. The urban situation has been observed to have a negative relation with fertility in much empirical research (Knodel and Prachuabmoh 1973; Limanonda 1982; BDHS 1999-2000). Not only with the urban-rural dichotomy, regional variation in fertility behaviour has been observed by Dyson and Moore 1983, Morgan and Rindfuss 1984, Gage and Njogu 1994, Mortimer and Tiffen 1995, Dre’ze and Sen 1995 in empirical research. Though this difference is perceived mainly on

cultural aspects, Venderpost (1992) found this spatial demography as the determinant of fertility behaviour.

This regional variation within the same country is also observed by Ahmed 1984, Rob and Kabir 1988, Sabir and Bhadra 1991, and Khan and Rahman 1997 in Bangladesh. Urban women were found higher users of contraceptives than rural women. Again some parts of Bangladesh were found less acceptors of contraception than other parts on cultural grounds.

Status of Women and Membership in Micro-credit Organisation: The status of women, including *women's economic security and contribution to family support, freedom of mobility and household decision-making power*, is observed to be a strong determinant in fertility decision making (see for example, Coward 1986; Hirschman and Guest 1990; Vlassoff 1992). The proposition is that the higher the status of women, the lower is the fertility rate.

In developing countries where women's labour force participation is low, access to micro-credit organisation empowers women by increasing their autonomy and decision-making ability within the household. Women are thereby able to attain their fertility goals by using contraceptives to limit fertility (Balk 1994; Schuler and Hashemi, 1994; Schuler *et al* 1997, 1998; Sidney *et al* 1997; Kabeer 1998; Mayoux 1999). Again, membership in a credit programme can promote women's greater interaction with the outside world and provide greater mobility.

In Bangladesh, Ullah and Chakrabarty 1993, Sabir 1993, and Barkat *et al* 1997 mentioned the positive association between the increased status of women and contraceptive prevalence. More specifically, Hossain *et al* 1990, Sabir and Bhadra 1991, Caldwell *et al* 1999, and Khuda *et al* 2001 found *women's labour force participation* and Simmons *et al* 1988, Hossain and Phillips 1996 and Khuda *et al* 2001 found *the degree of women's mobility* as determinants of fertility transition in Bangladesh. Ullah and Chakrabarty 1993, and Islam and Mahmud 1995 found a positive relation between participation in family planning decision-making and contraception. The research findings of Amin *et al* 1993, Steel *et al* 1998, and Kabeer 1998 regarding Bangladesh show that contraceptive use levels increased significantly for women in credit groups.

Family Planning Programmes and Contraception: Easterlin 1978, Bulatao and Lee 1983, McDonald 1993, and Easterlin and Crimmins 1985 observed the huge influence of contraception on fertility transition in many societies without a structural change. Especially the work of Easterlin and Crimmins (1985) on micro-level data for Sri Lanka and Colombia, and macro-level data for Taiwan and a number of Indian states led them formulate a supply-demand theory of fertility, the basic premise of which was that supply of modern contraception creates its own demand. The same notion is upheld by Caldwell and Caldwell 1984, Kennedy 1993, Robey *et al* 1993, and Lockwood 1995, among many others. In developed countries, according to Lesthaeghe and van de Kaa (1986, quoted in van de Kaa 1996: 422), “improved birth-control technology played a central role in the reduction of unwanted fertility in these societies, and thus was instrumental in removing excess fertility”.

But the success of family planning programmes and use of contraception has often been perceived as dependent variable of other socio-economic-cultural and biological factors (see for example, Lesthaeghe 1983; Ringheim and Mahmood 1993; Djamba 1993).

Family planning programmes are also perceived as the part of government family planning policy that is also considered as a determinant of the fertility transition. For example, the one-child policy in China, the birth rate raising policy in Israel (Yuval-Davis 1987), or educated women in Singapore (Leng and Khoon 1984) or to sterilise women from poorer backgrounds in Puerto Rico (Mass 1976).

The World Bank report (Cleland *et al* 1994) and the bulletin of Population Reference Bureau (Carty *et al* 1993) clearly identified “the national family planning programme with nearly all responsibility for fertility decline” (Khuda *et al* 2001) in Bangladesh. The bulletin summarises “In the absence of other compelling explanations, analysis of Bangladesh’s recent fertility reduction must focus on the government’s unremitting commitment to the family planning program as the key to its success” (Carty *et al* 1993: 16). Government family planning policy and programme has also been perceived as the central important factor by Koenig *et al* 1987; Khuda *et al* 1990; Rob and Cernada 1992; Shah and Cleland 1994; Khan and Rahman 1997; though Khuda *et al* (2001) condemned these reports for playing down the substantial social change that had taken place in Bangladesh.

As part of the family planning programme effort, contraception and contraceptive methods have been identified as the next most important determinant to the fertility transition in Bangladesh. According to the World Bank report (Cleland *et al* 1994: 134), “The crucial change that has taken place concerns acceptability of and access to birth control and not structural change that has driven down the demand for children. Economic and social change, with concomitant shifts in ideas and outlook, may have been an important facilitating factor, just as contraceptive availability is seen as facilitating factor in demand theories.” Koenig *et al* 1987, Duza and Nag 1993, and Islam *et al* 1998 found contraception as the most important factor of transition while Chowdhury *et al* 1986, Rob *et al* 1987, Akbar *et al* 1991, Akhter 1987, 1991, 1992, and Khan and Rahman 1997, among others, emphasised reliable contraceptive methods.

Communication: Having information is the primary and the most important step of getting involved in practice. Once considered a supportive service, communication is now recognised as a key factor in the rapid increase in contraceptive use during the past decades (Retherford and Palmore 1983; Cleland and Wilson 1987; Sadik 1991; Bulatao *et al* 1993). According to *Population Reports* (1994) by Johns Hopkins School of Public Health, analysis of family planning programme effort in 35 countries shows a close relationship between communication effort and the percentage of couples using modern contraception (Ross *et al* 1989). Separate DHS data from Ghana (Olaleye and Bankole 1992), Nigeria (Bankole 1994) and Kenya (Westoff and Rodriguez 1993) show that, among women with otherwise similar socio-economic characteristics, more exposure to family planning messages in the mass media is linked significantly to more contraceptive use. Works of Katz *et al* 1963, Knodel and van de Walle 197, Rogers and Kincaid 1981, Montgomery and Casterline 1993, 1996 Bongaarts and Watkins 1996, and Mason and Sinding 1998 show the direct influence of interpersonal communication in fertility decline.

In Bangladesh, ESCAP 1986, Sabir and Bhadra 1991, Khuda *et al* 1992, and Barkat *et al* 1997 drew attention to the *knowledge of contraception* as one of the key determinants of family planning programme success in Bangladesh. They mentioned the role of both mass media and interpersonal communication efforts.

Since 1975, Radio Bangladesh has assigned 65 minutes daily to population and family planning issues on its national service, and 30 minutes on its regional programmes,

while television allocates 120 minutes weekly (Haider *et al* 1995; Khuda *et al* 1994). According to Khuda *et al* (2001), “the radio sessions are heard throughout the community”. Hasan 1991; Mitra *et al* 1996; and Barkat *et al* 1997 found a significant impact of mass media on spreading the knowledge of contraception and family planning. The role of the Information, Education and Motivation (IEM) unit and the Information, Education and Communication (IEC) unit of Bangladesh Government in this regard were mentioned by Rob and Cernada 1992; and Barkat *et al* 1997.

Ullah and Chakrabarty (1993) observed *family planning service delivery* as one of the most important factors in fertility transition of Bangladesh. More particularly, Koblinsky and Phillips 1986, Phillips *et al* 1996, Koenig and Simmons 1994, Kamal and Sloggett 1994, 1996, Schuler *et al* 1996, Janowitz *et al* 1996, 1999, Hossain and Phillips 1996, Arends-Kuenning 1997, and Khuda *et al* (2001) singled out the FWAs as the most important determinant for making the family planning programme of Bangladesh a successful one. FWAs play important roles both in service delivery and spreading knowledge of family planning through interpersonal communication.

Kincaid *et al* 1993 emphasised *interpersonal communication* as the determinant of fertility transition in Bangladesh. Marten (2002) identified *social interaction* as a very important determinant to fertility transition in Bangladesh and suggested that “programmes promoting family planning can improve their outcomes by actively targeting husband, and by stimulating community discussion through existing formal groups (such as women’s organizations) and informal groups (such as neighbourhoods) rather than just targeting clients as individuals”. Barkat *et al* 1997 found positive association of membership in any community organisation with contraception. Thus communication is perceived as one of the key factors of fertility decline in Bangladesh.

International Population Movement: Watkins (1986) stressed the role of international population movement. Based on the experience of Kenya she argued, “The global networks disseminated and altered population ideologies” and influenced Kenyan elites. This concept of influence of international population movements is also part of diffusion of innovation of family planning at global perspective that is communicated through various mass media and interpersonal channels (Bongaarts and Watkins (1996).

In Bangladesh, besides disseminating the international population ideologies through various communication channels, according to Khuda *et al* (2001), UNDP, World Bank and American Foundations played direct roles by fostering plans and offering funding for family planning and still now all the subsequent plans on family planning issues are being run with the direct help of World Bank and other powerful supports as part of international population movement.

4.7 Summary

Throughout the literature review on demographic transition theories and explanations, one thing came out clearly as Kabeer (2001) observed, “if there is one generalizable statement to make about the causes and processes of fertility transition, it should be that, regardless of universalistic claims of both economic and transition theories, there is no single universal cause or process behind the onset of fertility decline”. For example, demographic transition theories and economic theories on fertility transition were moderately relevant for developed countries with some exceptions, but most of the third world countries experienced the transition without the desired structural change. Again, government family planning programmes, prioritised “supply-demand” explanations of fertility as clearly being important in enabling many societies to achieve lower fertility rates- societies as varied as Indonesia, Bangladesh and China; equally, however, fertility rates have declined in other contexts long before such programmes became widely available- for example, Sri Lanka, Viet Nam and Kerala. High female labour force participation, identified by economists as a proxy for the opportunity cost of child care, has not been necessary for fertility decline in some Asian countries or sufficient in many African countries. In many parts of sub-Saharan Africa, average years of school per child appears to be positively related to family size, belying the prediction that quantity has to be traded off against quality of children. Economists for a variety of reasons have also singled out the education of women as a fertility-reducing variable. Empirically, the effect of women’s education varies considerably across the world. Of 24 countries covered by the World Fertility Survey, education appeared to be significant in explaining fertility differentials in 13 countries; and on the other hand it had little or no effect in 11 countries (Thomas 1991). Women of Ghana are more independent economically and in decision making over their own life than the women of Kenya, but Kenya went through steep transition, not Ghana.

Through literature review, rather than the ways demographic theories and economic explanations of fertility transition prescribed, emphasis was found on the government family planning programme success for the fertility change in Bangladesh. Some socio-economic changes like reduced child mortality and increased female education (both are part of government family planning programme) has certainly facilitated the demographic transition, but the degree of these socio-economic changes seems insufficient to explain the volume of transition Bangladesh already experienced. The success of government family planning programme, supported by international donor agencies and other non-government organisations, through ideational change is thought to more reasonably explain the particular situation of Bangladesh.

Zaidi 1961, Arens and van Beurden 1977, Hartman and Boyce 1983, Khuda and Howlader 1990, and Khuda *et al* 2001 argued that demand for moderate fertility had existed in the societies in Bangladesh but for religious and other socio-cultural causes and lack of proper knowledge, this demand could not be addressed. Hartman and Boyce (1983: 89-90) interpreted the pre-existing demand for family planning in the societies citing the situation in a 1975 Bangladesh village, "...when the villagers learnt that birth control was possible, many readily shed the belief that only Allah controls reproduction".

Both the knowledge of family planning programme, contraceptive devices, and the advantages of contraception, and the ideational change of having a smaller family, had taken place through diffusion of innovation, more particularly through proper use of communication channels, mass media and interpersonal. IEC programmes of the IEM unit of Bangladesh Government were disseminated through radio, television, bill boards, cinema hall, poster, mobile vans, traditional drama (*jatra*), popular songs and even through school text books. At the same time, government and non-government female family planning workers delivered both service and information to the doorsteps of village households. Various social interactions were arranged among village people, and village religious leaders, and other opinion leaders were trained to contribute the ideational shift to overcome the strong religiosity. *Imams* were paid to lecture in mosques in favour of family planning. Thus an all-out communication effort can be considered as the central determinant to the success of family planning programme of Bangladesh. This is the reason why this research focuses on finding out the impact of communication processes in the fertility behaviour of Bangladesh.

The determinants of fertility behaviour and ultimately fertility transition found through the above literature review now will be used in developing a questionnaire for data collection. This data collection strategy and methods of analysis are discussed in chapter 5.

Chapter 5

Data Collection and Research Methods

Introduction

In this chapter data collection procedures and research methods will be elaborated. The main demographic data sources of Bangladesh are the census, vital registration and sample surveys. Among them the two most important nation-wide surveys are: the Bangladesh Fertility Surveys (BFSs) conducted in 1975-76 and again in 1989; and the Bangladesh Demographic and Health Surveys (BDHS 1993-94, 1996-1997, and 1999-2000). In these surveys data are available only on mass media access, not on interpersonal communication or sociometric questions. Though sociometric data were collected in the *Jiggasha* Project (for details see, Kincaid *et al* 1993, Kincaid 2000) but that data were collected using snowball sampling, which according to Kincaid (2000: 220), “suffers from the non-coverage of women who are unlikely to be in the social networks of potential volunteer link persons.” Also that data were collected from only one area of Bangladesh, i.e. Trishal area. Moreover analysis combining *Jiggasha* data and other survey data is not possible because these data are based on representative sampling from which one cannot combine network data from *Jiggasha* project with the principle components obtained from other surveys. Thus there was a requirement to collect data afresh from field for this study. The practical steps of collecting data and the research methods are discussed in this chapter in *eight* broad sections:

- Section 1: selection of the sample population;
- Section 2: organisation of the questionnaire;
- Section 3: pilot survey;
- Section 4: selection of the sample areas;
- Section 5: area locations;
- Section 6: collection of data: action in the field;
- Section 7: dairy for data collection;
- Section 8: notes on the survey;
- Section 9: analysis procedure;
- Section 10: summary.

5.1 Sampling the Population

Many of the research articles on demographic transition throughout the world over the last 50 years revealed the fact that women's education, economic position, household characteristics, and social status influence the use of contraception and fertility. Thus women are considered in demographic transition research both for their traditional role and their role with the changing circumstances. Women were the sample population in this research and the key reasons for selecting women as the sample population in this research are:

5.1.1 Women are the 'target' audience of FP programmes in Bangladesh

It is supported by much research that the 'responsibility' of fertility regulation rests essentially on women in Bangladesh. According to the BDHS (1999-2000) preliminary report, among all the currently used modern family planning methods (43.4 per cent), women used methods are 38.6 percent, which means women are about 90 per cent of modern family planning method users. The most widely used method is pill (23 percent), followed by female sterilisation and injectables (7 percent each), IUD (1.2 percent) and implant/norplant (0.5 percent). Male used methods contribute only 4.8 percent (condom 4.3 percent and male sterilisation 0.5 percent). Among traditional methods (10.3 percent), withdrawal i.e. male participatory method, contribute 4 percent, whereas periodic abstinence (5.4 percent) and other methods constitute 0.9 percent. So here also women contribute more than 61 percent. Thus women not only constitute the largest portion of acceptors of FP methods but they are also the more consistent users. The reason may be that the prevailing social attitudes, that are supported by the government as well, perhaps made it easier to convince women rather than men to accept family planning. In the FP methods campaigns, both from government and NGO-levels, target acceptors are women. Karkal's (1998: 228) view, "Whether anti-natalist or pro-natalist, population policies tend to treat women's bodies as the instruments of male dominated populationist ends" seems to be confirmed by the BDHS (1999-2000) report.

Whatever may be the reason, women are the main practitioners of family planning devices in Bangladesh, and this is the main reason for selecting women as the target sample in this research.

5.1.2 Women derive their function from their husbands

In the prevailing patriarchal societies of Bangladesh men head the household and women serve them, they derive their name, residence, nationality, sustenance, and function from their husbands. So, though women are the main practitioners, women's fertility perception, practice, and the underpinning causes of that practice, may well be a reflection of the decisions of their husbands and the society behind them. Thus views of women will give insight to the views of their husbands and the social context.

5.1.3 Women and 'proximate determinants'

Among the four proximate determinants of fertility stated by Bongaarts and Potter (1983), except for *contraception*, the three others (*marriage*, *induced abortion* and *lactational infecundability*) are directly related with women. This is another reason for sampling women.

5.1.4 Technical causes: un-reachability of men

There were two other practical causes considered to be very important for selecting women as the target sample. First, as the male-members are the breadwinners of the families in Bangladesh, they are not available in their home for interviewing at daytime.

In addition, 'family planning' is still perceived as a 'taboo topic' in Bangladesh and it is also perceived as a women issue (*meyeli byapar*). For example, no male family planning device was advertised in the mass media till the time of the data collection for this research. So, male members might not feel very willing to discuss the topic considering it as a 'female issue'.

5.2 Organising the Questionnaire

While attempting to identify the role of communication in fertility transition of Bangladesh, it was thought to be important to reveal the *communication environment* of the women of Bangladesh. According to Parvin (1997), communication environment refers to social, political, cultural and economic interaction of a community within itself and with other communities including the

dominant community. To do this, a structured questionnaire was constructed and used in the survey.

A brief overview of the situation of women in Bangladesh may help understand the variables that were addressed in the questionnaire.

5.2.1 Situation of Women: A Brief Overview

According to the Fifth Five Year Plan of People's Republic of Bangladesh (1997-2002), women constitute about 49 per cent of the population in Bangladesh. Their literacy rate is only 25.5 per cent, much lower than that of men (39 percent); life expectancy is 58.9 years for men and 58 years for women. Excess mortality of women from childhood has resulted in a skewed sex ratio in the population of 104 men for every 100 women. Health care for women is often restricted to their reproductive health. General health of women at all ages is often neglected. Women are married at a much lower age than men. The mean age at marriage of women being 19.9 while that of men is 27.9. Early marriage, repeated pregnancy, long child bearing spans resulted in women's low nutritional status and high maternal mortality rate (4.4 per 1000 live births).

Despite the constitutional provision (the Constitution of People's Republic of Bangladesh, Article 29) to forbid the discrimination of women in respect of any employment or office of the state, women's visibility in the public service is negligible. Wage differentials between women and men are very high in the case of wage employment. Female-headed households earn 40 per cent less income than male-headed households. Women are generally pushed into the unskilled labour force primarily because of the obstacles women and girls face in acquiring marketable skills.

In Bangladesh, the family is patrilineal. Once married, women are transferred to their husband's family, and therefore, they are not relied on for economic and physical support in old age in the way the sons are. Female children may also be unwanted for another reason – the dowry that is required at marriage time. On the contrary, sons bring dowry home by marriage and so give an economic strength to the family. From these manifold socio-economic motivations the question of son survivorship is so vital that the families cannot be satisfied with just one son, and

they seek safety in more live male children. This strong son preference even leads to female infanticide in rural areas, resulting in sex differentials in child mortality. Women also have compelling reasons for desiring sons because they have been conditioned to think of their success and destiny of life in terms of giving birth to male children. This unwanted and unwelcome atmosphere at birth fixes the destiny of women throughout their life. There are exceptions and also the scenario is changing, but this is the major and general trend of women's status in Bangladesh. There may be differences in urban and rural setting or in respect of economic status, but the image of women is that of being dependent, and incapable of decision-making even on their own life and health. While preparing the questionnaire, these perspectives were taken into consideration. The questionnaire is comprised of *five* sections:

- i) background questions;
- ii) social-economic-cultural questions;
- iii) reproductive questions;
- iv) family planning questions;
- v) sociometric questions;

In the sub-sections 5.2.2 to 5.2.6 a brief overview of the questions developed for the survey is presented. Though there is a detailed discussion in chapter 4 on almost all the determinants (except the sociometric variables) tested in this research, the rationale for some of the questions is again discussed with the reference to their relevance in the Bangladesh perspective.

5.2.2 Background Questions: The questions of this section mainly deal with age of the respondents and the husbands, the respondent's marriage age and age at giving birth to the first child, religion and the duration of residing at the current address. There are eight questions altogether in this section (see Appendix 3 - section 1).

5.2.3 Social-Economic-Cultural Questions: Over the last three decades, an extensive literature has accumulated on the social, economic, and cultural determinants of the demand for family planning and fertility in developing societies. More recently, there has been growing recognition that family planning programs are themselves also significantly affected by the social-cultural and institutional environment in which they operate.

In section two, questions were prepared to explore the social-economic-cultural conditions in which women communicate. The questions included in this section mainly dealt with the respondent's education level, occupation, household income source, housing quality, possession of modern equipment, access to modern mass media, female autonomy and women's decision making power. Altogether 23 questions were included in this section (see Appendix 3-section 2).

5.2.4 Reproductive Questions: In this section, the respondent's reproductive history is sought. This includes: the number of children, desire for more children, sex of first child born, age of last child born, number of children who died, assistance at delivery, decision maker(s) in selecting delivery place and assistance, place (s) of giving birth to children. Altogether there are 10 questions in this section (see Appendix 3-section 3).

5.2.5 Family Planning Questions: In this section questions (17 questions altogether) are chosen to determine the family planning practice of the women interviewed. The questions are on contraception, reasons of practising contraception, reasons for not practising contraception, source of information on contraception, and the factor(s), which influenced contraception use.

Both mass media components and interpersonal relations are set to assess the respondent's reliance on them (with intensity at a 0-10 scale where 10 is the highest) in this particular issue.

5.2.6 Sociometric Questions: In this section, the respondent is asked to name five people (other than husband) whom she perceives as friends and/or feels their opinion and various behavioural practices are important in her life. Also asked is whom the women goes to for suggestions regarding mundane problem as well as personal issues like contraception. The aim of these sociometric questions is to explore the influence of interpersonal communication (i.e. influence of peer group, kith and kin, relatives, opinion leaders) in fertility behaviour, which is one of the prime goals of this research.

There are in fact two broad types of sociometric questions in this section. First type, i.e. question 2 through 10, deals with the general network questions: type of

relationship, for how long the person is known, intensity of relationship, common method of communication, location of their living, meeting place, meeting frequency, frequency of discussing and seeking advice on mundane problems, frequency of feeling that person's influence in personal decision making. The second type, i.e. questions 11 through 18, deals with the discussion related to family planning. For example, frequency of discussing family planning with the person the respondent was mentioning, whether that person approves family planning, uses a modern family planning method, encourages the respondent to practise family planning and vice versa, and whether that person's fertility behaviour encourages the respondent.

The developed questionnaire was piloted in Bangladesh and this process is outlined in the next section.

5.3 Pilot Survey

For piloting the questionnaire, one person was sought who had at least some orientation in communication network analysis. Contacts were made with a Lecturer in the Department of Mass Communication of Rajshahi University in Bangladesh. He agreed to perform a small-scale survey for this research.

The pilot survey was conducted in Puratun Baza *mahalla*, under Akkelpur municipality in Joypurhat district. Though it is a municipal area, it has a legacy of village culture rather than that of a city. The area is composed of a combination of multicultural and multilingual inhabitants: *Marowari* (people of Hindu community who migrated from Rajstan of India at least hundred years ago for better survival and whose mother language is still now Hindi); western Hindus (people of lower caste Hindu community who migrated from the western part of India at least hundred years ago); Biharis (people of Muslim community who migrated from Bihar of India during the partition of India); and the major community, the Bangalee Muslims. Though most of the people living here are poor, a remarkable number of middle class people also live here. Moreover there are some rich men living here; most of them are businessmen, some are service-holders, and a few people who are thought to be engaged in 'smuggling' at the border area.

Data were collected from 30 women (one married woman of reproductive age per household) from 30 households. Within that mahalla 30 women fulfilled the set

criterion and all of them were interviewed. Data were collected from April 04, 2002 to April 14, 2002 and then the completed questionnaires were sent to the researcher in Napier University, Edinburgh.

It was found that all the questionnaires were properly completed. But while preparing the data set, one minor problem was noticed in setting the criterion for selecting the sample audience and two more questions were added in sociometric questions section.

5.3.1 Changes Made to Pilot Questionnaire: First of all, a change was made in setting the criterion for selecting the sample population. The criterion used for selecting the sample population before pilot study was to interview one currently married woman per household. But it was found in the pilot survey that newly married women who had not given birth to any child were unaware of family planning practice and in reality were dreaming of having children rather than thinking of contraception or limiting family size. So, who or what factor influenced them in practicing family planning methods was an irrelevant question to most of them. Considering this, recently married women were excluded and the criterion was re-set slightly differently as:

One currently married woman of reproductive age per household would be interviewed who had at least one child at the time of interview and if there were more than one married woman who suited this criterion in the same household, the youngest woman would be interviewed.

The last part of this change, i.e. “interviewing the youngest woman if there were more than one woman in a household who fulfils the criteria”, was made after expert personal advice from Thomas W. Valente, School of Medicine, University of Southern California.

Secondly, to understand the clique pattern among village women, a question was added as to whether the person(s) the women mentioned as their friends were also connected with each other. If they were connected, who were connected with whom and what was the relationship.

Finally, to ascertain whether these women interviewed had personal networks outside the communication system where they were living, another question was added in this sociometric section. They were asked to name another five names (at the most), outside the system, who also had influence in their fertility behaviour.

The questionnaire finally developed has been placed in Appendix 3.

5.4 Selecting Sample Areas

A cluster sampling technique was used in selecting the sample areas. Before elaborating about the particular sample areas, some explanations are given for the sampling criterion.

5.4.1 Villages are Main Sample Areas: According to Jahangir (1984), Bangladesh is a big village as seventy seven per cent of total population lives in rural areas. Villages are the basic unit of rural society in Bangladesh. Seventy two per cent of the total labour force is involved in agricultural cultivation in villages (Huda 1995) and 40 per cent of the national income comes from villages. But most importantly for this research is, 80 per cent of Bangladesh women live in rural areas. Thus village women were the main targets of the survey and villages were the main sample areas.

5.4.2 Geographical Divisions: Bangladesh consists of six administrative divisions that are again divided into 64 districts, 507 thanas (*counties*), 4479 unions, 59990 mouza-s (mouza is a measurement of area generally comprised of some villages) and 87928 villages accordingly (Bangladesh Bureau of Statistics 2002). The six administrative divisions are different not only geographically but also economically, socially and culturally. To address this diversity of areas, six villages were selected, one from each of the six divisions.

Besides these six villages, another village was selected to allow determination of religious influences on fertility. For this purpose, data were collected from a village where the majority of the inhabitants were Hindu. This may help understand the cultural influence in fertility patterns because in Bangladesh, cultural differences are mainly guided by different religious faiths.

Also one sample was from a non-metropolitan small town. The pilot survey was made in a small town *mahallah*. The response from the pilot survey in Akkelpur correlated positively with the rural villages. Applying Cronbach's Alpha, similar Alpha co-efficients were found for when the pilot area was included and when it was excluded (Alpha = 0.51 and 0.54 respectively). Thus it was decided to include the pilot data in the data set.

5.4.3 Specific Location: To select the specific location, *four* interrelated conditions were considered:

- i) Cost;
- ii) Distance from Dhaka city;
- iii) Reachability, i.e. transport facilities;
- iv) Some known people in the area;

Distance from Dhaka was taken into consideration because Dhaka is the capital city and geographically it is at the middle of the country, so going to any place of the country is relatively convenient from Dhaka. In reference to the aim of the research the following locations were taken as the specific sample areas.

5.4.3.1 Rural Areas: Seven Villages (Six+One)

As the full communication network is analysed with sociometric data in this research, all the households in the village (for rural areas) and the *mahallah* (for the small town) that fulfilled the selection criterion of one woman per household who was currently married and at least had one child were included in the survey. To keep the sample size manageable, very big villages were avoided and the villages that were comprised of less than 25 households were also avoided.

Six villages were selected, one from each of six divisions. Though it is difficult to find an urban Hindu area, there are still several almost totally Hindu-inhabited villages. Mahugaon, is such a Hindu village (95.1 per cent of the respondents were found to be Hindus) in Rajshahi division, and was chosen in this survey to allow comparison with Muslim villages. The area chosen for the pilot survey, the *Puratun Bazar* mahallah, in a non-metropolitan small town Jaypurhat was taken as the sample small town area in this research.

5.5 Area Location

In this section, first the specific area locations are presented on the map of Bangladesh and then a summary profile of the surveyed areas are presented to give an overall idea of the chosen areas.

5.5.1 Areas Chosen: Map of Survey Sites

According to the discussions in section 5.4, eight areas (seven villages and one *mahallah* from a non-metropolitan small town) were chosen for surveying in this research. These areas are:

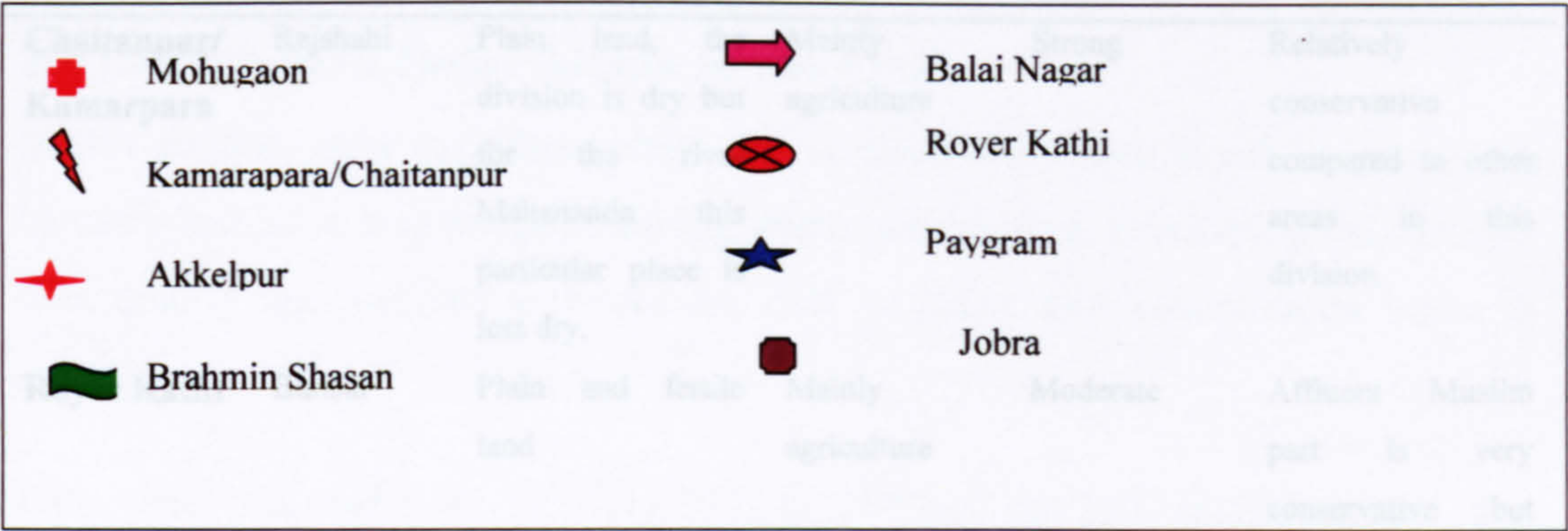
- Chaitanyapur in Rajshahi division;
- Royer Kathi in Barisal division;
- Paygram in Khulna division;
- Jobra in Chittagong division;
- Brahmin Shasan in Sylhet division;
- Balai Nagar in Dhaka division;
- Mohugaon in Rajshahi division; and
- Puratan Bazar in Rajshahi division;

These specific areas are presented in the map of Bangladesh in figure 5.5.1-1.



Figure 5.5.1 -1: Map of Bangladesh (PTO for complete legend)

Though the sites that were surveyed cannot be displayed exactly on this map in figure 5.5.1-1, the approximate areas where they are situated are indicated in the figure by shape and colour in which the sites are displayed.



Between the villages chosen, there were some variations in weather, topology, and cultural norms. Summary characteristics of these surveyed areas are presented in the table 5.5.2.

5.5.2 Summary Profile of Surveyed Areas:

Though Bangladesh is perceived to be a homogeneous country there are some variations in respect of topography and weather, which ultimately shape the economy, religiosity and other social characteristics of various parts of the country. Though perceived rich and poor, strong religiosity and less strong religiosity, conservativeness and moderate outlook exist side by side in each area, there is a broad perception about various parts of the country. This existing perception along with the attained perception through observation while working in the field and discussing with the local people is presented as summary profiles of those areas in the table 5.5.2-1.

Table 5.5.2-1: Summary Profile of Surveyed Areas

Study Area	Division	Topology	Economy	Religiosity	Social Condition
Chaitanpur/ Kamarpara	Rajshahi	Plain land, the division is dry but for the river Mahananda this particular place is less dry.	Mainly agriculture	Strong	Relatively conservative compared to other areas in this division.
Royer Kathi	Barisal	Plain and fertile land	Mainly agriculture	Moderate	Affluent Muslim part is very conservative but poor Muslims and Hindus are moderate.
Paygram	Khulna	Fertile plain land	Business, fishing, agriculture	Moderate	Affluent Muslim part is conservative but poor Muslims and Hindus are liberal.
Jobra	Chittagong	Hilly area	Agriculture, business, wage-earning	Strong	Conservative
Brahmin Shasan	Sylhet	Hillock area	Original inhabitants are well off but the settlers are poor. Economy is mainly non-agriculture.	Strong	The division is very conservative but this particular village is less conservative because most of the settlers are poor and women have to go for work outside home.
Balai Nagar	Dhaka	Plain land	Mainly Agriculture	Moderate	Not very conservative.
Mohugaon	Rajshahi	Dry plain land	Very poor. Mainly agriculture	Moderate	Liberal though very poor.
Akkelpur	Rajshahi	Dry plain land	Van-pulling, small business, day-labouring.	Mixed	Multi-religious and multi-cultural, not very conservative though the division is conservative.

was required. The first survey village was Chaitanyapur in Chapai Nawabganj district where one of the team member's family provided the survey team with accommodation.

5.6.1 Chaitanyopur, Rajshahi

Rajshahi division, the northern part of Bangladesh, is the most dry part of the country that suffers from a famine-like condition nearly every Autumn, which is called *monga*. Dying for scarcity of food in summer and autumn, and in winter for severe cold is a regular feature in this area.

In the village Chaitanyapur, in Dhainagar union of Chapai Nawabganj district, agriculture is the main source of income. The landlords generally invest their money in mango and sugarcane cultivation, and the major portion of the population is *Kamla* (Bangla word for day-labourer and especially used in this region) to those mango and sugarcane fields. This village is by the river Mahananda, and the only way to communicate with the other part of the river, i.e. Chapai Nawabganj town, is by boat or launch. This has kept the overall communication system constrained. Compared to other regions of Bangladesh, this area is perceived as a 'conservative' area.

The team-member's father, who was also a member of the local Union Parishad, introduced the team to some of the influential people of the village and explained the aim of this survey. Then he introduced the team to the local FWA and the village *dai* (traditional birth attendant). These two family planning related women along with the team-member's sister who was a Higher Secondary Student of the local college, joined the team. A full-day training was given to these three new members of the team. Thus finally the team got a combination of five male and five female members with four local people. This ten-member team worked divided into five groups comprised of one male and one female member. As one person from the village was common in each group, village women welcomed the surveyors in almost every house; they even answered the questions when they were cooking in kitchens, weaving nets, making baskets, feeding their children. Sometimes the local dialects were different from the team members, and the local people recruited in the team helped to overcome this problem.

The only problem the survey team found there was the presence of male members at home at the time of interviewing, on Friday afternoons when the males came back for *jummanar* prayer. Women were reluctant to answer the questions when the male members were home. Although male members knew about the aim of this survey, they asked many irrelevant questions. So, Friday afternoons were not ideal for interviewing women.

Though the number of households in the Community Series of the Bangladesh Bureau of Statistics 1991 was 69, going door to door the team found 106 households. Among 106 households, the team managed to interview women from 84 households. Three households were absent, five were found older than reproductive age, four were widowed, five were newly married, two were abandoned by their husbands and three were found to have no children so they were not included in the survey. This took two weeks, from August 12th through to August 27th 2002, to collect data interviewing 84 women of the village.

At the end of each day the team met to discuss any problem(s) that were found in collecting data and plans were formed to resolve the problems. For example, on the second day of data collection, two filled out questionnaires were found to have some difficulties. In one questionnaire, the respondent named only two people as her friends who were male and from outside the village. In another questionnaire, the respondent named one person who was not of the same village. The next day the concerned team members went to both the households again and checked the answers regarding this criterion.

5.6.2 Royer Kathi, Pirojpur, Barisal

The soil of this southern part of Bangladesh is perceived naturally to be alluvial that gives rise to a high yielding of crops. This is the reason why Barisal-Pirojpur-Bhola-Potua Khali (the greater Barisal division) zone is called the “granary of Bangladesh”. Many rivers and canals surround the whole region. Royer Kathi is a village in Pirojpur district. The main income source is agriculture. Some other traditional family businesses are pottery, weaving and fishing.

To select a village from Barisal, contact was made with one of the Upazilla Agriculture Extension Officers in Pirojpur. Being an agriculture officer he has good

contact with the neighbouring villages and is highly reputed amongst village people. He knew the area well and selected this village according to the set criterion for selection and other practicalities such as the distance from Pirojpur town and the reachability of the place to all the members in the team. He made contacts with the ex-Zamindar of Royer Kathi and his wife (they were Zamindar here for 27 generations and after their family title, the village is named *Royer Kathi*, which means village of Roys). He also made contacts with some students of Pirojpur Govt College, Pirojpur Govt. Women's College, some NGO-persons and cultural activists of the town as possible data collectors.

Pirojpur town is an 11-hour journey from Dhaka by bus. Royer Kathi is an adjacent village to Pirojpur town, about 8km. After arriving at Pirojpur, the Agriculture Extension Officer introduced the team members and the ex-Zaminder, now a social worker, and the most influential person in Royer Kathi. He and his wife assured all possible help. In fact, their residence was almost the centre place while working in that village. He instructed some of the village-youths to help the team and they all along were with the team during the survey period, they showed the way to village homes, and introduced the team members to the household members when needed. Another influential person of that village, who had a large agricultural farm in that village, worked as a team-member throughout the survey. Also one local NGO *Sakaler Janyo Kori* (Bangla for 'Do For All') helped by providing three field workers.

The team of this village was comprised of: The Agriculture Extension Officer, Pirojpur Sadar Upazila; one Part-time Lecturer, Pirojpur Govt. College who was also a journalist of the local newspaper; one female HSC Student, Pirojpur Govt. Collage; one female HSC Student, Magura College; two Field Workers (one male and one female) of the NGO *Sakaler Jonyo Kari*; the Co-ordinator of the NGO *Sakoler Janyo Kari*; one Cultural Activist of *Udichi* (a progressive and reputed cultural organisation of Bangladesh), Pirojpur; one male HSC Student of Pirojpur Government College; and an Employee of Rural Electric Board. They were provided with two full-days of orientation training.

Like Chaitanyapur, here also the team was divided into five sub-teams, two people in each team, one male and one female. In each team at least one member was from the local area with local dialect. This gave the team a quick and easy access to the

village women. Every morning all the team members gathered in Agriculture Extension Officer's apartment to undertake the briefing and discussion for that day's work.

Royer Kathi is a large village with defined area location and is comprised of both Hindu and Muslim community. Among 124 households (though according to Population Census Report 1996 this number is 104) in this village, women from 98 households were interviewed. Four were found absent, 6 were found older than the reproductive age, 5 were newly married, and 4 were widowed, 3 were abandoned by their husbands, 2 could not give birth ever so they were excluded in the survey. So 97 per cent of the women who met the set criterion were interviewed. The survey was conducted between September 7th and September 16th, 2002.

The problems and progress of the data collecting procedure were discussed each day after returning from the field when all the team members gathered in the Agricultural Extension Officer's apartment to review progress.

5.6.3 Paygram, Khulna

Khulna division is very green and the largest mangrove forest in the world *Sundarbans* is in this division. People, who have cultivable land, get high yields. The village Paygram in the Phultala union of Khulna district is a typical village in the Khulna division. Like other traditional villages of Bangladesh, Paygram is comprised of *paras* (sub-areas within a village. Normally people of same profession live clustered in the same *para*) with specific professions. For example, in Paygram there is Paul para (who make pottery), Rhishi para (make shoes), Nikeri para (who fish) and so on. Both Muslims and Hindus live in the village.

A lecturer in the Department of Statistics in Rajshahi University made contact with Paygram. Her relatives who live in Paygram were retired professors in Government P.C. College and are now considered to be social-cultural activists. They possess high esteem in that area and are social elites. The survey in Paygram was conducted using their home as a base and with their help. They contacted the administrative chief of the Upazila, and the team-members recruited from the locality. They also contacted the FWA of that village and requested to work with the team. It was the season of *Durga Puja* (the greatest religious festival for Hindus) and also a painful

eye-virus broke out through the country. This made management of the team very difficult.

However the team was made up of 8 people: one FWA of Phultala union, Khulna; one lecturer in a local Collage, Khulna; two male HSC students of Phultala Govt. College, Khulna; two female Honours Students of Govt. B.L. College, Khulna; one newspaper- hawker of Paygram; and one female School Teacher in Phultala. Here also the team was divided into four sub-groups and collected data. As all the team-members (except the researcher) were from Paygram, having access to the village-women was not a problem. At the start of the work the Executive Head of the Upazila visited the working place, which also gave weight to the research team amongst villagers.

The team worked 18 days in two-shifts to cover the village, September 27th to October 15th, 2002. 8:30 pm was the meeting time for all the team-members to discuss the work progress and problems at the professor's home. For any problem noticed, in a few cases, the concerned member of the team re-visited the households and corrected the problem(s).

Going door-to-door 212 households were found in this village, women from 197 of these households were interviewed. Women of 4 households were found to be absent as they went to their parent's home for *Durga Puja*, 3 were found to be older than the reproductive age, 3 were widowed, 2 were newly married, 1 was abandoned by her husbands and 2 had no children so they could not be included in the survey.

5.6.4 Jobra, Chittagong

Generally Chittagong division is perceived as one of the most 'conservative' parts of the country. Though economically solvent generally, the culture is perceived to be 'conservative' and different from the plain-land people. This difference is evident in their language, food-habit, and the norms by which they live their lives. Chittagong is a port city and a noticeable amount of people work in the Middle East and some people have good business transactions with Burma and India.

Jobra is an adjacent village to Chittagong University and famous for *Grameen Bank* (a micro credit organisation that is reputed throughout the world), which is

perceived to be an organisation that changed the life of village women through micro-credit. So, when an Assistant Professor of the Journalism Department in Chittagong University introduced the researcher to some students of the department to work with, and when they said they selected Jobra for surveying, the researcher became hesitant to work in that village considering that it might be a very advanced village and would not represent the real village characteristics of Chittagong area. But the students assured that the information found in press about *Jobra* was far different from the reality.

One female MPhil student from the Education Department of Rajshahi University who also took part in the survey in Chaitanyapur, Rajshahi accompanied the researcher to Chittagong from Dhaka to take part in the survey. In Chittagong, the control room for this survey was the apartment of the Assistant Professor of the Department of Journalism, a friend and colleague of the researcher. He organised some of his students for this field survey. Also the other faculty members of this department (all were students of Mass Communication and Journalism, Dhaka University and that way very close to the researcher) extended their help and support in various ways.

The team was made up of 7 students from the Department of Journalism in Chittagong University and one from Political Science Department of Rajshahi University. Among the 7 students from Chittagong University, one was MA Final Year male Student; 2 female students from 3rd Year Honours; one female student from 4th Year Honours, 3 male students from 3rd Year Honours. All of them were local people except one female student who was from Rangamati district and another student of Political Science from Rajshahi University joined the team as an outsider. This team worked in four sub-groups. A full day extensive orientation was given to the team members.

Village Jobra was around 10km from Chittagong University. From 9 am to 4pm was the work-schedule. At 8:45 am they met in one of the team member's home in Jobra. Her father was an Associate Professor in Chittagong Govt. College. He introduced the team to the Union Parishad Chairman and members. They assured all sorts of help. And some other students of Chittagong University, who were local

people of Jobra, also took part in the survey voluntarily. It took eight days, from October 24 to November 01, 2002, to complete the survey.

While working in Jobra, it became clear that without the students of Chittagong University, it was impossible to collect any data because the dialect was too different; in fact it was almost another language. At the same time, without the reputation of one of the team member's family and the support of that family it was also impossible to get an access into the village.

The income source of the village people was mainly agriculture and next to it was wage earning. Male members of the survey team could not interview the women because of "Purdha". Women did not allow the presence of any male member while they were interviewed and at the same time they did not allow the survey team to have any photograph of them. The concept of family planning was not very welcome to them. For example, Nurunnahar Khatun, one 32-year old woman with six children was suffering from some gynaecological problems that took her almost to death and at the same time she was pregnant. The day the team went to interview her, she was then having saline for her survival, yet at the same time was very eager to be interviewed. But when asked why she was not using contraception, she became furious and asked the team to leave her home for uttering those *kufri* (non-Islamic, i.e. anti-religious) words. She said she would have happily as many children as Allah permits.

Though the success story of the *Grameen Bank* project in Jobra village is famous throughout the world as the symbol of women's empowerment through micro-credit organisation, none of the women interviewed in this survey was found to be connected with this micro-credit programme.

There were two different *paras* in Jobra: *Purbo para* and *Pashchim para*, that is, East and West *para*. Acres of paddy fields differentiated these two *paras* physically and religion differentiated culturally. People in *Purbo para* were mainly Muslims whereas the *Paschim para* was a Buddhist area. As the Buddhist people only comprise 0.2 per cent of the national population, their fertility behaviour ultimately has no impact on national fertility transition. So, that *para* was excluded and data were collected from the bigger area *Purbo Para*.

Going door-to-door 115 households were found and the team interviewed women from 97 households. 3 were absent, 4 were older than the reproductive age, 2 were widowed, 1 was newly married, 2 were not willing to be interviewed, there was no wife in 3 households, and 3 had no children so they could not be included in the survey. Including 2 unwilling women with 3 absent, data could not be collected from a total of 5 women. The rate of data collection was 95.65 per cent among the women who satisfied the selection criterion.

5.6.5 Brhammin Shasan, Sylhet

Sylhet is in the hilly part of Bangladesh and is perceived as one of the most conservative areas in Bangladesh. Almost ninety percent of the tea gardens of Bangladesh are in greater Sylhet district. A number of people even from remote villages in Sylhet division work in the UK, either as hotel-owners or as hotel-labourers. Some people also work in the Middle East. This area is perceived as comparatively rich area of the country.

To select a village in Sylhet Division, contact was made with the Department of Anthropology in Shahjalal University of Science and Technology in Sylhet. An Assistant Professor of the Anthropology Department organised the survey team comprising students from her department. During the survey, the researcher stayed at her apartment and the apartment was used as the base. Six students took part in this survey: five female students and one male student.

There are two distinct parts in this village in respect of economic condition. The original people of the village enjoy a moderately good economic condition, they have cultivable land, some are in service; but some poor people have migrated from remote villages and are living there in *guchchhagram* (Bangla word for “clustered village” that is made up of some congested rooms in a long corridor or a big building where poor people live at a very low rent or sometimes they are given that accommodation by the government.). Male members of this poor section are engaged in rickshaw pulling or day-labouring whereas female members are working as maidservants or day-labourers in street construction or brickfields.

Though according to the Population Census Report (published in March 1996) the household numbers are 67, going door to door 93 households were found. Among these 93 households in this village, women from 74 households were interviewed. Two were always found absent as they were working as maid-servants in affluent people's home in the town and lived there, 4 were found older than reproductive age, 3 were newly married, 2 were dumb, and 5 had no children, there was no wife in one household, and one was sick so they could not be included in the survey.

It took six days to complete the survey between November 11 and November 20, 2002.

Though the villagers helped the team as university people, the real problem was it was the time of Ramadan (the holy month for Muslims when they remain in fasting during the day time). Both the interviewees and interviewers were fasting so there was a change in working time compared to other places. Here the time schedule was from 10:30am to 4:30 pm, one shift. Reason was the *sehri* (having meal and prayer at around 3:30 am) and *iftar* (breaking of fasting at the dusk around 5pm) time. After having *sehri* all the people go to bed and wake up late during this month normally, so work started late. Again for the preparation of *iftar*, women need to finish other jobs at least one hour before the *iftar* time. But the plus point was that the housewives were normally not engaged in cooking during the daytime in this month. So the interviews could be uninterrupted. As the members of the team were female except one male member, this was a major aid to collect data, especially for collecting data at this month when women maintain stricter *Purdha* than other times. Another problem was a greater presence of husbands home during this period. In one or two cases women at first showed less willingness to discuss a *na-pak* topic (dirty topic) like family planning in the holy month but these problems were overcome through the skilled handling by Anthropology students of Shah Jalal University Science and Technology.

Like other places, the co-ordinating place was the apartment of the Assistant Professor of the Anthropology department where the researcher stayed; all the team members used to gather in this apartment before starting work and after finishing the work they again returned there to discuss the progress and problems. The team-members did not need much instruction as they had prior experience of surveying

from their course of study and had experience from other projects. All the students in the survey team were local inhabitants of Sylhet district so there was no language problem, except for the researcher.

5.6.6 Balai Nagar, Goyahata, Dhaka

As the districts of Dhaka division went through the experience of urbanisation earlier than other parts of Bangladesh, it is generally perceived that this experience of urbanisation may have some effect on the villages of this division. Tangail is a nearby district to Dhaka city (a two-hour journey by bus) and Balai Nagar is a village in Goyahata Union in Tangail district of Dhaka division. Initially official request was made from Napier University, Edinburgh to the Goyahata Union Parishad Chairman to help organise the survey. This Union Parishad Chairman is also a member of the development organisation “Hunger Project” and contact was made with him through this organisation.. In his official letter to Dr Robert Raeside, Director of Studies with this PhD programme, he promised to help.

The village of Balai Nagar is a typical village under Goyahata Union in Tangail district. Income source of the people is mainly agriculture. Many women are connected with “Hunger Project”.

Unfortunately there were not many good rest houses or secure hotels in the locality so the survey was conducted from a base in the residence of the Union Parishad Chairman. The chairman organised a team and introduced the researcher to that team. As many women of that village were associated with Hunger Project, having access to village women was not a problem. But the real problem was to build a survey team there. Unfortunately at that time no college or university student was available in that village. So the team was totally constructed of common village people. It was very difficult to train them up. The team was made up of: one female Primary School Teacher who was also a member of Goyahata Union Parishad; one female teacher of Goyahata Aliya Madrasa (a centre for Islamic education); two house wives from Balai Nagar who also had some affiliation with the NGO *Hunger Project* and a honey-bee cultivator. Extensive two days training was provided to them and all the questionnaires were translated into Bangla for them.

It took 8 days, from December 9 to December 17, 2002 to complete the survey though the village was comparatively a small one.

Though the number of households in Balai Nagar according to the Population Census Report 1991 (published in 1996) is 63, the survey team found 85 households in Balai Nagar going door-to-door. Among these 85 households in this village, women from 63 households were interviewed. None were found absent, 6 of the women were found to be older than the reproductive age, 3 were widowed, 5 were newly married, 3 were abandoned by their husbands, 3 had no child and 2 refused to be interviewed as somebody of their household recently died so they were not included in the survey. Among the women who were fitted with the selection criterion, the team could not interview only 2 women, thus the rate of interviewing women who were compatible with the set criterion was 97.61 per cent.

5.6.7 Mohugaon, Birganj, Dinajpur

As stated earlier, to assess the role of religion on fertility behaviour one Hindu majority village was surveyed. Mohugaon is a village of Sujalpur Union in Dinajpur district of the Rajshahi division.

All the characteristics commonly found in the northern part of Bangladesh appear here. People are poor and the economy of this village is totally dependant on agriculture, mainly the cultivation of sugar cane. There is a big sugar mill in Mohiniganj. Some other people are engaged in professions like rickshaw pulling, van pulling, and other day labouring. Social and cultural norms were similar to the other villages of the country; the only difference was religion.

Two members of the team who took part in surveying *Chaitanyapur* led the survey in Mohugaon, Dinajpur. The survey was conducted from the home of one of the team member's who was from Birganj. Their family has very high repute in that locality. At the same time, being a Hindu family they had access to the adjacent Hindu dominated area. Four female students from Mohugaon were included in the survey team and they all were from Hindu community and students of Birganj Government College. Here also a one-day orientation was given to the team members newly included. Two members had already experienced surveying with

the same questionnaire that made the work easier. Survey of this area took place from 26th December 2002 through to 2nd January 2002.

However among 102 households in this village (though according to Population Census Report published in March, 1996 this number is 95), women from only 81 households were interviewed. Women of 5 households were found to be absent, 4 were found to be older than the reproductive age, 3 were widowed, 4 were newly married, 2 were sick, 2 refused to be interviewed and one had no child so they were excluded from the survey. The proportion of women who met the selection criterion was 93.14 per cent.

Thus data were collected from all seven villages and one small town area. In total 724 women were interviewed.

5.7 Diary for Collecting Data

The “diary of collecting data” is presented in the table 5.7.1 below, where the dates of collecting data staying at fields are recorded.

Table 5.7.1: Diary of Data Collection

Study Area	Starting Date	Finishing Date
Kamarpara/Chaitanpur	August 12, 2002	August 27, 2002
Rajshahi Division		
Royer Kathi	September 7, 2002	September 16, 2002
Barisal Division		
Paygram	September 27, 2002	October 15, 2002
Khulna Division		
Jobra	October 24, 2002	November 1, 2002
Chittagong Division		
Brahmin Shasan	November 11, 2002	November 20, 2002
Sylhet Division		
Balai Nagar	December 9, 2002	December 17, 2002
Dhaka Division		
Mohugaon	December 26, 2002	January 2, 2003
Rajshahi Division		
Akkelpur (Pilot Survey)	April 4, 2002	April 14, 2002
Rajshahi Division		

5.8 Notes on the Survey

While undertaking the survey some common features were observed throughout all the areas, these are:

i) There was a lack of consistency of data between the Population Census Report and the Union Parishad Record Book. The Population Census Report 2001 is yet to publish, but the latest census report, which was published in 1996 gave the records of households in mouza-basis rather than village-basis. On the other hand in most of the cases, the number of households in Union Parishad record book was far more than those mentioned in the census report. While discussing the problem with Professor Abul Barkat of Economics department in Dhaka University, he gave a good explanation. He had also noticed this problem and suggested that the reason for the record of the population and number of households being more than the real number is economic. Professor Barkat thinks one of the reasons may be that Union Parishad officials do this with the aim of having more relief allocation for that area. Whatever might be the reason, the number of households that were mentioned in official statistics of the Union Parishad record book was different from the households the team found by going door-to-door. However, the number of households mentioned in the Population Census Report was found closer to the number the survey teams found. The teams got a little higher number of households, which is possible within the six-year period.

ii) Another problem was, nobody knew properly the boundary of the village. Some times people claimed to be of another village rather than the village the team was working and within the members of the same household it became a matter of great debate in which village they were living. If the team quoted from any official documentation, the village people did not agree with that document. In fact they seemed to have no faith in any official records. In almost all the villages the survey team faced this problem.

iii) In most of the villages there is no household number (it is called the holding number in Bangladesh). There are many numbers on the front door of every household, some were given by family planning office, some were given by the election commission, some were given by the health service and so on, and all of them were different to each other. Surprisingly just after household number 3

household number 1771 arrives, nobody questions that, and nobody knows the reason for it. Also some household numbers were banished through *lepa* (in mud houses women brush the walls and floors with a liquid paste made up of cow-dung, mud and water to keep the wall and floor clean and away from dust, this brushing is called *lepa*). So the team had to mark freshly on those households with coloured chalk.

iv) The extreme poverty, low female literacy and lack of any moderate knowledge of their life sometimes made the situation of women pathetic. In many of the cases it was evident that they did not have any idea of number. For example, one woman told without any hesitation that her age was 19, her son's age was 22, and she was married for 20 years. At the same time, there was no birth record. So it was impossible to know the real age of women, their marriage age or their age at first child born.

v) No women thought of their own income (except for the women who were educated and were in service these were very few in numbers) as the income of the household. They were earning from making mats, weaving, working in other people's house, labouring in agriculture, having loan from micro credit organisation but never thought of that money as an income source to their family. Women earning was not perceived as earning in any real sense even to the women and thus when they were asked about the income source of the family they only mentioned their husband's income.

vi) Similarly when asked about the property, women mentioned her husband's property, even father-in-law's property as their own property. In fact, rarely they do have any sense of ownership.

vii) In many areas it is still a popular belief amongst village women that if their husbands use any contraceptive method, it will be a "gunah"(sin) for them because it will cause their husband's harm.

viii) It was hard to quantify the household possessions of many of the women interviewed because their economic condition was so poor that they even had no type of furniture.

ix) Sense of privacy was rarely found in any situation. While women were being interviewed, all the other women (in-laws, daughters, neighbours), children used to gather around them. Certainly this affected their answers. This may have had a particular affect on the answers of their choice of person in section five. It became worse when their husband or any male member was present. Women used to ask their male family members, if they were at home, the answers to questions, although they could answer very well when the male family members were not home. Even brother-in-laws (husband's younger brother) told all the information about their sister-in-laws' family planning status, methods practised and so on.

x) There is a dominant perception of "good women". A "good women" is she who never talks to anybody about her problems other than husband, and at the most to her in-laws (women), preferably mother-in-law. Having friends is not a good thing for a married woman. So this gave rise to a tendency of stating that they had no contacts with anybody outside home when they were asked about the person(s) with whom they shared their mundane problems. This tendency was harmful to the answers to the sociometric questions and it took a great deal of effort to overcome this problem. The team members had to continually convince the interviewed women of the importance of the real answer. The survey team had to rely on the answers the interviewed women provided to the interviewers. There was no way of crosschecking them directly. For example, it was found that one woman was telling about whom she talked to. In the mean time if her mother-in-law entered, she changed her tune and told that except her husband and mother-in-law she never talked to anybody. This may have severely hampered the analysis in some cases. To ensure more accurate relational data perhaps ethnographic and observational methods may be more a reliable approach.

5.9 Analysis Methods

The analysis of the survey is conducted in chapters six, seven and eight. In chapter six, data collected in the survey is first explored using exploratory statistical tools to check variables for consistency and detect any oddities. This will involve the use of standard statistical methods to describe the data and allow investigation of the variability between study areas. On this descriptive analysis an understanding of the relative frequency of information sources and sources of communication will be gained.

Using factor analysis and other combinations, similar variables were used to create new variables. For example, the variable “total children” was created by adding the “number of male children” and the “number of female children”. The other new variables created were:

Possession Score/Equipment Score: From a Pareto graph it was found that among the 11 measures of modern equipment, except for furniture, watch, electricity, radio, bicycle and TV, possession of the others were negligible. So these others were dropped from the analysis and then the mean of the equipments, i.e. furniture, watch, electricity, radio, bicycle and TV were added together to create the new variable “equipment score”.

Information Score: The mean of all seven information sources, i.e., radio, television, newspaper/magazine, bill boards, posters, relatives and friends were counted per study area and then the means of all these sources were added up to create the “information score”.

MCO: Micro-Credit Organisation Affiliation was recoded as “mco” on the basis of whether any affiliation is there or not, i.e. yes = 1 and no = 0.

Wjob: A dummy variable created that codes any type of job other than ‘housewife’ as 1 and housewife as 0.

Education Score: School attendance, school level, husband’s education and language competence were reduced to one score through factor analysis and the new variable education score was created which accounted for 69.5 per cent of the variation amongst the variables..

Family Members Live Abroad Score: The variables number of family members living abroad, frequency of contact and frequency of receiving financial help from these members were reduced using factor analysis to one variable called “fmlabrd-score”. This new variable accounted for 82.64 per cent of the original variation.

Housing Score: House type, roof, wall, floor-these four variables were reduced to one new variable “housing score” using factor analysis and this accounted for 51.9 per cent of variation amongst the original variables.

Female Autonomy Score: ‘Status of travelling unaccompanied’ and ‘decision making power in household matters’ - these two variables were factor analysed (this accounted for 79.1 per cent of the original variation) to create the new variable “female-autonomy score”

FP Information Source: According to the Pareto graph in figure 5.9-1, FWA, friends, radio, relatives, GHW, TV and NGO were found to be important sources of FP information compared to village theatre, newspaper, bill board and cinema hall, which are negligible. New variables were created by combining FWA and GHW and NGO to “official FP information source”, friends and relatives were combined to “friend-relatives fpinf source” and radio and television to “radio-television”.

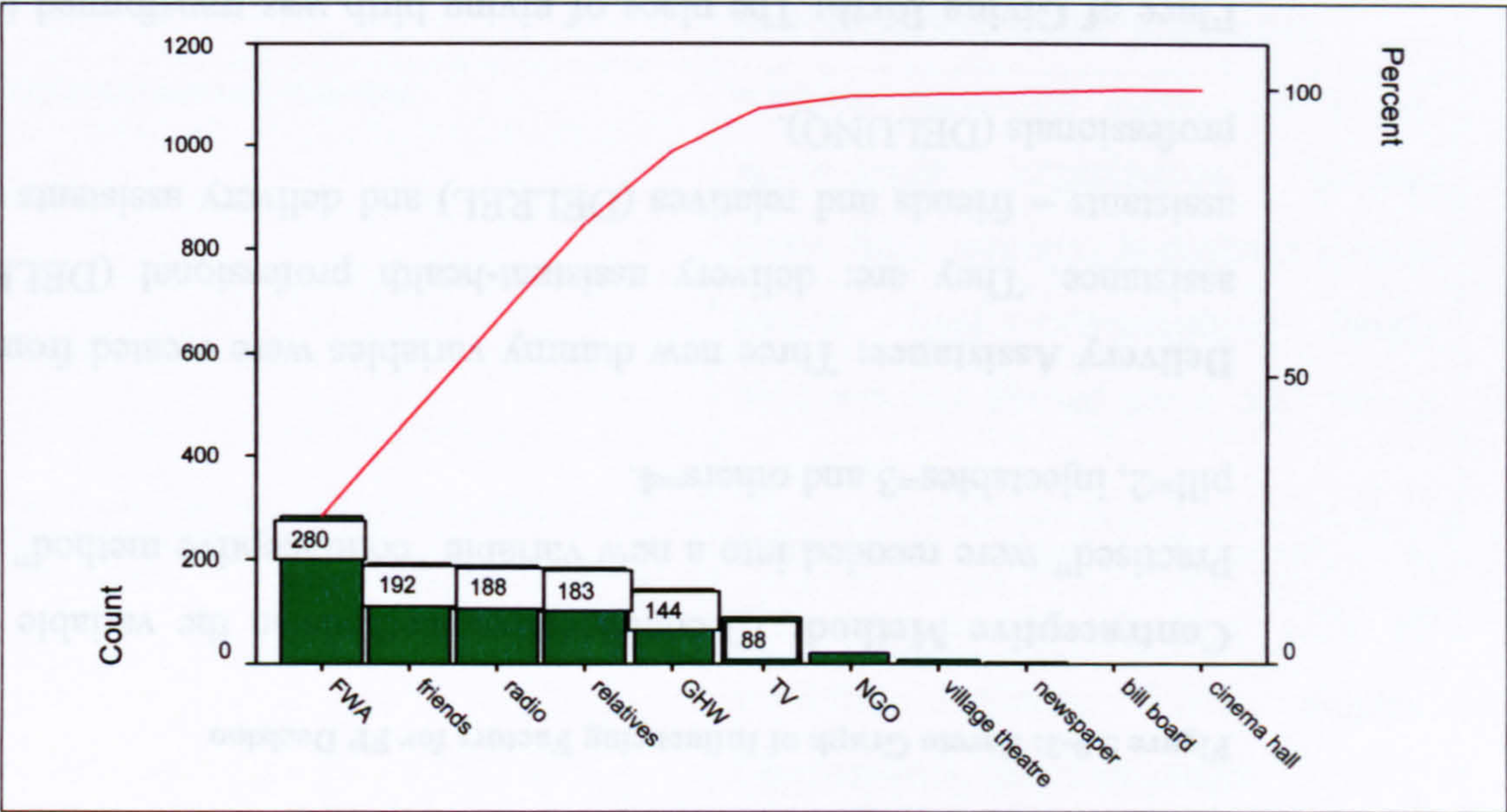


Figure 5.9-1: Pareto Chart of FP Information Source

Influencing Factors: From the Pareto graph in figure 5.9-2 it is clear that husband and FWA are the two most important influencing factors. The other 14 influencing factors were reduced to three new variables using factor analysis. These were “display” (poster, pamphlet, public lecture, movie, mobile van, village theatre, magazine), “interpersonal” (opinion leader, parents, friends, in-laws and relatives), and “mass media” (TV ads and radio FP programme). These accounted for 37 per cent, 14.3 per cent and 10.8 per cent of the original variation respectively.

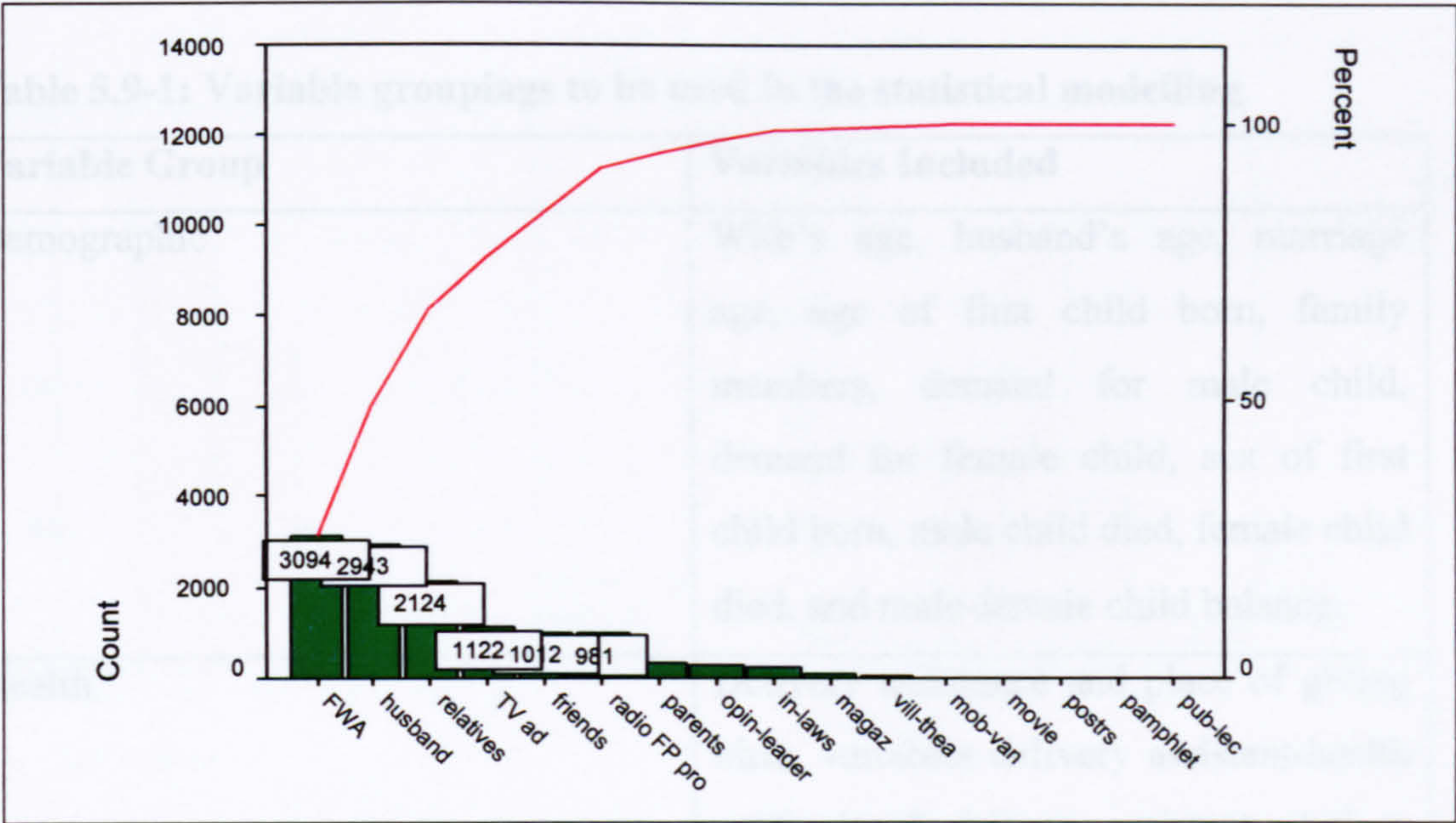


Figure 5.9-2: Pareto Graph of Influencing Factors for FP Decision

Contraceptive Method: 10 contraceptive methods in the variable “FP methods Practised” were recoded into a new variable “contraceptive method” with none=1, pill=2, injectables=3 and others=4.

Delivery Assistance: Three new dummy variables were created from the delivery assistance. They are: delivery assistant-health professional (DELHP), delivery assistants – friends and relatives (DELREL) and delivery assistants – unqualified professionals (DELUNQ).

Place of Giving Birth: The place of giving birth was transformed into a dummy variable with “place of giving birth” at home coded as 1 and 0 otherwise.

Income Source: The household income sources were transformed into a dummy variable “income source” with agriculture-agriculture related income =1, and 0 for other sources.

The variable names and the codes used in the analysis are displayed in Appendix 4. To conduct the statistical analysis the variables were categorised into: Demographic, Health, Socio-economic-cultural, and Communication. The variables in these categories are listed in table 5.9-1.

Table 5.9-1: Variable groupings to be used in the statistical modelling

Variable Group	Variables Included
Demographic	Wife’s age, husband’s age, marriage age, age of first child born, family members, demand for male child, demand for female child, sex of first child born, male child died, female child died, and male-female child balance.
Health	Delivery assistance and place of giving birth, variables delivery assistant-health professional, delivery assistant-relatives and delivery assistant-unqualified
Socio-economic-cultural	religion, education score, wife’s job, micro-credit organisation, housing score, land property, household income source, food consumption, family members live abroad score, and female autonomy score
Communication	Information score, frequency of discussing family planning with FP workers, husband, FWA, display, interpersonal, and mass media

How these variables affect the decision to adopt family planning is determined first by assessing how the number of children a mother has is influenced by these variables. To do this Poisson regression should be used as the dependent variable, total number of children, is a count. However, as algorithms for fitting a Poisson model were unavailable to the researcher, ordinary least squares (OLS) regression was used with the dependent variable transformed by taking its square root to approximately satisfy the normality of the transformation as illustrated in figure 5.9-3.

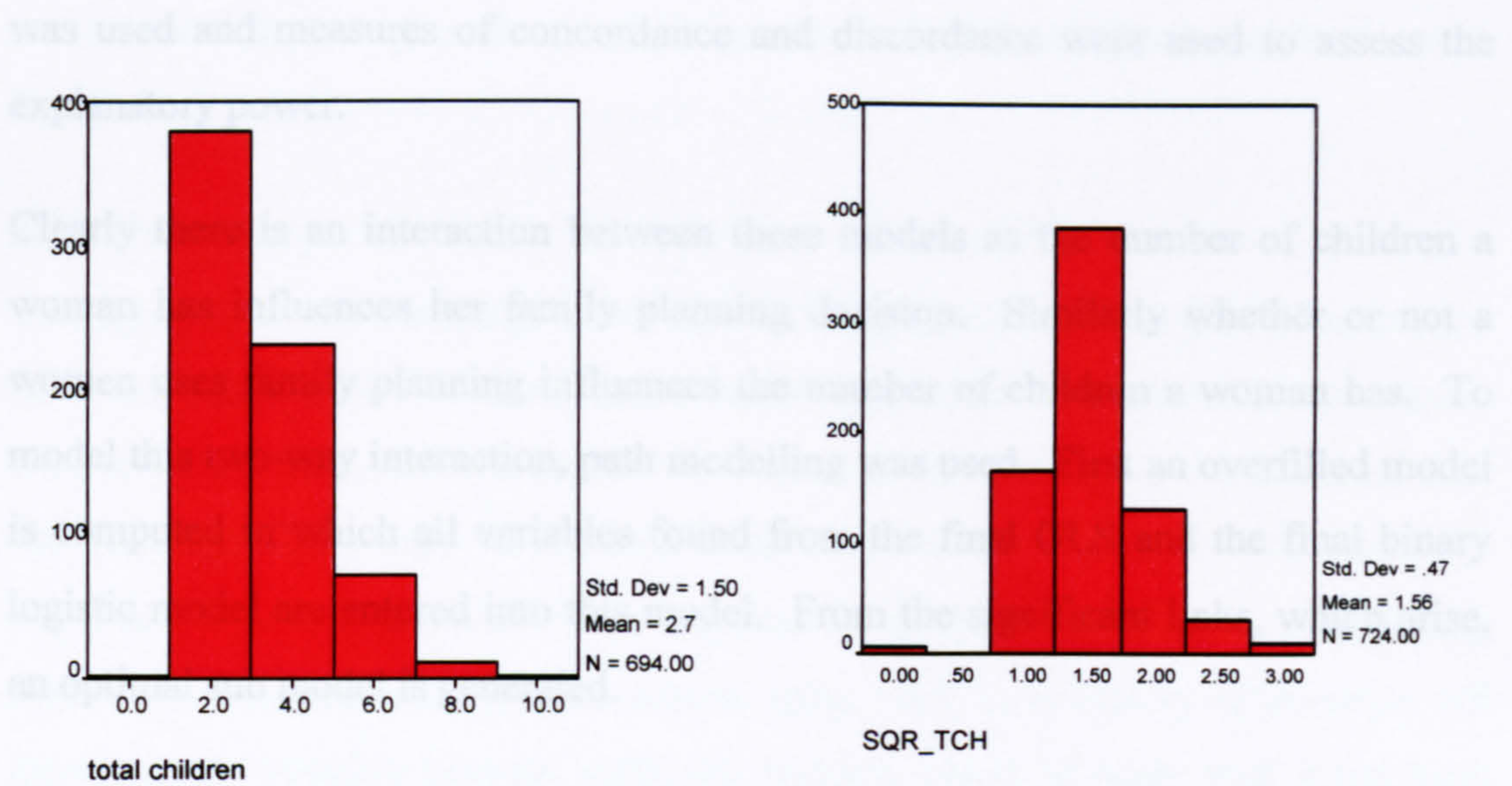


Figure 5.9-3: Ordinary Least Squares Regression For SQR_TCH

An evolutionary approach to determining the regression model was taken in which the demographic variables were entered first. The significant ones from this fit were retained and the health variables then added. Again at the next stage the significant variables were retained and the social economic variables added. Finally in the last stage, variables, which remained significant, were retained and the communication variables were then added. At each stage the coefficient of variation (R-squared) was computed to allow assessment of explanatory power. This allowed the contribution of communication variables to be ascertained.

Although this is a recommended procedure to develop models, (see Krzanowski 1998), there is a danger of dropping variables at an early stage which as a result of interaction with other variables would later be significant. To overcome this all the variables were entered simultaneously and a best subset stepwise procedure was used. The modelling approaches should generate similar models and so some model validation is done.

The normal diagnostic measures of model fit were also compiled and assessed at each stage, (see Krzanowski 1998).

To reflect the importance of the different variables on a woman’s decision to use family planning or not, a similar approach as above was used to generate models. But as the dependent variable is a dichotomous variable, binary logistic regression

was used and measures of concordance and discordance were used to assess the explanatory power.

Clearly there is an interaction between these models as the number of children a woman has influences her family planning decision. Similarly whether or not a woman uses family planning influences the number of children a woman has. To model this two-way interaction, path modelling was used. First an overfilled model is computed in which all variables found from the final OLS and the final binary logistic model are entered into this model. From the significant links, which arise, an optimal sub model is generated.

This analysis is conducted in chapter six and the purpose of this analysis is to test the main hypothesis that communication has a significant impact on the decision to use family planning and hence the number of children born. Further hypothesis are also tested i.e. communication variables have more influence than demographic and socio economic variables.

Further the relative importance of interpersonal to mass media will be ascertained from the analysis in chapter 6.

The hypotheses are further tested in Chapter seven when the structure of communication between individual women in each village is analysed. Matrices of communication and their intensity are constructed. From these matrices sociograms are produced and variables measuring the centrality and power of actors and cliques are constructed. The software package UCINET-6 is used to conduct the analysis. This allows a number of sub-hypothesis to be tested, notably the effect of the actors' positions in the networks. Essentially these are the sub-hypotheses listed in Appendix 1.

11 new variables are generated in this analysis to depict measures of an actor's degree of centrality and power, these are described in see section 8.1 of chapter 8.

The relationships between these variables are explored in chapter eight through the use of correlation matrices. The key variables are then added to the statistical models developed in chapter 6 to allow a full assessment of the role of

communication among women and its impact on fertility decision-making in rural Bangladesh.

5.10 Summary

Through this survey the image of women in Bangladesh could be perceived at least on a very small scale. No doubt more varied data could be explored if more areas were to be included. But the survey was constructed considering the limits of time and funding. The whole survey was conducted within 7 months. But here it is important to note that unlike collecting data from Matlab or Savar or Manikganj, data were collected mainly from remote areas with little history of surveys. All these became possible because sufficient contacts could be made with some local popular and influential people who took the job as their own and helped whole heartedly throughout the survey. Also the village people were very co-operative. Perhaps the researcher got easy access to both the women of villages and to the concerned authority because she was a woman from Bangladesh. Her nationality, language and contacts all gave her the opportunity to become one of them. They trusted her and became convinced that one woman of their country was doing something abroad regarding them in a broader sense. This was especially so among young women, school and college girls. Some times even some older women were also found to tell that if daughters can be established like this lady (the researcher) then there is no harm in having a female child.

Another reason of success was the inclusion of local woman interviewers in the team. These team members could interview the women even while they were bathing in ponds, cooking in kitchens, bathing their children, milking their cows or husking rice with *dheki* (traditional wooden husking instrument). Images illustrating this informal setting in which data were collected, appears in Appendix 5. Also, the women who were found to be absent during the day, local female team-members had access to those households at night to collect the data. Inclusion of FWA or *dai* in the team in some places added extra benefit in the way that they knew the women who were using contraception, those who were newly married and they had easy access to almost all the households. Most importantly, access was gained as a result of staying in popular and influential people's homes having the chance of being introduced and supported by them throughout the survey in fact gave access to

those areas. Thus a great deal of effort from the various sectors combined and contributed to make this survey a successful one.

Finally, data were collected from different locations of Bangladesh to ensure that woman from each part of rural Bangladesh were addressed. Whatever might be the difference among them one thing was very common and that was all these educated-uneducated, rich-poor, urban-rural, Muslim-Hindu women of eight different areas were the acceptors of family planning methods that contributed to the impressive decline of fertility in Bangladesh. Accumulating all the data together and analysing them properly, the profile of women in Bangladesh may be traced out. Also, analysis of their communication patterns on this issue can reveal the influence of communication on the fertility behaviour women in rural Bangladesh, which is the subject of the following chapters.

Chapter 6

Analysis of Demographic, Health, Socio-economic- cultural and Communication Variables

Introduction

As stated in chapter 5, data were collected using a structured questionnaire that was comprised of five different sections: background questions, socio-economic questions, reproductive questions, family planning questions and sociometric questions. In this chapter data collected on demographic, socio-economic-cultural, family planning and reproductive variables along with communication variables of interviewed women in the surveyed areas are analysed. The sociometric questions are analysed in chapter 7. This chapter is organised in *four* broad sections. They are as follows:

Section 1: describes all the variables tested using descriptive statistics;

Section 2: determines the variables for family size and contraceptive use;

Section 3: investigates the inter-linkages of the fertility system using path modelling;

Section 4: Discussion.

Conducting this analysis will allow testing of hypotheses one to four as listed in Appendix 1 and allow the impact of communication on fertility decision making to be assessed with regard to demographic, health and socio-economic and cultural variables.

6.1 Descriptive Statistics

In this section, all the demographic, health, socio-economic-cultural and communication variables, which are tested in this research, are analysed using descriptive statistics in order to reflect the variation both within and between study sites. Variables will be analysed in four sub-sections, namely:

- i. background variables;
- ii. socio-economic-cultural variables;
- iii. reproductive variables; and
- iv. family planning variables;

6.1.1 Background Variables

The basic profile of the respondents such as age, their husband’s age, religion, duration of living at the current place of residence, previous place of living, age at first marriage and the age at first child born are analysed in this section. The age of women and their husbands, age of marriage and first children born for each village are displayed in table 6.1.1-1.

Table 6.1.1-1: Summary Report of Age with Different Variables

Report					
Study Area		WA	HA	MARAGE	AGEFCH
Balai Nagar	Mean	25.94	33.32	15.75	17.94
	N	63	63	63	63
	Std. Deviation	5.932	7.923	2.209	2.301
Brahman Sha	Mean	25.84	34.42	16.36	18.03
	N	74	74	74	74
	Std. Deviation	5.952	6.782	3.632	3.456
Jobra	Mean	28.62	38.79	15.75	17.63
	N	97	97	97	97
	Std. Deviation	6.294	9.726	2.847	2.712
Kamarpara	Mean	28.63	36.33	15.10	17.59
	N	84	84	84	84
	Std. Deviation	7.462	9.724	3.091	3.014
Paygram	Mean	28.86	36.94	14.72	17.23
	N	197	197	197	197
	Std. Deviation	6.220	8.014	2.465	2.725
Rayer Kathi	Mean	28.66	38.10	16.14	18.28
	N	98	98	98	98
	Std. Deviation	7.120	10.239	3.251	3.162
Mohu Gaon	Mean	28.06	35.91	15.58	18.58
	N	81	81	81	81
	Std. Deviation	5.699	8.418	2.459	3.009
Akkelpur	Mean	30.00	38.80	15.77	18.07
	N	30	30	30	30
	Std. Deviation	9.067	9.956	3.245	3.300
Total	Mean	28.17	36.66	15.49	17.79
	N	724	724	724	724
	Std. Deviation	6.616	8.911	2.901	2.946

Conducting analysis of variance it was found that there were significant differences between regions on some of these variables. But for most it was only a small difference between one or two areas. The variable wise findings are discussed below.

Women’s Age: The mean age of the women interviewed is 28.17 years. This variable is displayed in figure 6.1.1-1 for each village, which shows that there is no significant difference in the mean ages of the women interviewed between the surveyed areas. The reason for this may be the specific criterion of selecting the sample audience.

While selecting the audience, criterion was to interview one woman per household of the village who was married, living with husband (i.e. not widowed or abandoned) and who had at least one child at the time of interview. In cases if there were more than one woman of this criterion (in joint families) found in the same household, the younger one was interviewed.

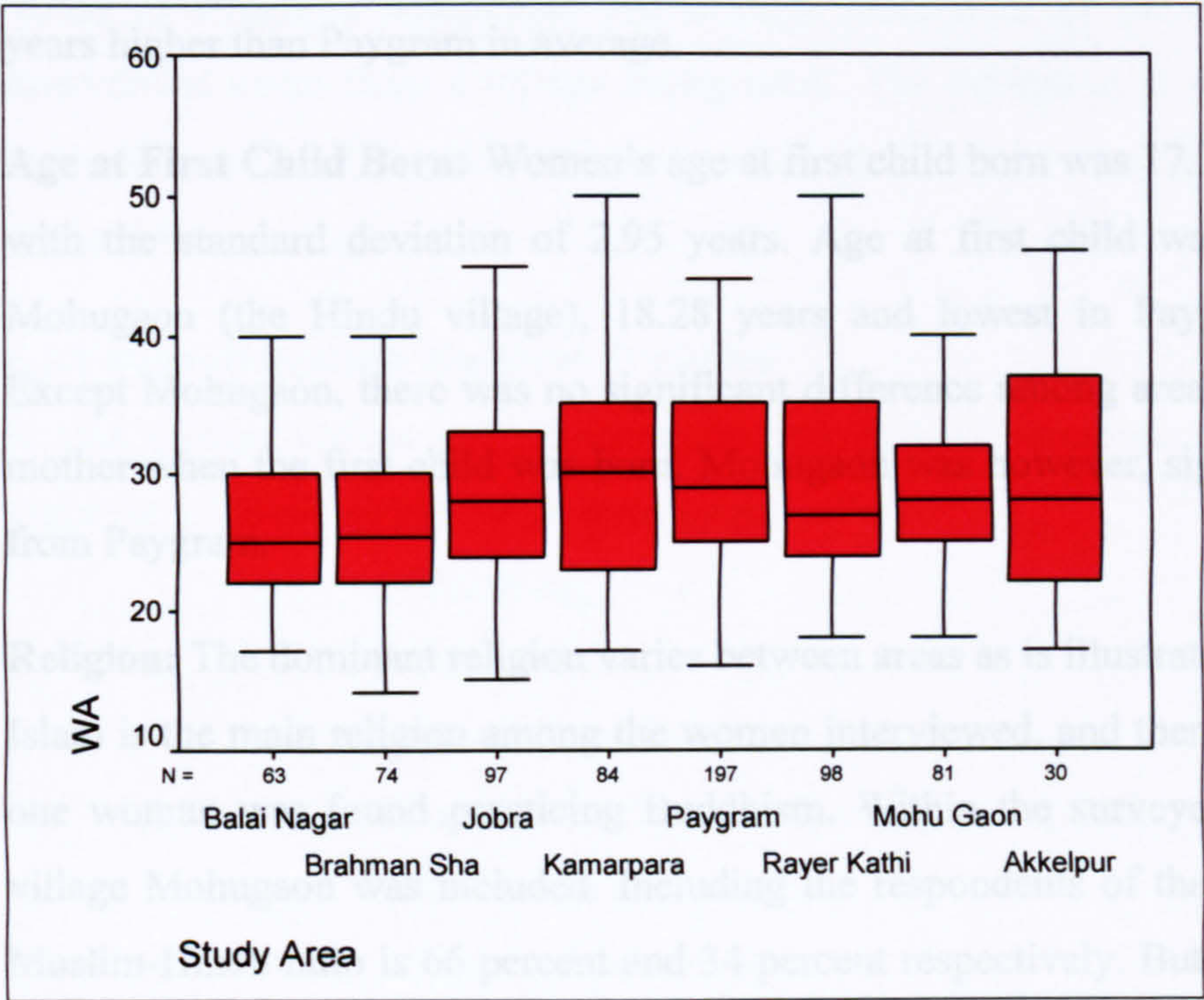


Figure 6.1.1-1: Average Women Age in Surveyed Areas

Husband’s Age: According to the summary report in table 6.1.1-1 above, on average, husband’s age is 36.66 years, nearly 8.5 years more than that of wife’s age throughout the survey areas. Significant difference was found in mean husband age in areas. Though the mean husband age was found highest in Akkelpur (the middle town mahallah in Akkelpur), Jobra (Chittagong division) was found to be significantly different in the husband’s age from Balai Nagar (Dhaka Division) and Brahman Shasan (Sylhet Division). Husband age in Jobra was found 5.8 yeas more than that of Balai Nagar and 4.3 years more than Brahman Shasan on average. Rayer Kathi (Barisal Division) was also found to be significantly different from Balai Nagar. According to the analysis, husband’s age is significantly higher in Jobra (Chittagong division) than other surveyed areas, which is commonly known as the conservative part of Bangladesh. Husband’s age is significantly lower in Balai Nagar.

Women’s Marriage Age: The average marriage age of women was found 15.49 years with the standard deviation of 2.9 years though according to Bangladesh Government order, lowest marriage age for women is 18 years. The lowest marriage age was recorded in Paygram in Khulna division, 14.72 years with a standard deviation of 2.46 years. Brahman Shasan and Rayer Kathi was significantly different from Paygram with regard to marital age, that is, Brahmin Shasan and Rayer Kathi were 1.65 and 1.45 years higher than Paygram in average.

Age at First Child Born: Women’s age at first child born was 17.79 years on average with the standard deviation of 2.95 years. Age at first child was found highest in Mohugaon (the Hindu village), 18.28 years and lowest in Paygram, 17.23 years. Except Mohugaon, there was no significant difference among areas for the age of the mother when the first child was born. Mohugaon was however, significantly different from Paygram.

Religion: The dominant religion varies between areas as is illustrated in figure 6.1.1-2. Islam is the main religion among the women interviewed, and then is Hinduism. Only one woman was found practicing Buddhism. Within the surveyed areas one Hindu village Mohugaon was included. Including the respondents of that Hindu village the Muslim-Hindu ratio is 66 percent and 34 percent respectively. But without this Hindu village this ratio is 75.52 per cent and 24.48 per cent respectively.

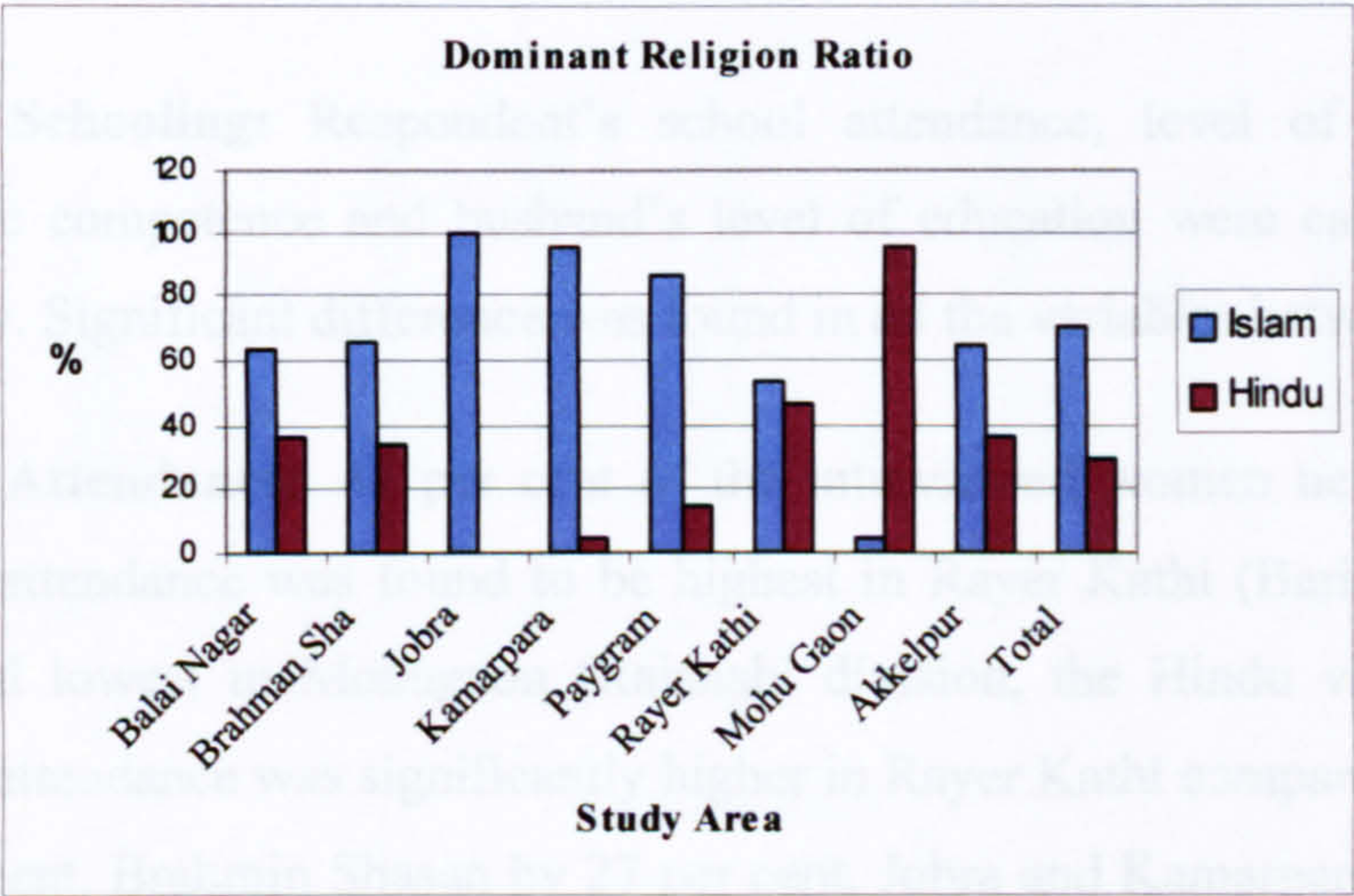


Figure 6.1.1-2: Dominant Religion Ratio in Surveyed Areas

Years of Residence: On average, women lived at the current place of residence for 11.35 years. The lowest average residence years was found in Brahmin Shasan, 6.68

years. Brahmin Shasan was significantly different in residence years at the present place with all the areas except Balai Nagar. The reason may be as stated in chapter 5, many of the residents came from outside this area to derive the benefit from *Guchchha Gram* (clustered village) offered by *Ershad* regime (first the Marshal Law administrator and then the president of Bangladesh, 1982 through 1990).

Years of Previous Residence: On average more than 97 per cent of the women interviewed came from a village background. The exception is Akkelpur, the small town that was used to pilot the survey where there was a more even spread between city and town backgrounds.

6.1.2 Socio-Economic-Cultural Variables

In this section various social, economic and cultural variables are analysed. These variables were categorised into several sub-sections:

- i) Schooling;
- ii) Occupation;
- iii) Housing and Property;
- iv) Family Members and Food Consumption;
- v) Household Possession;
- vi) Source of Information;
- vii) Family Members Live Abroad; and
- viii) Female Autonomy;

6.1.2.1 Schooling: Respondent's school attendance, level of education attained, language competence and husband's level of education were calculated in this sub-category. Significant difference was found in all the variables between the areas.

School Attendance: 41 per cent of the interviewed women never attended school. School attendance was found to be highest in Rayer Kathi (Barisal division), 88 per cent and lowest in Mohugaon (Rajshahi division, the Hindu village), 36 per cent. School attendance was significantly higher in Rayer Kathi compared to Balai Nagar by 34 per cent, Brahmin Shasan by 27 per cent, Jobra and Kamarpara by 48 per cent and Mohu Gaon by 52 per cent. Mohu Gaon was found to be significantly lower in school attendance compared to other surveyed areas. This difference is shown in the figure 6.1.2.1-1.

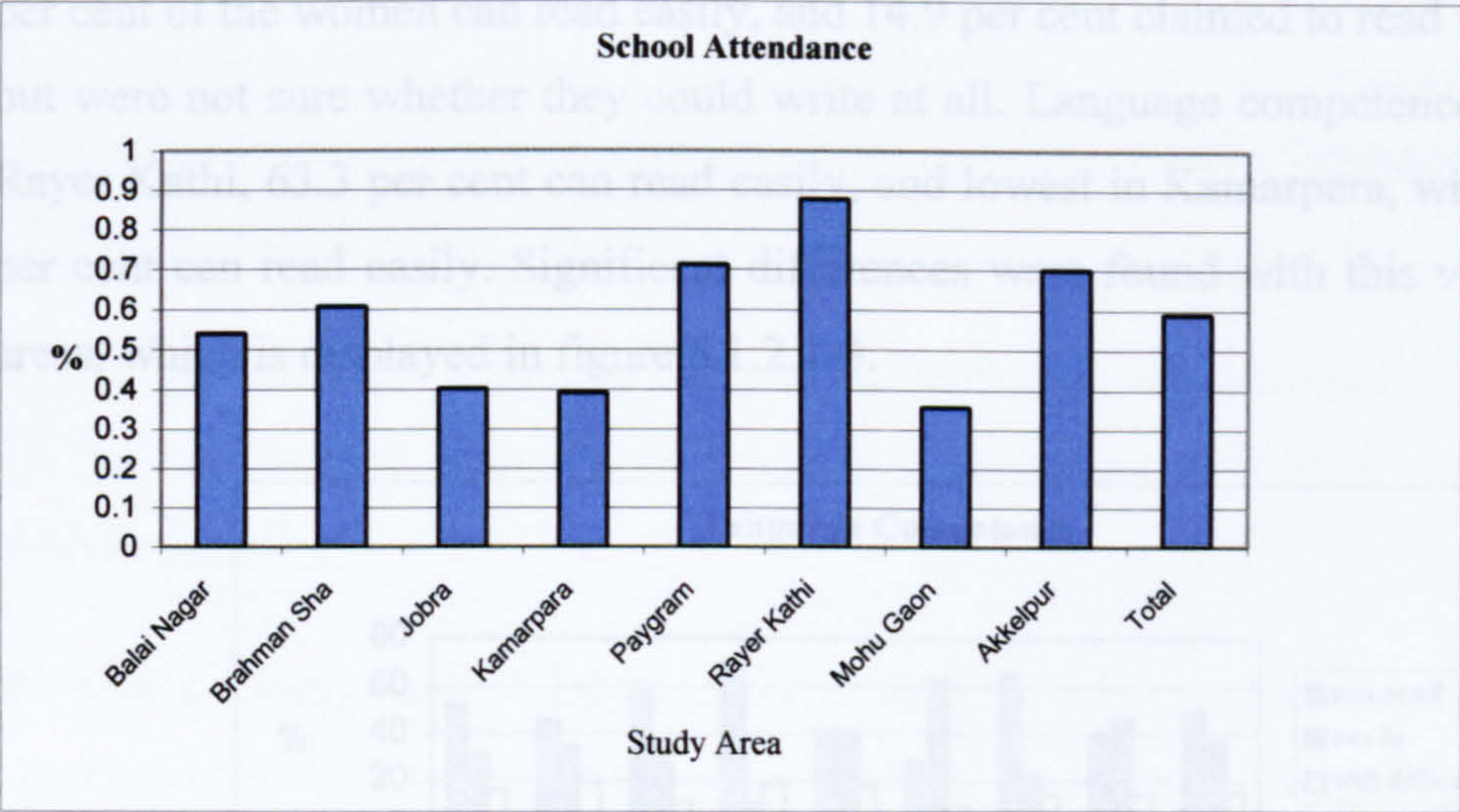


Figure 6.12.1-1: Mean % School Attendance of Women in Surveyed Areas

Level of Education: Among the interviewed women, 41.6 per cent never attended school. 38.9 per cent only attended primary level, 15.8 per cent secondary level, 2.4 per cent college level and 1.4 per cent attended degree level (graduation level). A significant difference in level of education was found in areas, especially for Rayer Kathi, which was found to be 44 per cent higher than Balai Nagar, 70 per cent higher than Jobra, 81 per cent higher than Kamar Para, 39 per cent higher than Paygram and 69 per cent higher than Mohugaon. Significant difference in school level was also observed within other areas, which is illustrated in figure 6.1.2.1-2.

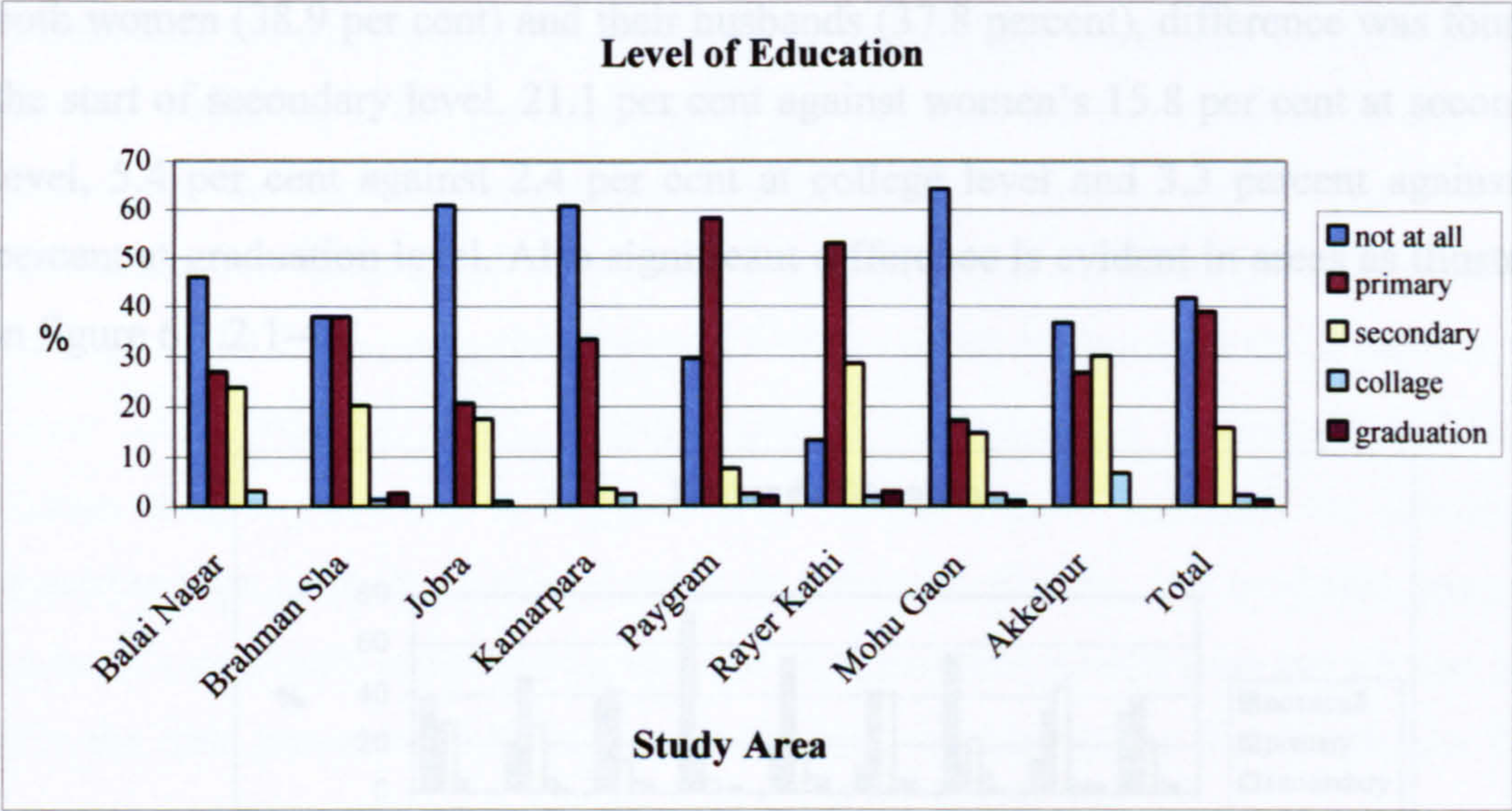


Figure 6.1.2.1-2: Women’s Level of Education in Surveyed Areas

Language Competence: Though 58.4 per cent of the women reported having attended school, 48.9 per cent among them can neither read nor write at all. Only 36.2

per cent of the women can read easily, and 14.9 per cent claimed to read with difficulty but were not sure whether they could write at all. Language competence is highest in Rayer Kathi, 63.3 per cent can read easily, and lowest in Kamarpara, where only 10.7 per cent can read easily. Significant differences were found with this variable within areas, which is displayed in figure 6.1.2.1-3.

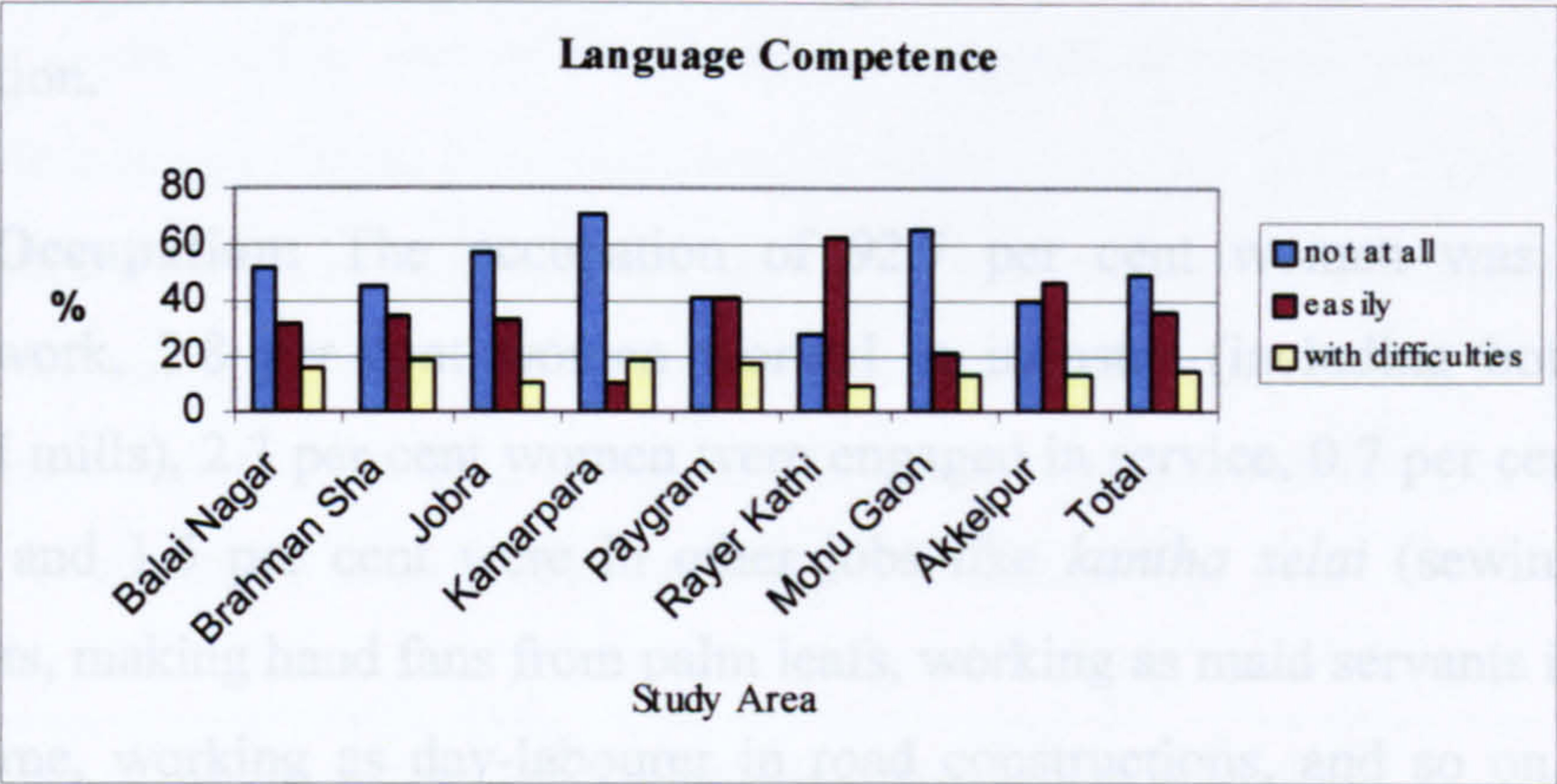


Fig 6.1.2.1-3: Women’s Language Competence in Surveyed Areas

Husband’s Education: 32.2 per cent of the husbands never attended any school, which is 9.4 per cent more enrolment than that of the women. Highest school attendance of husbands was recorded in Rayer Kathi, 89.8 per cent, and lowest in Kamarpara, 27.4 per cent. Though attendance at primary level is almost similar for both women (38.9 per cent) and their husbands (37.8 percent), difference was found at the start of secondary level. 21.1 per cent against women’s 15.8 per cent at secondary level, 5.4 per cent against 2.4 per cent at college level and 3.3 percent against 1.4 percent at graduation level. Also significant difference is evident in areas as illustrated in figure 6.1.2.1-4.

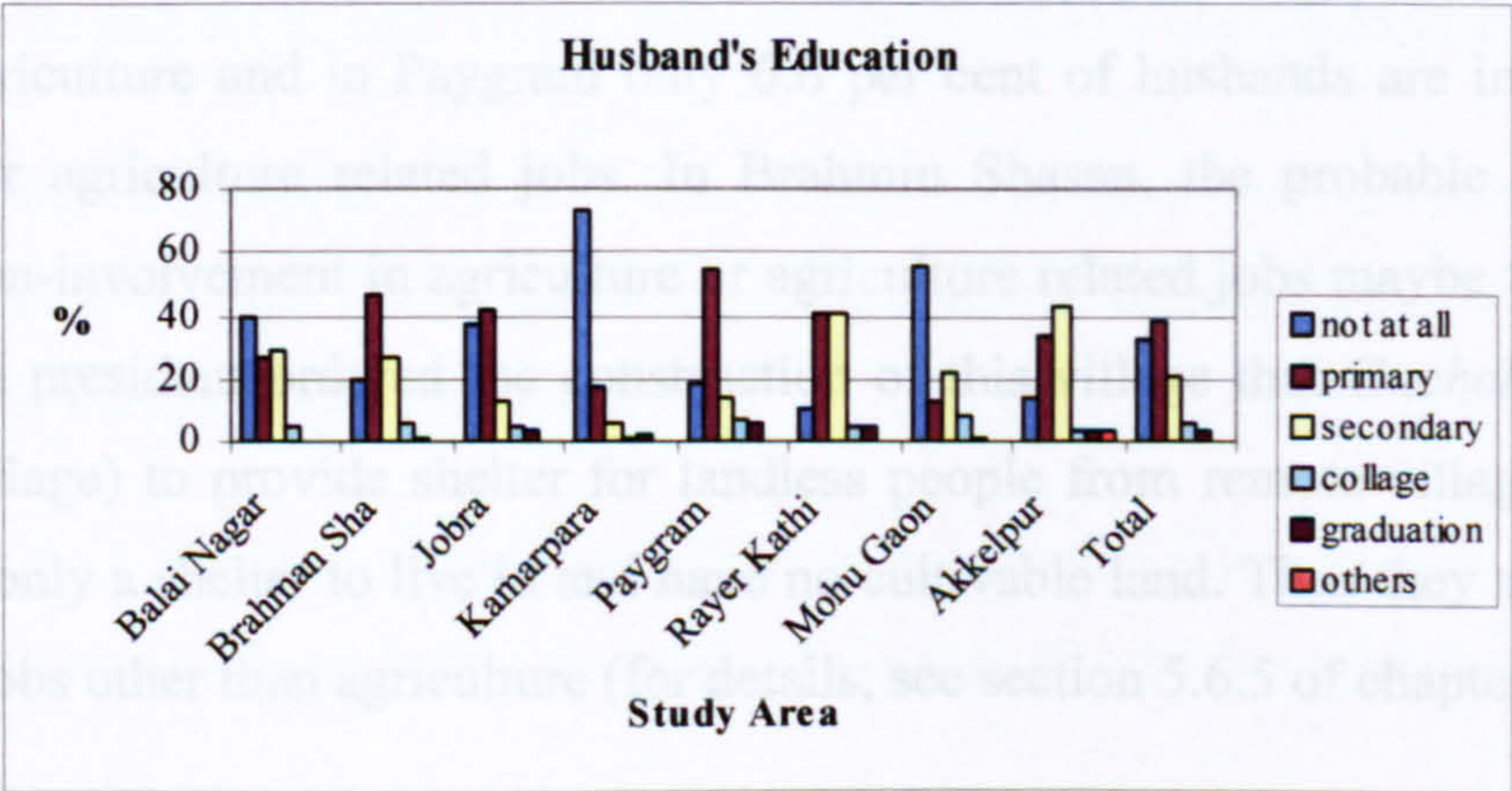


Figure 6.1.2.1-4: Level of Husband’s Education in Surveyed Areas

Using factor analysis, women's schooling, level of schooling, language competence and husband's education were combined into one new variable "education score", (see Chapter 5, section 5.9).

6.1.2.2 Occupation: Women's occupation, husband's occupation, income source of the households, and women's micro-credit organisation affiliations are examined in this sub-section.

Women's Occupation: The occupation of 92.7 per cent women was stated as household work, 2.8 per cent women worked in industry (including both cottage industry and mills), 2.3 per cent women were engaged in service, 0.7 per cent were in agriculture, and 1.5 per cent were in other jobs like *kantha selai* (sewing sheets), weaving mats, making hand fans from palm leaves, working as maid servants in wealthy people's home, working as day-labourer in road constructions, and so on. In Balai Nagar (Dhaka Division), 100 per cent of the respondents were housewives. Otherwise there were no appreciable differences among the areas.

Husband's Occupation: Agriculture is the main occupation of the husbands of the women interviewed. Occupation of 33.8 per cent was agriculture, but most of them worked on other people's land as an agricultural labourer. Other frequently cited occupations were business (24.4 per cent), driving (13 per cent), service (10.2 per cent) and day labouring (10.1 per cent). Only 0.1 per cent are not involved in any work. Husband's occupation type varied significantly between areas. For example, agriculture and agriculture related jobs are the main occupations of husbands in Mohugaon (87.7 per cent), Balai Nagar (77.8 per cent), Kamar Para (51.6 per cent) and Rayer Kathi (40.8 per cent), whereas none of the husband's occupation in Brahmin Shasan is agriculture and in Paygram only 6.6 per cent of husbands are involved in agriculture or agriculture related jobs. In Brahmin Shasan, the probable reason of husband's non-involvement in agriculture or agriculture related jobs maybe that in the 80's the then president ordered the construction of this village that *Guchchha Gram* (clustered village) to provide shelter for landless people from remote villages. These people have only a shelter to live in and have no cultivable land. Thus they are mainly involved in jobs other than agriculture (for details, see section 5.6.5 of chapter 5).

Micro-credit Organisation: 40.1 per cent women had affiliation with micro-credit organisations. Among them, 7.5 per cent were with Grameen Bank, 6.1 per cent with BRAC, 2.1 per cent with BRDB, and 24.4 per cent with other micro-credit organisations including national organisations such as the ASA, Proshika and regional/local organisations. Micro-credit organisation affiliation was found highest in Balai Nagar (Dhaka division), 61.9 per cent and lowest in Jobra (Chittagong division), which is the ‘conservative’ part of Bangladesh. In respect of micro-credit organisation affiliation, there is significant difference among areas as shown in the figure 6.1.2.2-1. From the figure, in Jobra around 90 per cent of the women have no affiliation with any micro-credit organisation, which is 80 per cent in Kamarpara and around 80 per cent in Brahmin Shasan but in Akkelpur, Paygram and Balai Nagar around 60 per cent of the interviewed women have micro-credit organisation affiliation.

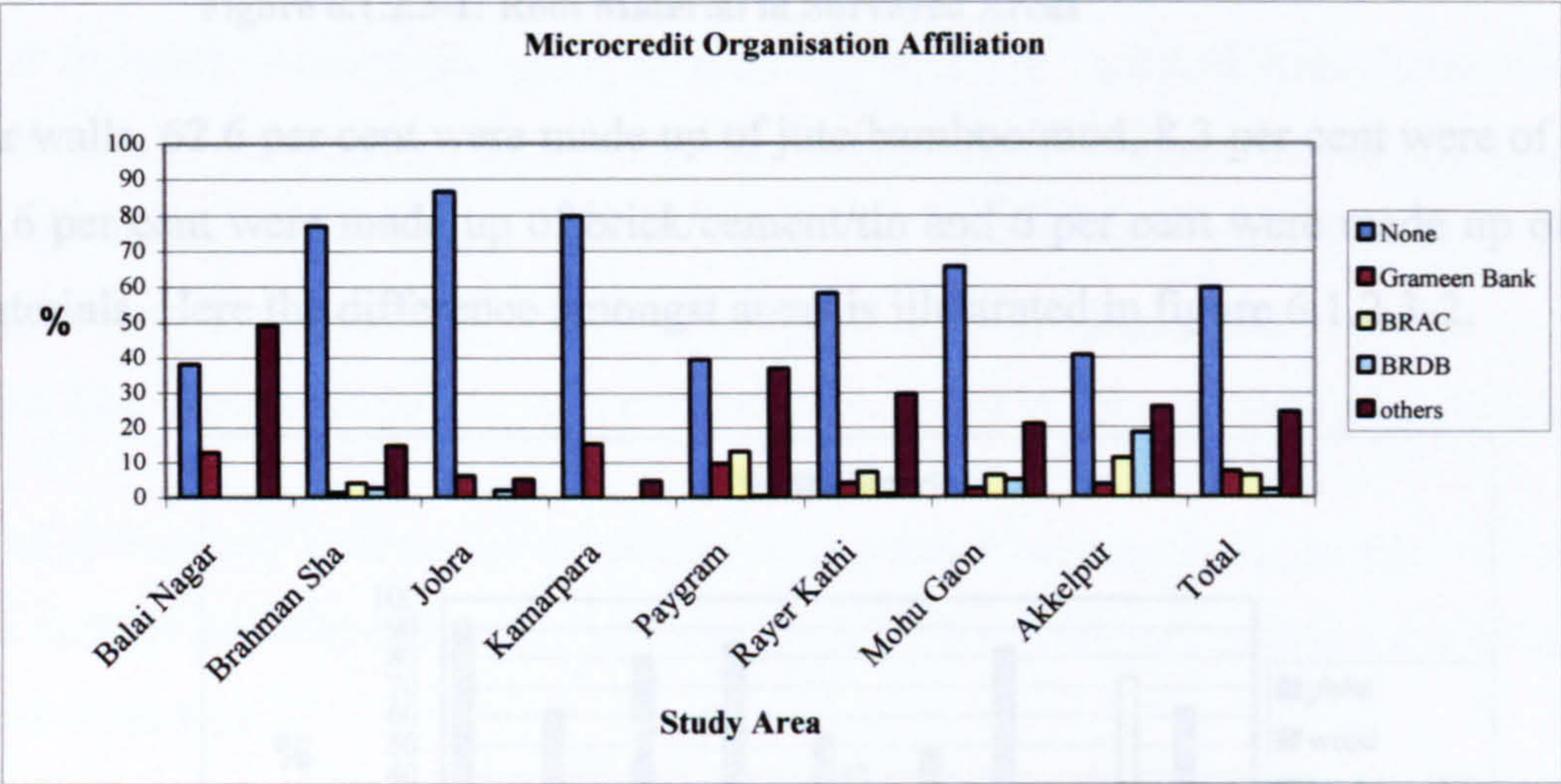


Figure 6.1.2.2-1: Micro-credit Organisation Affiliation of Women in Surveyed Areas

Household Income Source: Husband’s occupation was the key source of household income. Thus household income source mirrors the husband’s occupation category.

6.1.2.3 Housing and Property: In this sub-section house type (own or rented), house material (roof, wall, and floor) and access to land are highlighted. The level of household possessions is also examined.

House Type: 92.4 per cent of the women live in their own house, i.e. their husband’s house. 6.2 per cent live in rented houses and 1.4 per cent in other arrangements.

House Material: 29.6 per cent of the household roofs are made up of bamboo or thatch, 59.1 per cent are of tin, 10.2 per cent are of cement/concrete/tiles. However roof-material differs significantly amongst areas as displayed in figure 6.1.2.3-1.

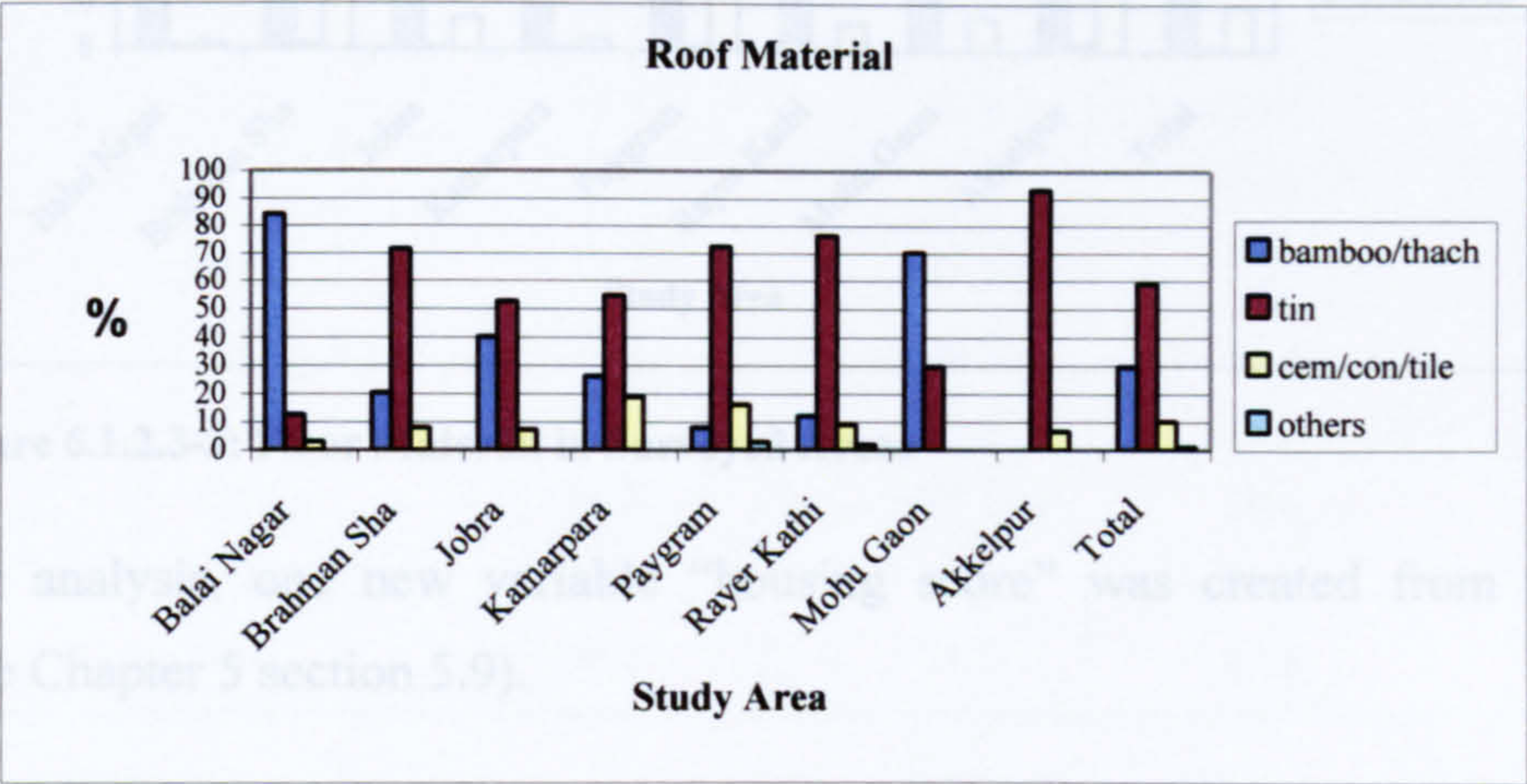


Figure 6.1.2.3-1: Roof Material in Surveyed Areas

For walls, 62.6 per cent were made up of jute/bamboo/mud, 8.3 per cent were of wood, 28.6 per cent were made up of brick/cement/tin and 6 per cent were made up of other materials. Here the difference amongst areas is illustrated in figure 6.1.2.3-2.

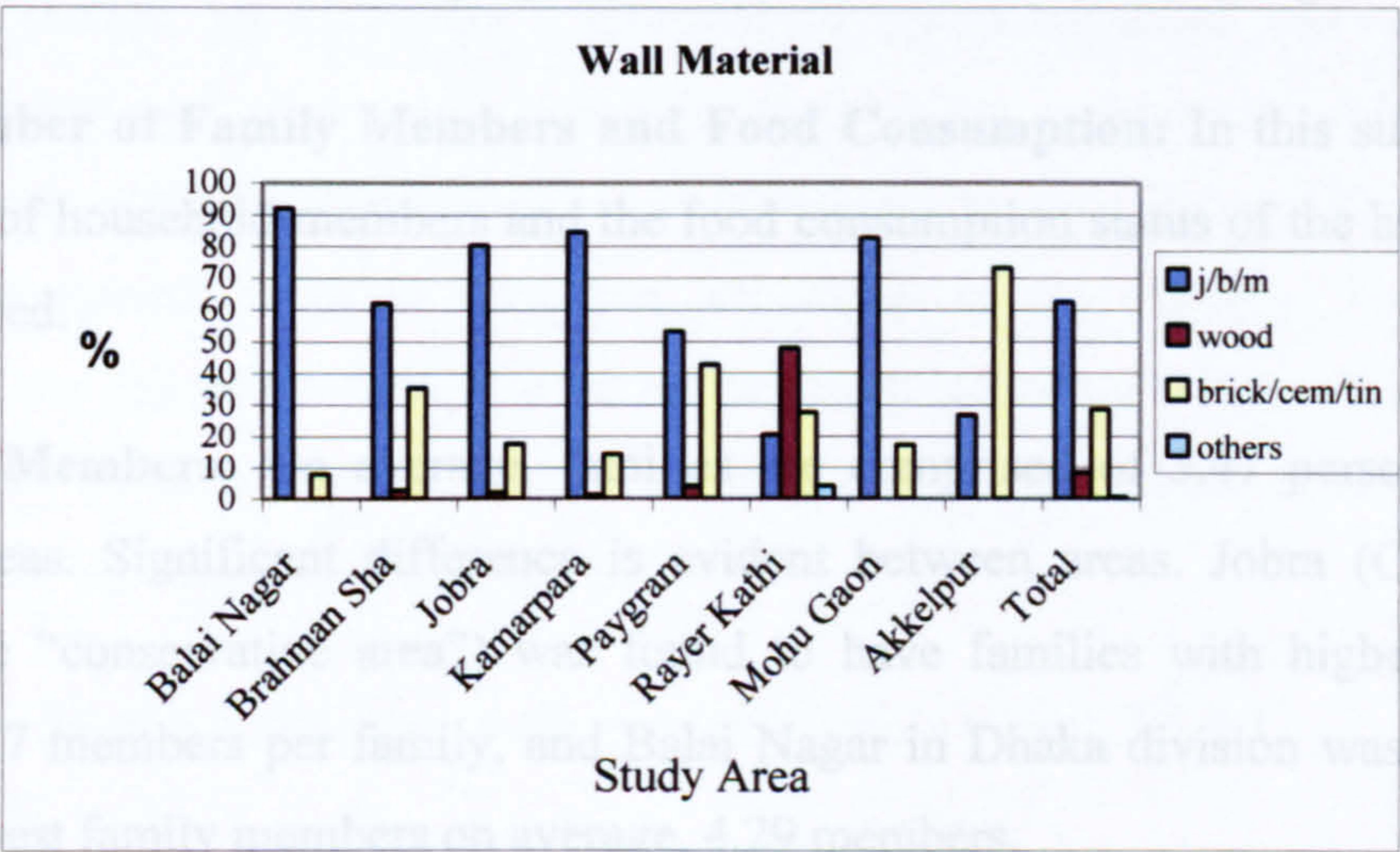


Figure 6.1.2.3-2: Wall Material in Surveyed Areas

For the floor, 78.5 per cent were composed of mud, 1.4 per cent of wood and 20.2 per cent of brick/cement. This composition was significantly different between the areas.

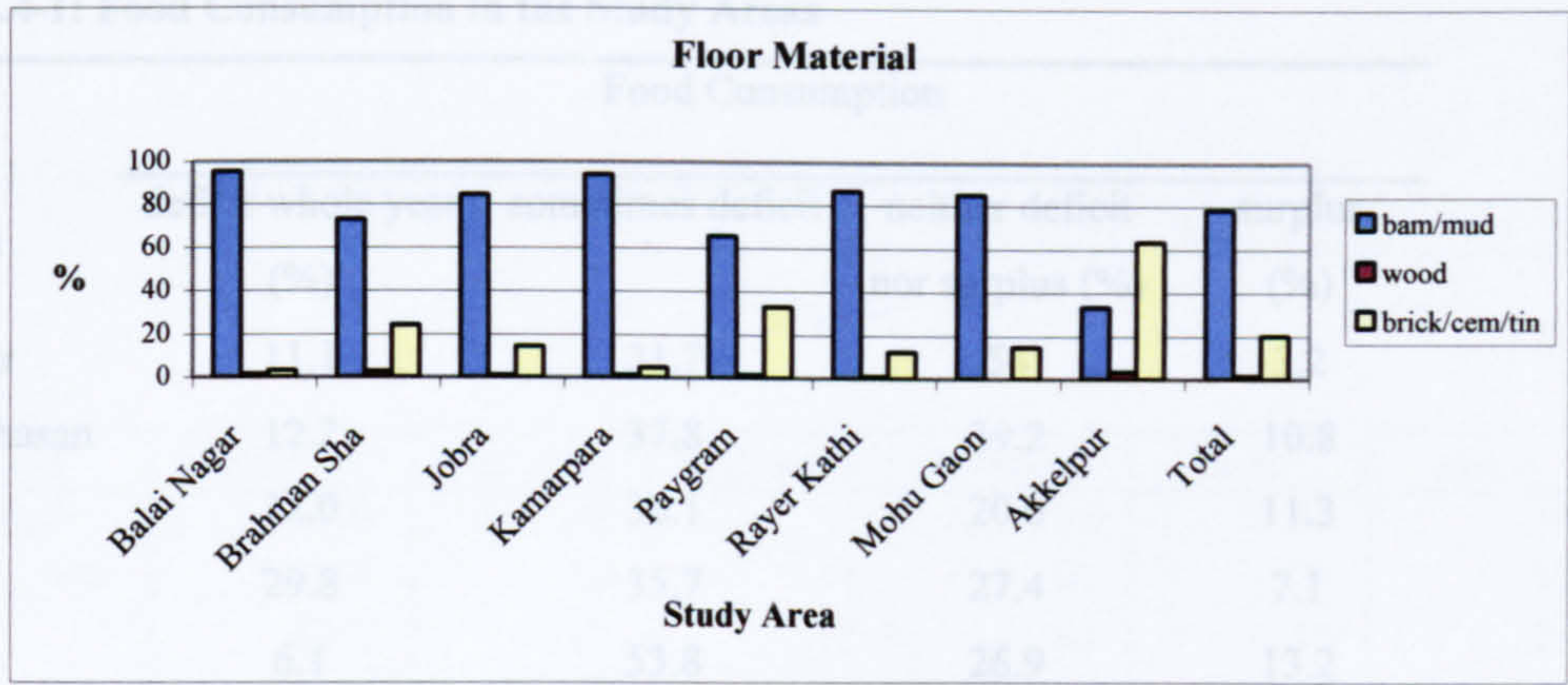


Figure 6.1.2.3-3: Floor Material in Surveyed Areas

Using factor analysis, one new variable “housing score” was created from these variables (see Chapter 5 section 5.9).

Access to Land: 50 per cent of the women interviewed had no access to any type of land property. Among the other 50 per cent, 40.3 per cent had some homestead land and only 9.7 per cent had some cultivable land. This distribution differs amongst areas. However, all the women of Balai Nagar and Mohugaon reported to have no land property. 80.2 per cent of Paygram people had only homestead land, no cultivable land. The highest cultivable land property was found in Jobra (Chittagong division).

6.1.2.4 Number of Family Members and Food Consumption: In this sub-section, the number of household members and the food consumption status of the households were measured.

Household Members: On average, families are comprised of 5.47 persons in the surveyed areas. Significant difference is evident between areas. Jobra (Chittagong division, the “conservative area”) was found to have families with highest family members, 6.7 members per family, and Balai Nagar in Dhaka division was found to have the lowest family members on average, 4.29 members.

Food Consumption: On average 16.7 per cent women reported a food deficit for the whole year. 39.4 per cent reported a deficit of some times of the year, 31.1 per cent said neither deficit nor surplus and only 12.8 per cent reported being in surplus food consumption. This distribution differs between areas as is displayed in table 6.1.2.4-1.

Table 6.12.4-1: Food Consumption in the Study Areas

Study Area	Food Consumption			
	deficit whole year (%)	sometimes deficit	neither deficit nor surplus (%)	surplus (%)
Balai Nagar	11.1	31.7	54	3.2
Brahmin Shasan	12.2	37.8	39.2	10.8
Jobra	32.0	36.1	20.6	11.3
Kamarpara	29.8	35.7	27.4	7.1
Paygram	6.1	53.8	26.9	13.2
Rayer Kathi	25.5	32.7	28.6	13.3
Mohu Gaon	3.7	34.6	32.1	29.6
Akkelpur	30.0	20.0	40.0	10.0
Total	16.7	39.4	31.1	12.8

6.1.2.5 Household Possession: Throughout the surveyed areas on average 39.3 per cent of the households possess electricity, 26.2 per cent possess TV, radio 33.1 per cent, watch 41.7 per cent, furniture 88 per cent, bicycle 27.3 per cent, refrigerator 1.5 per cent, motorcycle 3.6 per cent, telephone 1.5 per cent, sewing machine 1.9 per cent, car 0.8 per cent, and others 0.4 per cent.

As stated in section 5.9 of chapter 5 a household equipment score was constructed from the data collected of the main possessions held. Cars, motorcycles, refrigerators, telephones and sewing machines were rarely stated and so were ignored. However the household equipment score is very low, especially in the villages. The highest equipment score (3) was recorded in Akkelpur (a small town). Within village areas, Mohugaon (the Hindu village) scored the highest, 2.4. The lowest score was observed in Kamarpara (Rajshahi division), only 0.71.

The area wise household equipment score is presented in table 6.1.2.5-1.

Table 6.1.2.5-1: Mean Household Equipment Score in Surveyed Areas

Report							
Mean							
Study Area	EQUIP SC	electricity	television	furniture	radio	watch	bicycle
Balai Nagar	1.6190	.30	.16	.94	.33	.35	.48
Brahman Sha	2.0135	.68	.41	.92	.26	.53	.15
Jobra	.8646	.31	.12	.80	.15	.23	.05
Kamarpara	.7108	.08	.02	.93	.18	.19	.23
Paygram	1.9949	.46	.34	.87	.41	.48	.30
Rayer Kathi	1.4845	.23	.16	.93	.35	.49	.25
Mohu Gaon	2.3951	.52	.43	.94	.49	.43	.52
Akkelpur	3.0000	.77	.60	.53	.50	.83	.23
Total	1.6819	.39	.26	.88	.33	.42	.27

Among the equipments, the most frequently stated equipment is furniture. It should however, be noted that, as the term “furniture” was not well defined in the questionnaire, the concept of furniture varied hugely. On average, the modern equipment score was 1.68 in a 6-point scale.

6.1.2.6 Source of Information: According to the National Media Survey 2002, radio exposure is 30.4 per cent, of which male is 41 per cent and female is 22 per cent. Radio listening increased from 36 per cent to 39 per cent in 1998 and then declined to 30.4 per cent in 2002. On the contrary, ownership of TV increased from 8 per cent in 1995 to 14 per cent in 1998 and then to 25 per cent in 2002, and TV viewing increased from 31 per cent in 1995 to about 61 per cent in 2002. More than two-thirds (69.7 per cent) of these viewers reported viewing TV on Friday (the weekly holiday) between 8-10 pm (the time of weekly drama) and a high proportion on Friday between 3-6 pm (time of screening of a Bangla feature film). Exposure to print media is very low. About 26 per cent read a newspaper and 7.9 per cent magazines. Male and female readership are 40 per cent and 14 per cent respectively, and urban readership is 40 per cent whereas rural is only 18.7 per cent.

To ascertain the source of information with the frequency of exposure to those sources, data were collected along with a frequency measure, i.e. daily = 3, weekly = 2, monthly = 1, and never = 0. According to the summary report in table 6.1.2.6-1 below, the most important and regular source of information for the women interviewed is relatives and friends, i.e. informal communication. Especially in villages

women’s source of information is mostly informal communication (“mainser mukhe mukhe”, i.e. through other people’s mouth). Whereas mass media, i.e. radio, television, newspaper-magazines, billboards, posters are important sources of information in the town area. Among mass media, radio is the most important source of information, then television.

Table 6.1.2.6-1: Mean Source of General Information in Surveyed Areas

Report							
Mean							
Study Area	radio	television	newspaper/ magazine	bill boards	posters	relatives	friends
Balai Nagar	1.33	.90	.10	.00	.00	2.43	1.71
Brahman Sha	.73	1.57	.38	.00	.00	1.65	2.15
Jobra	.74	.73	.14	.00	.03	2.23	1.74
Kamarpara	.39	.10	.05	.00	.00	2.55	1.80
Paygram	.77	1.24	.19	.00	.01	1.80	1.24
Rayer Kathi	1.65	.72	.22	.00	.00	2.22	2.60
Mohu Gaon	1.25	1.56	.04	.00	.00	2.67	2.05
Akkelpur	2.50	.24	.23	.50	2.80	2.80	.03
Total	1.01	.97	.17	.02	.12	2.18	1.73

Overall, newspapers/magazines, billboards, posters play a very small role as sources of information.

6.1.2.7 Family Members Live Abroad: The number of family members living abroad, the place of their living, frequency of contact with these members and the financial help gained from them are reviewed in this sub-section.

Number of Family Members Live Abroad: 90.3 per cent of women reported that none of their family members were living abroad. In Balai Nagar and Mohugaon no one reported that they had any family member who was living abroad. The only difference was found in Jobra (Chittagong division), where 29.9 per cent of the families had at least one family member living abroad and 9.3 per cent reported to have two persons who were living abroad. Among these people living abroad, irrespective of study areas, 6.8 per cent live in Middle Eastern countries, 0.4 per cent in Malaysia, 0.1 per cent in Canada, 0.3 per cent in Europe and 2.2 per cent in others places such as India. Among the 39.2 per cent people in Jobra who reported of their family members living abroad, 38.1 per cent lived in Middle Eastern countries.

Contact with Family Members Living Abroad: 91.1 per cent had no contact with their family members who lived abroad. Three per cent had yearly contact, 2.5 per cent had monthly contact, 2.5 per cent reported to have weekly contact and only 0.8 per cent reported of daily contact with family members living abroad.

Regarding financial help, 94.3 per cent reported that they never had any help from these members living abroad. 2.1 per cent got some help, 0.7 per cent got a little and only 2.9 per cent got regular financial help from family members who lived abroad.

6.1.2.8 Women's Autonomy: Two of the components of the female autonomy score were examined: household decision-making power and travelling status.

Decision Making Status: 31 per cent of interviewed women reported having no decision-making power regarding household matters. 8.6 per cent women reported that they could make decisions occasionally, 10.9 per cent could make decisions often and 32.2 per cent women reported making decisions in household matters always. Decision-making power was observed highest in Balai Nagar (Dhaka division), 76.2 per cent, followed by Mohugaon (Hindu village). Among the women who could never make any household decision, these were found mostly in Brahmin Shasan (Sylhet division), 55.4 per cent; then Kamar Para (Rajshahi division) 46.4 per cent, and Jobra (Chittagong division) 44.3 per cent. All these three areas are considered as more “conservative” areas of the country, (a detailed discussion is in chapter 5).

Travel Status: 64 per cent of the women cannot travel unaccompanied in the surveyed areas. Travelling unaccompanied rate was highest in Mohugaon (Hindu Village), 86.4 per cent, followed by Paygram 85.8 per cent, and lowest in Brahmin Shasan (Sylhet division), 28.4 per cent. Unaccompanied travelling status was also high in Balai Nagar (Dhaka Division) and Akkelpur (Middle town mahallah), 74.6 per cent and 73.3 per cent respectively. Presented in table 6.1.2.8-1 is the area wise difference in travelling status.

Table 6.1.2.8-1: Travel Status of Women in Surveyed Areas

Study Area	Travelling Status	
	Yes (%)	No (%)
Balai Nagar	25.4	74.6
Brahmin Shasan	71.6	28.4
Jobra	53.6	46.4
Kamarpara	60.7	39.3
Paygram	14.2	85.8
Rayer Kathi	42.9	57.1
Mohu Gaon	13.6	86.4
Akkelpur	26.7	73.3
Total	36.0%	64.0%

A new variable “female autonomy score” is created using factor analysis of these two variables as is discussed in section 5.9 of Chapter 5.

6.1.3 Reproductive Variables

Number of children, sex of first child born and demand for children, status of children death, delivery assistance, person deciding delivery place and assistance, place of giving birth are the variables that were measured in this sub-section.

Number of Children: From the table 6.1.3-1 below, one can observe that the mean number of children was 2.64 of which 1.37 were male and 1.27 were female. The average number of children is highest in Jobra, 3.64 and the lowest is in Mohugaon, 2.19.

Table 6.1.3-1: Mean Number of Children in Surveyed Areas

Mean Study Area	Number of Children	Number of Male Children	Number of Female Children
Balai Nagar	2.2	1.19	1.03
Brahmin Shasan	2.53	1.49	1.04
Jobra	3.65	1.95	1.70
Kamar Para	2.70	1.32	1.38
Paygram	2.59	1.35	1.24
Rayer Kathi	2.53	1.23	1.30
Mohugaon	2.20	1.11	1.09
Akkelpur	2.33	1.10	1.23
Total	2.64	1.37	1.27

Sex of First Child and Demand for Children: According to the table 6.1.3-2, on average, the mean number of additional children sought is 0.46 (male 0.33 + female

0.13) and thus the demand for male child is around 2.54 times more than that for a female child. This difference in preference is highest in Rayer Kathi (Barisal Division) 3.9, second highest is in Paygram 3.6 (though demand for children is lower there) and then in Jobra (Chittagong division) 3.5. The difference in sex preference is lowest in Balai Nagar (Dhaka division) and then in Akkelpur (the small town) as are detailed in table 6.1.3-2.

Using correlation measures between the variables sex of first child born, and demand for male and female children, a significant association was found between sex of first child born and demand for more children. The demand for female child was found lower than that for male child if the first child born was a female.

Table 6.1.3-2: Mean Demand for Male and Female Children

Study Area	Demand for Male Child (mean)	Demand for Female Child (mean)
Balai Nagar	0.24	0.17
Brahmin Shasan	0.51	0.28
Jobra	0.49	0.14
Kamarpara	0.36	0.14
Paygram	0.18	0.05
Rayer Kathi	0.39	0.10
Mohu Gaon	0.30	0.15
Akkelpur	0.30	0.17
Total	0.33	0.13

Child Death: There is a small difference between the experience of male and female child death, mean death of female child was 0.16 whereas mean death of male child was 0.13. The male-female profile of child death is exhibited in table 6.1.3-3.

Table 6.1.3-3: Mean of Male and Female Children Death

Mean Study Area	Female Child Died	Male Child Died
Balai Nagar	0.06	0.06
Brahmin Shasan	0.24	0.24
Jobra	0.27	0.20
Kamarpara	0.29	0.23
Paygram	0.11	0.07
Rayer Kathi	0.13	0.14
Mohu Gaon	0.04	0.01
Akkelpur	0.17	0.27
Total	0.16	0.13

Delivery Assistance: From the table 6.1.3-4 below, women get assistance at delivery mainly from unqualified professionals, which is almost 14 times more than that of qualified health professionals. A considerable portion of women never got any

assistance at the time of delivery and the proportion of women who never had any delivery assistance was highest in Mohugaon (the Hindu village).

Table 6.1.3-4: Mean Delivery Assistance in Surveyed Areas

Mean Study Area	Health professionals	Relatives	Unqualified professionals	None
Balai Nagar	.03	.03	1.37	.60
Brahmin Shasan	.47	.32	2.41	.11
Jobra	.33	.04	3.38	.05
Kamarpara	.05	.19	2.57	.19
Paygram	.10	.02	3.44	.08
Rayer Kathi	.26	.04	3.20	.04
Mohugaon	.05	.00	.02	.95
Akkelpur	.23	.00	.40	.80
Total	.18	.07	2.51	.26

From the table 6.1.3-5, 88.8 per cent of the respondents never had any assistance from any qualified health professional, only 4.8 per cent women got assistance from qualified doctors, 6.1 per cent from any midwife or nurse, and 0.3 per cent from Family Welfare Visitors (FWVs).

Table 6.1.3-5: Assistance from Health Professionals

% within study areas				
Study Areas	Health Professionals			
	None %	Qualified doctors %	Nurse/midwives %	Family welfare visitors %
Balai Nagar	98.4	-	1.6	
Brahmin Shasan	73.0	6.8	20.3	
Jobra	83.5	2.1	12.4	2.1
Kamarpara	96.4	2.4	1.2	
Paygram	91.9	6.1	2.0	
Rayer Kathi	82.7	9.2	8.2	
Mohu Gaon	96.3	2.5	1.2	
Akkelpur	83.3	10.0	6.7	
Total	88.8%	4.8%	6.1%	0.3%

Among the unqualified professionals more than 96 per cent are *dai* (traditional birth attendants, normally elderly women who have experience of attending deliveries without having any formal training or education on this matter). Regarding assistance from relatives, parents assisted in 4.7 per cent of cases, in-laws in 1.1 per cent of cases and brothers and sisters in only 0.1 per cent of cases. Thus, traditional birth attendants (*dai-s*) were cited as the main delivery assistants.

Reasons for No Professional Delivery Assistance: The main reported reason for not having any assistance by any health professional was “the service was not needed”. In 63.65 per cent of cases, women answered that they were not attended by any health professional because it was not required due to the grace of Allah (*Allah’r rahmate darker hoy naai*). Other reasons are ‘cost’ (29.7 per cent), ‘service not known’ (18.3 per cent), religious (11.9 per cent) and lack of privacy (11.8 per cent).

Person Deciding Delivery Place and Assistance: In 63.8 per cent of cases husbands decided the delivery place and assistance for the women. Other than husbands, the second most important person in this decision-making was their mother-in-law, 17.1 per cent. Also father-in-law decided in 3.5 per cent of cases. Thus husbands and in-laws decided in total 84.4 per cent of cases. The women’s decision in selecting delivery place and assistance was cited only in 6.9 per cent of cases.

Place of Giving Birth: Home is the main place where the women give birth in rural Bangladesh. The next was the public sector, i.e. government hospital and thana health complex. Women have very little or almost no access to NGO, private sector and other places for giving birth. As can be observed from table 6.1.3-6, home is 20 times more used delivery place than public sector (government hospital, thana health complex, maternal and child welfare centre), 60 times more used than NGO sector, 34 times more used than private sector and 60 times more than other places.

Table 6.1.3-6: Mean Delivery Place

Mean	home	Public sector	NGO-sector	Private sector	others
Study Area					
Balai Nagar	2.08	.02	.00	.00	.00
Brahmin Shasan	1.93	.51	.01	.11	.06
Jobra	3.25	.32	.01	.10	.00
Kamarpara	2.64	.01	.00	.01	.00
Paygram	2.51	.04	.05	.07	.00
Rayer Kathi	2.40	.05	.15	.10	.00
Mohugaon	2.09	.04	.06	.06	.00
Akkelpur	.83	.10	.00	.00	.63
Total	2.40	.12	.04	.07	.04

6.1.4 Family Planning Variables

On average, 69.3 per cent of the interviewed women had practised at least one family planning method. In the small town Akkelpur, this practice rate is 100 per cent. Among the village areas, the highest contraceptive prevalence rate is observed in Paygram (Khulna Division), 85.3 per cent, next is Mohugaon (the Hindu village), 72.8 per cent and the lowest is in Jobra (Chittagong division), 36.1 per cent. The prevalence of family planning (FP) use is detailed in table 6.1.4-1.

Table 6.1.4-1: FP Practice in Surveyed Areas

% Within Study Area	Family Planning Method(s) Practice	
	No	Yes
Study Area		
Balai Nagar	33.3%	66.7%
Brahmin Shasan	33.8%	66.2%
Jobra	63.9%	36.1%
Kamarpara	38.1%	61.9%
Paygram	14.7%	85.3%
Rayer Kathi	31.6%	68.4%
Mohu Gaon	27.2%	72.8%
Akkelpur	0.0%	100%
Total	30.7%	69.3%

The duration of practicing contraceptive method was 2.94 years on average. The longest duration was in Akkelpur, 6.55 years and shortest was in Jobra, 1.3 years.

FP Methods Used: The most popular method is pill with 66 per cent of the respondents using this method. The second most used method was injectables mentioned by 17 per cent of the respondents, and a mix of pill and injectable (method mix) was cited by 5.3 per cent of the women. Female sterilisation was the method used by 5.17 per cent of the women while male sterilisation was cited by only 0.71 per cent. There was significant regional variation in that the Pill, for example, was most popular in Paygram while injectables were used most in Kamarpara 29.8 per cent, female sterilisation was highest in Balai Nagar (Dhaka division), 15.9 per cent and method mix was cited most in Akkelpur (the small town). From figure 6.1.4-1 it is clear that use of some of the methods is very low compared to pills and injectables.

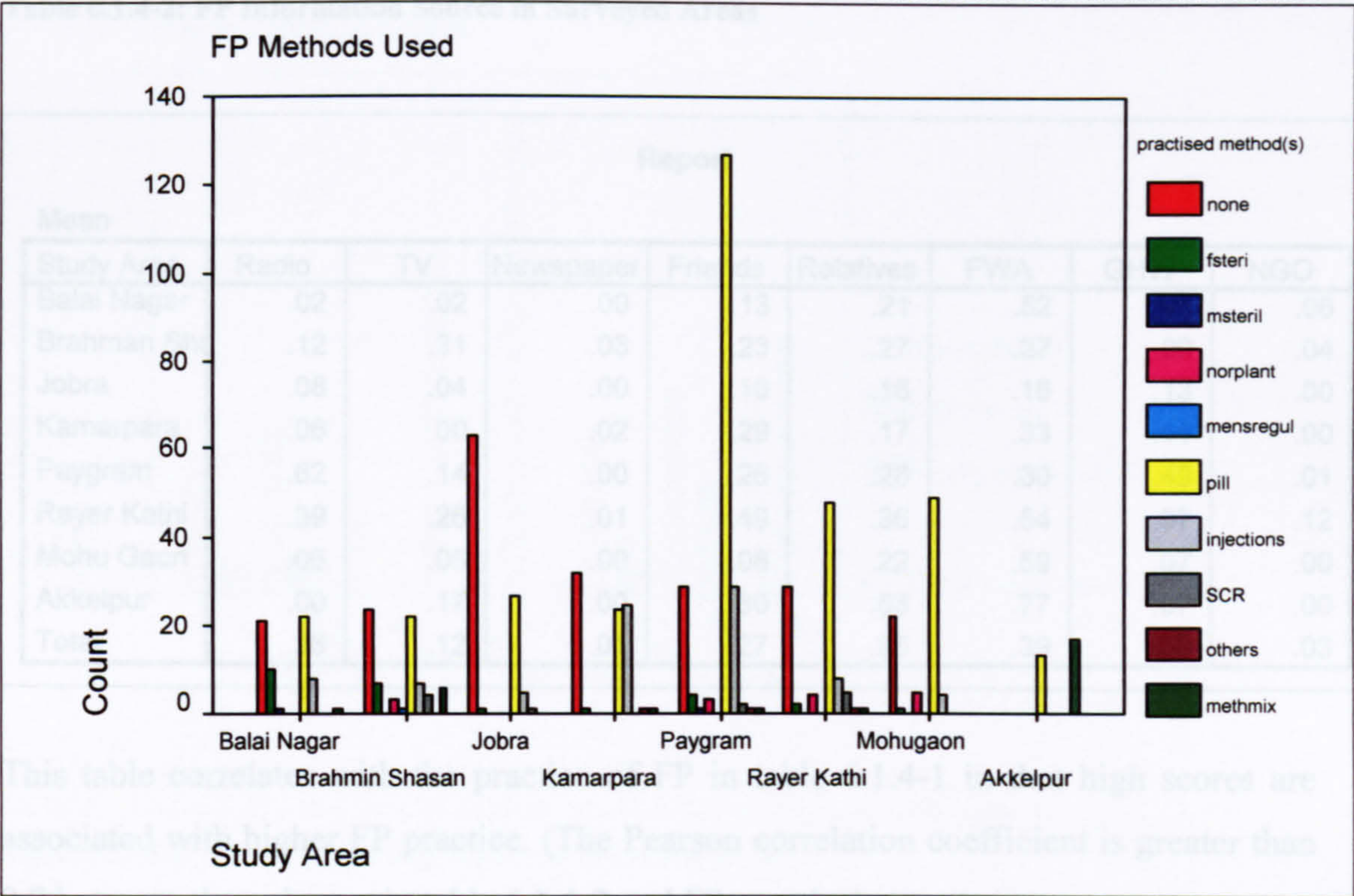


Figure 6.1.4-1: FP Methods Practised in Surveyed Areas

Family Planning Information Source: FP information source was almost like the source of general information. From table 6.1.4-2, Government Family Welfare Assistants (FWA) appears to be the most important source of family planning information. Then friends, relatives, Government Health Workers (GHW) were also cited as vital sources of information. Thus interpersonal communication, i.e. the combination of communication with FWAs, friends, relatives and health workers, was the dominant source of family planning information. Among mass media, radio was the most important source of family planning information, and then television. Newspapers and magazines have not much appeal in this regards, reason may be the low literacy rate. No one mentioned billboard and cinema hall as the sources of FP information. Only 0.01 per cent mentioned newspaper and 0.01 per cent mentioned village theatre as the source of FP information, so these were removed when extracting the mean FP information source. Interpersonal sources were found to be the main source of FP information among the women interviewed.

Table 6.1.4-2: FP Information Source in Surveyed Areas

Report								
Mean								
Study Area	Radio	TV	Newspaper	Friends	Relatives	FWA	GHW	NGO
Balai Nagar	.02	.02	.00	.13	.21	.52	.06	.06
Brahman Sha	.12	.31	.03	.23	.27	.27	.09	.04
Jobra	.08	.04	.00	.16	.16	.16	.13	.00
Kamarpara	.06	.00	.02	.29	.17	.33	.11	.00
Paygram	.62	.14	.00	.26	.26	.30	.49	.01
Rayer Kathi	.39	.26	.01	.49	.36	.54	.07	.12
Mohu Gaon	.06	.06	.00	.06	.22	.59	.07	.00
Akkelpur	.00	.17	.00	.80	.53	.77	.07	.00
Total	.26	.12	.01	.27	.25	.39	.20	.03

This table correlates with the practice of FP in table 6.1.4-1 in that high scores are associated with higher FP practice. (The Pearson correlation coefficient is greater than 0.7 between the columns in table 6.1.4-2 and FP practice).

Place of Collecting Devices: Public sector (comprised of government hospital/medical centres, family welfare centre, thana health complex, satellite clinics, Maternal Child Welfare Centre, FWA) was the main source of collecting devices. As a source of devices, the public sector was 6.5 times more used than the private medical sector, 14.5 times more than private other sectors and 29 times more than the NGO sectors. Within the public sector, FWA was the most important source (57.62 per cent), then hospitals and medical centres (19 per cent) and then Family Welfare Centres (15.66 per cent). The Thana Health Complexes, Maternal Child Welfare Centres and Satellite Clinics only amounted to a total of 3.7 per cent. The sources of collecting family planning devices are displayed area-wise in figure 6.1.4-2.

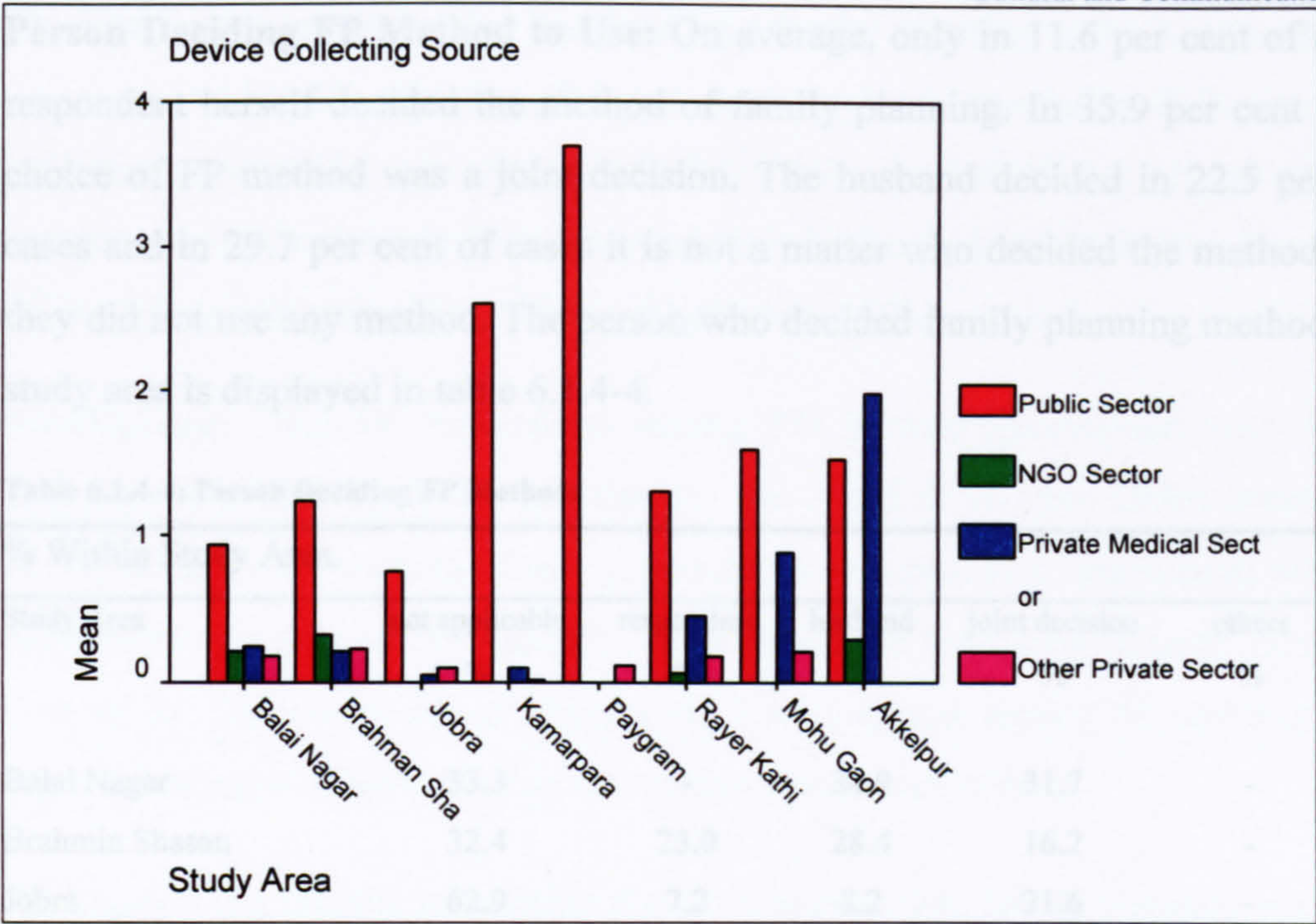


Figure 6.1.4-2: Device Collecting Source in Surveyed Areas

Methods Used by Husband: Only 3.2 per cent of husbands used a contraceptive method. In Akkelpur, the rate of contraceptives used by husbands was the highest, 10 per cent and the lowest use was in Mohugaon, zero. Condom was the most popular male contraceptive method, but only 2.6 per cent husbands used this method. Male sterilisation rate was 0.4 per cent and traditional methods were cited at only 0.1 per cent. The detail is presented in table 6.1.4-3.

Table 6.1.4-3: Husbands Contraceptive Methods Used

% Within Study		Methods Used by Husbands		
Study Area	None	Condom	Male sterilisation %	Traditional
	%	%		%
Balai Nagar	98.4	-	1.6	
Brahmin Shasan	91.9	4.1	2.7	1.4
Jobra	96.9	3.1		
Kamarpara	97.6	2.4		
Paygram	97.5	2.5		
Rayer Kathi	96.6	3.1		
Mohugaon	100			
Akkelpur	90.0	10.0		
Total	96.8%	2.6%	0.4%	0.1%

Person Deciding FP Method to Use: On average, only in 11.6 per cent of cases the respondent herself decided the method of family planning. In 35.9 per cent of cases, choice of FP method was a joint decision. The husband decided in 22.5 per cent of cases and in 29.7 per cent of cases it is not a matter who decided the method because they did not use any method. The person who decided family planning method type by study area is displayed in table 6.1.4-4.

Table 6.1.4-4: Person Deciding FP Methods

% Within Study Area					
Study Area	not applicable	respondent	husband	joint decision	others
	%	%	%	%	%
Balai Nagar	33.3	-	34.9	31.7	-
Brahmin Shasan	32.4	23.0	28.4	16.2	-
Jobra	62.9	7.2	8.2	21.6	-
Kamarpara	38.1	21.4	13.1	26.2	1.2
Paygram	14.2	14.7	24.9	45.7	0.5
Rayer Kathi	28.6	12.2	28.6	30.6	-
Mohu Gaon	25.9	1.2	28.4	44.4	-
Akkelpur	-	-	3.3	96.7	-
Total	29.7%	11.6%	22.5%	35.9%	0.3%

Reasons for FP Method(s) Practice and Limiting Family Size: Among the women who are practising family planning devices, 76.67 per cent do so to limit family size, 20 per cent to delay next birth, 2.7 per cent for health reason and 0.85 per cent for some other reasons. The reason for limiting family size appears to be mainly economic. Among the women who are practising family planning with the aim of limiting family size, 72.89 per cent want to limit family size for purely economic reason, 25.13 per cent to avoid probable hazards from many children (also perhaps related with economic cause), and 1.97 per cent for other reasons like health reasons, philosophical reasons, social commitment and so on. Thus economic reason is the main factor for deciding to limit family size.

Reason for Not Using FP: The desire for more children is the main reason for not practising family planning method. On average 10.2 per cent of women wanted more children and hence they did not use any family planning method. Among the women who did not practise any family planning method, 34 per cent wanted more children.

The next important causes for not practising family planning were: health reasons (23 per cent), husband's objection (9.3 per cent), lack of knowledge (8.7 per cent) and religious reasons (5.7 per cent). A further 16.0 per cent of the women gave other reasons, the main one of which was that their husbands lived overseas, (especially in Jobra, where this reason was cited by 52 per cent of the women).

Sterilisation: Only 16 respondents among 724 women interviewed were sterilised, (2.2 per cent). The reason for sterilisation was asked in an open-ended question. Half of the women who were sterilised, perceived sterilisation as a "permanent solution", 4 respondents mentioned "ill health", 2 mentioned for "avoiding hazards" and 2 other pointed to "economic cause". However, 5 respondents among 16 sterilised women regretted being sterilised and this was mainly due to side effects.

FP Expert: Irrespective of whether the respondents were family planning users or not, family planning field workers were the perceived experts in family planning issues amongst the women interviewed. 66.4 per cent of women thought FWAs (Family Welfare Assistants)/FW were the experts in this issue, 8.3 per cent mentioned GHW (Government Health Workers), 1.4 per cent mentioned *dai*-s, 0.8 per cent mentioned NGO family planning workers, and 4.8 per cent mentioned "others" (including neighbours, opinion leaders, friends, and relatives). However, 18.2 per cent women among non-users stated that they did not know who was the expert regarding family planning. Altogether 75.5 per cent thought FWA/FW/GHW/NGO FPW (who went to homes for distributing family planning information and supplied family planning devices) were the experts in family planning issues. This view was similar across all the study areas.

Although it was found that women who used the pill collected them monthly and the women who used injections collected them 3-monthly, women had more frequent access to family planning field workers. The reason may be that these field workers are either from the same village or from the neighbouring villages so they meet not only formally but also informally and almost always they are within reach and they meet as neighbours. It was found that 17.7 per cent of the respondents had daily exposure to these "experts", 14 per cent had weekly exposure, 28.9 per cent mentioned of monthly exposure and 6.4 per cent stated 3-monthly. 31.6 per cent stated that they never discussed with these "experts" though only 18.2 per cent reported that they had no idea

who were the family planning experts. Thus 13.4 per cent of the respondents who knew about the FP experts in their area had never discussed family planning with these people.

Most Influencing Factors in FP Decision: To measure who or what factor(s) had the most influence in the FP decision along with the degree of influence, data were collected on a “0-10” scale, where 10 is most intense. Sixteen fixed factors with one open factor “others” were provided in the questionnaire.

Table 6.1.4-5: Means of Most Influencing Factors in FP Decision

From the table 6.1.4-5, the most influencing factor is found to be the FWA followed by

Report																
Mean	Study Area	husband	opinion-leader	parents	TV ad	in-laws	radio FP	relatives	vill-theatre	friends	magaz	FWA	movie	posters	pamphlet	pub-lecture
	Balai Naga	2.11	.00	.00	.19	.13	.30	3.17	.00	.92	.00	2.00	.00	.00	.00	.00
	Brahmin Si	4.92	.11	.35	1.95	.58	.26	3.97	.00	1.64	.00	1.64	.00	.00	.00	.11
	Jobra	2.65	.00	.01	1.15	.05	1.04	1.94	.00	1.72	.00	1.03	.00	.00	.00	.00
	Kamarpara	4.55	.32	.52	.44	.61	.51	2.87	.12	1.36	.12	4.39	.12	.12	.12	.12
	Paygram	2.76	.08	.09	2.91	.05	2.87	2.49	.05	.40	.19	7.41	.01	.00	.00	.00
	Rayer Kath	6.78	2.30	2.43	.91	1.16	1.34	3.06	.16	2.55	.06	2.88	.00	.00	.00	.00
	Mohugaon	4.75	.00	.00	1.46	.00	1.36	4.16	.07	1.22	.27	5.95	.00	.00	.00	.00
	Akkelpur	8.10	.00	.10	1.50	.00	.00	3.03	.00	4.57	.00	6.13	.00	.00	.00	.00
	Total	4.10	.38	.46	1.56	.32	1.37	2.96	.06	1.42	.10	4.31	.02	.01	.01	.02

husband, then relatives and friends. Parents, in-laws and opinion leaders are also important influences in deciding family planning behaviour. These are all interpersonal communication factors. Among the mass media, radio family planning programmes and TV advertisements were the two most influential factors. Other mass media such as newspaper/magazine, movie, poster, pamphlet, and mobile van had very little or almost no influence. This was also true for village-theatre or public lecture. From these descriptive statistics it was clear that interpersonal factors rather than mass media factors were more important factors for influencing the FP decision. Interpersonal factors were found to be 7.5 times more influential than that of mass media factors. Represented in Figure 6.1.4-3 were the mean influences of both interpersonal and mass media factors.

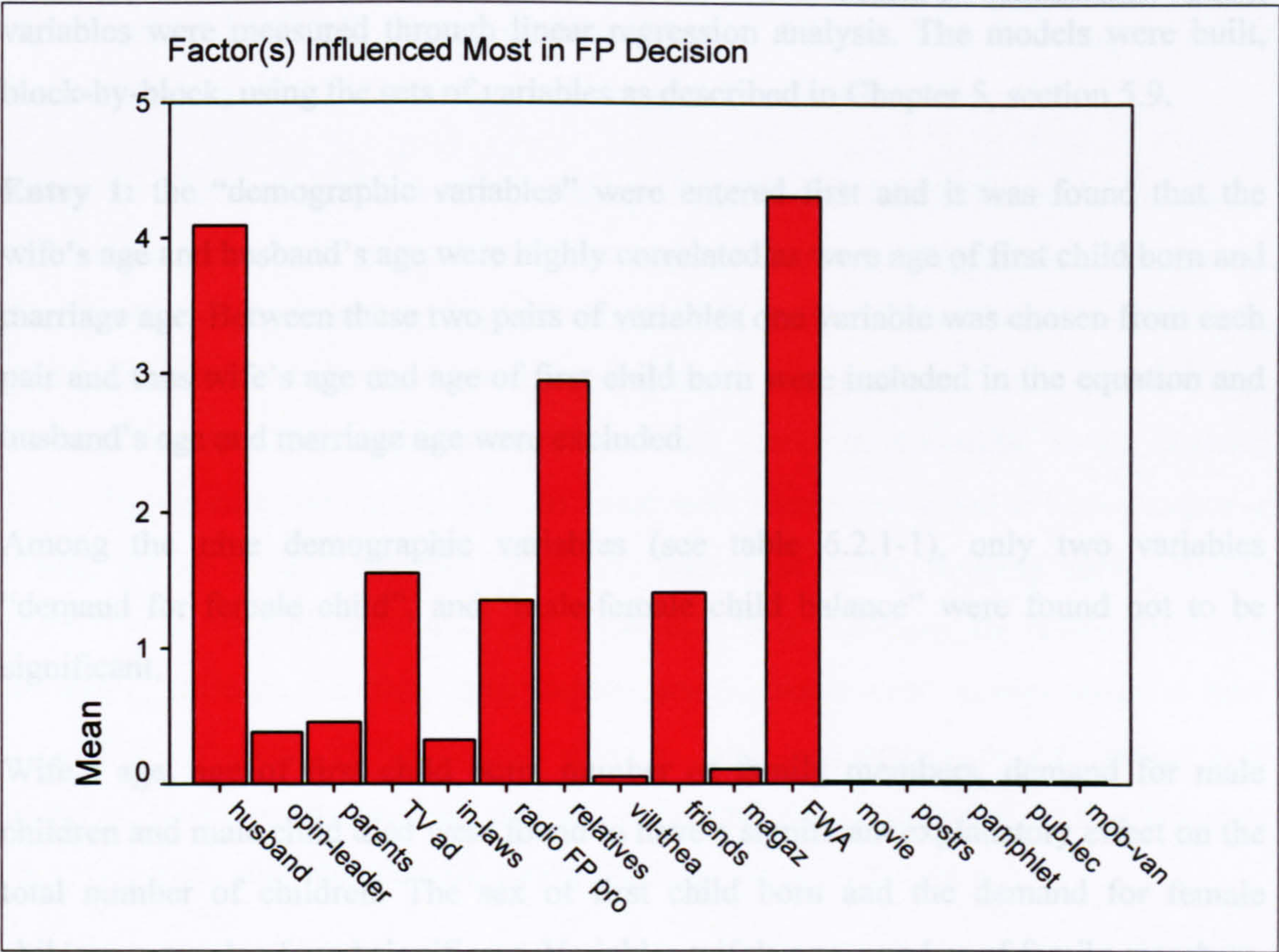


Figure 6.1.4-3: Factors Influenced Most in FP Decision

Three new variables were created using factor analysis from these influencing factors on the basis of commonalities. These new variables were: influencing factor1-display, influencing factor2-interpersonal, and influencing factor3-mass media, (see Chapter 5, section 5.9). Husband and FWA were separated to allow a separate analysis of their individual influence.

6.2 Statistical Modelling

To determine how the demographic, health, socio-economic-cultural and communication variables explain the variation of total number of children and contraceptive use, analyses were made using linear regression and logistic regression methods respectively. As illustrated in Chapter 5 the square root of the total number of children is used as one of the dependent variables in order to satisfy the normality assumption of linear regression.

6.2.1 Regression Analysis

First the relation between the dependent variable “square root of total number of children” and other demographic, socio-economic-cultural, health and communication

variables were measured through linear regression analysis. The models were built, block-by-block, using the sets of variables as described in Chapter 5, section 5.9.

Entry 1: the “demographic variables” were entered first and it was found that the wife’s age and husband’s age were highly correlated as were age of first child born and marriage age. Between these two pairs of variables one variable was chosen from each pair and thus wife’s age and age of first child born were included in the equation and husband’s age and marriage age were excluded.

Among the nine demographic variables (see table 6.2.1-1), only two variables “demand for female child”, and “male-female child balance” were found not to be significant.

Wife’s age, age of first child born, number of family members, demand for male children and male child died were found to have a significant explanatory effect on the total number of children. The sex of first child born and the demand for female children were also found significant. Variables wife’s age, number of family members, sex of first child born, and male child died have significant positive effects, which implies that if: the wife’s age, the number of family members, and the number of dead male children are higher, then the total number of children is also higher.

The demand for male children, female children and age of the first child born were found to have a negative effect. There may be two reasons for this: shorter reproductive age and some socio-economic indication. Women who attain some qualifications or are from well off socio-cultural background are likely to prefer to give birth at a later age and have fewer children. The Adjusted R Square at this step is 49 per cent.

Entry 2: The insignificant variables at entry one were removed and the four health variables were entered at this step. Positive significant effects were found only with two variables: “delivery assistant-unqualified health professional” (DELUNQ) and “place of giving birth”, which means that the higher the rate of delivery attendance by unqualified health professional, i.e. *dai*-s, and the higher the rate of delivery at home, women were likely to have more children. Variables “delivery assistant- health professional” (DELHP) and “delivery assistant- relatives” (DELREL) were not

significant. Adjusted R square at this step was 50 per cent. So, only a minor improvement occurred with the inclusion of health variables.

Entry 3: Removing the health variables DELHP and DELREL, socio-economic-cultural variables were entered in the equation at this step. Significant effects were found with all the variables entered except DELUNQ, income source, wife's job, family members live abroad score and micro-credit organisation affiliation at this step. Among the significant socio-economic-cultural variables, education score, housing score, female autonomy score, religion, equipment score were found to have a negative effect, which means that the higher the education score, housing score, female autonomy score, equipment score and if the religion is Hinduism, the fewer is the total number of children. Variables land property and food-consumption were found to have a positive influence. In Bangladesh villages, food consumption is still related with access to land property and land property represents the agrarian culture that demands more live male children. The Adjusted R Square rose to 54 per cent.

Entry 4: At this stage variables removed were DELUNQ from health variables, and income source, woman's job, family members live abroad score, micro-credit organisation affiliation from socio-economic-cultural variables. Variables entered in the equation were communication variables, i.e. information score, FP information source (split up into three new variables official-fpinf, fr_fpinf and rt_fpinf) and frequency of discussing with FP experts, influencing factor1 (display), influencing factor2 (interpersonal), influencing factor3 (mass media), and also husband and FWAs, which were entered separately as influencing factors (discussed in "new variable created" section in chapter 5). All the communication variables except "information score" and "FWA" were found to be insignificant. In fact both the "information score" and "FWA" were found significant only after removing other communication variables from the equation. These two communication variables were found to have a significant negative influence on the square root of the total number of children. At this step the Adjusted R Square displayed a marginal increase to 55 per cent.

The entry-wise regression model is displayed in table 6.2.1-1.

Table 6.2.1-1: Regression Model for SQR_TCH and Other Explanatory Variables Entry-wise

Explanatory Variables	Demographic Variables			Demographic+ Health Variables			Demographic+Health+Socio-economic-cultural Variables			Demographic+Health+Socio-economic-cultural+ Communication Variables		
	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig
<i>Demographic Variables</i>												
(Constant)	1.007	0.100	0.000	0.711	0.116	0.000	0.701	0.116	0.000	0.729	0.116	0.000
wife's age	0.033	0.002	0.000	0.033	0.002	0.000	0.033	0.002	0.000	0.035	0.002	0.000
age of first child born	-0.041	0.004	0.000	-0.035	0.004	0.000	-0.032	0.004	0.000	-0.032	0.004	0.000
family members	0.045	0.005	0.000	0.046	0.005	0.000	0.049	0.005	0.000	0.051	0.005	0.000
demand for male children	-0.095	0.025	0.000	-0.093	0.025	0.000	-0.094	0.024	0.000	-0.100	0.024	0.000
demand for female children	-0.068	0.038	0.069	-0.059	0.037	0.109	-0.058	0.035	0.101			
sex of first child born	0.075	0.026	0.004	0.066	0.024	0.006	0.055	0.023	0.018	0.070	0.023	0.002
fchid	0.042	0.026	0.105									
mchid	0.108	0.032	0.001	0.105	0.033	0.001	0.097	0.031	0.002	0.089	0.032	0.006
mfchi-bal	0.003	0.009	0.703									
<i>Health Variables</i>												
DELHP				0.033	0.042	0.434						
DELREL				0.063	0.054	0.243						
DELUNQ				0.094	0.027	0.001	0.023	0.029	0.425			
pl_gbrth				0.157	0.051	0.002	0.126	0.051	0.013	0.134	0.049	0.006

Explanatory Variables	Demographic Variables			Demographic+ Health Variables			Demographic+Health+Socio-economic-cultural+ Communication Variables		
	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig
<i>Socio-economic-cultural Variables</i>									
INC_S				0.007	0.027	0.797			
edu-score				-0.025	0.014	0.071	-0.022	0.014	0.114
WJOB				0.053	0.047	0.259			
fmlabrd-score				0.007	0.012	0.565			
housing-score				-0.054	0.015	0.000	-0.050	0.015	0.001
femauto_score				-0.038	0.014	0.005	-0.036	0.014	0.011
religion				-0.105	0.029	0.000	-0.099	0.028	0.000
equip-score				-0.026	0.008	0.002	-0.022	0.009	0.017
MCO				0.003	0.025	0.915			
land property				0.037	0.020	0.068	0.036	0.020	0.070
food consumption				0.038	0.015	0.011	0.035	0.015	0.025

Explanatory Variables	Demographic Variables			Demographic+ Health Variables			Demographic+Health+Socio-economic-cultural+ Communication Variables		
	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig
<i>Communication Variables</i>									
information score							-0.007	0.005	0.166
friend-relatives fpinf							0.009	0.028	0.739
radio-tv									
display							0.001	0.012	0.927
interpersonal							0.007	0.014	0.618
mass media							0.011	0.013	0.415
husband							-0.002	0.003	0.590
FWA							-0.005	0.003	0.191
FP disfreq							-0.003	0.009	0.695

Demographic Variables: Adjusted R Square = 48.8% Dependant Variable = SQR_TCHI	Demographic +Health Variables: Adjusted R Square = 50.2% Dependant Variable = SQR_TCHI	Demographic + Health + Socio-economic-cultural Variables: Adjusted R Square = 54.1% Dependant Variable = SQR_TCHI	Demographic + Health + Socio-economic-cultural+ Communication Variables: Adjusted R Square = 53.8% Dependant Variable = SQR_TCHI
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Now that the structure of the model has been revealed the variables were entered into a stepwise regression procedure (reason is discussed in chapter 5, section 5.9), relaxing the entry criterion of using probability of F at 0.08 and removal at 0.10 level, and this gives the final model represented in table 6.2.1-2 below. Here all the variables in 4 categories were entered and a linear regression analysis was run instead of entering the variables category wise and re-entering after removing the non-significant variables.

Table 6.2.1-2: Stepwise Regression Table for SQR_TCH with Explanatory Variables

N=723	Unstandardised		Standardised	
Explanatory Variables and Category	Coefficient	Standard Error	Coefficient	Significance
<i>Demographic Variables:</i>				
Wife's age	0.034	0.002	0.493	0.000
Age at first child born	-0.032	0.004	-0.204	0.000
Number of family members	0.053	0.005	0.270	0.000
Demand for male child	-0.079	0.023	-0.097	0.001
Demand for female child	-0.079	0.034	-0.062	0.006
Male child died	0.095	0.031	0.082	0.002
<i>Health Variable</i>				
Place of giving birth	0.139	0.048	0.078	0.004
<i>Socio-economic-cultural Variables:</i>				
Housing Score	-0.036	0.014	-0.078	0.010
Religion	-0.100	0.028	-0.099	0.000
Equipment Score	-0.026	0.009	-0.105	0.002
Land Property	0.041	0.019	0.058	0.032
<i>Communication Variables:</i>				
FWA	-0.006	0.003	-0.055	0.021
Information Score	-0.007	0.005	-0.052	0.078
Constant	(0.9249)	(0.1074)		(0.000)
Adjusted R ² = 56.0%				

Through step-wise linear regression analysis, six out of nine demographic variables were found to be significantly associated with the total number of children. Among these six

significant variables: wife's age, number of family members, and male child died have a positive influence on the total number of children, whereas age at first child born, demand for male children and demand for female children have negative effects. The largest effects were of wife's age, age at first birth and the number of family members. Among the four health variables, only the place of giving birth was found to be positively significant that means that the higher the rate of giving birth at home, higher will be the total number of children. Among the eleven socio-economic-cultural variables, four variables were found to be significant. Out of these four variables, housing score, religion and equipment score were found to have a negative effect whereas land property was found to have a positive effect. If the housing quality and equipment score are higher, the lower is the number of total children and Hindus have fewer children than Muslims. As land property increases, so does the number of total children. Amongst these variables equipment score had the largest effect. Information score and FWA visits are the only two variables among ten communication variables, which are significant in explaining the total number of children and both have negative effects. Although compared to other selected variables the impact of these communication variables is slight. Women's education score, female autonomy score, and micro-credit affiliation were not significant. This model is similar to the entry-wise regression model.

In this model only around 56 per cent of the variation of the total number of children has been explained, clearly other influences remain to be accounted for and of those that have been included there is perhaps a need for improved precision in measurement.

6.2.2 Logistic Regression Analysis

Using binary logistic regression analysis the association between dependant variable family planning use (FP use) and the explanatory demographic, health, socio-economic-cultural and communication variables were modelled. Like the regression analysis with the dependant variable SQR_TCH, here also the same four categories of variables were entered into the equation.

Entry 1: In the first stage the "demographic variables" were entered. Among the nine demographic variables, only three variables "demand for male child", "male child died" and "demand for female child" were found significant. All of these three variables were

negatively associated with FP use, which means that the higher the demand for male children and for female children, lower will be the use of FP. The variable “male child died” had a negative effect meaning that as more male children die, less will be the use of FP. At this stage the overall percentage correct was 69.5, where 96.6 per cent of ‘yes’ but only 7.7 per cent of ‘no’ were correctly classified.

Entry 2: Keeping only the three significant components in the model, at the entry 2 stage of the modelling, the health variables were entered. Among the seven variables entered into the equation at this stage, the most significant relationship was found with the male child died variable. Its co-efficient was negative, meaning that the higher the number of male children died, the lower would be the probability of contraceptive use. Besides the ‘male child died’ variable, the demand for male and female children, DELREL, and DELUNQ were also found to be significant and were all negatively associated with FP use. Variables place of giving birth and DELHP are not significant. The overall percentage correct at this stage is 70.6, where 12.2 per cent of ‘no’ and 96.6 per cent of ‘yes’ are correctly classified.

Entry 3: Removing the health variables DELHP and place of giving birth, the eleven socio-economic-cultural variables were included in the equation at this stage. Among these newly entered variables, significant association was found with family members live abroad score, housing score, female autonomy score, religion, equipment score, food consumption, and micro-credit organisation affiliation. Variables family members live abroad score, religion, and food consumption, were negatively associated with FP use. Thus the more the family members live abroad, the less is the use of FP. Interestingly religion and food consumption are also negatively related with FP use, which means higher the number of Muslims, lower will be FP use. Other significant variables were housing score, female autonomy score, micro-credit organisation score and equipment score. These are positively related to FP use, meaning that if the housing quality and equipment score are high, then FP use is high. Also the higher the level of female autonomy and micro-credit organisation affiliation, higher is the use of FP. Education score, wife’s job, health professional as delivery assistant, and land property are found to be non-significant. At this stage overall percentage correct is 72.8 per cent, where 29.5 per cent of ‘no’ and 92.2 per cent of ‘yes’ were correctly classified.

Step 4: The variables removed at this stage were DELREL, education score, women's job, and entered were land property and communication variables. Family planning information source variables (split into three new variables official-fpinf, fr_fpinf and rt_fpinf) were not included with the consideration that only the women who were practising family planning were exposed to family planning information sources. Except influencing factors-display, all the communication variables were found to be significant and positively associated, which means that the higher is the exposure to these communication variables higher is the rate of FP use. Husband, FWA, frequency of discussing family planning with FP experts, influencing factor2 (interpersonal) and influencing factor3 (mass media) were found to have a significant positive association with FP use. The overall percentage correct at this stage is 84.3, where 69.5 per cent of 'no' and 90.9 per cent of 'yes' were correctly classified. Displayed in Table 6.2.2-1 is the development of the model.

Table 6.2.2-1: Entry-wise Logistic Regression for FP Use

Explanatory Variables	Demographic Variables				Demographic + Health Variables				Demographic + Health + Socio-economic-cultural Variables				Demographic+Health+ Socio-economic+ Communication Variables			
Demographic Variables	B	SE	Sig	Exp (B)	B	SE	Sig	Exp (B)	B	SE	Sig	Exp (B)	B	SE	Sig	Exp (B)
(Constant)	1.28	0.671	0.057	3.596	1.16	0.334	0.001	3.184	1.659	0.407	0.000	5.257	0.141	0.528	0.790	1.151
W_AGE	-0.01	0.015	0.346	0.986												
AGE_FCH	-0.01	0.028	0.727	0.990												
F_MEM	0.029	0.036	0.415	1.030												
D_MCHI	-0.43	0.162	0.007	0.648	-3.5	0.148	0.018	0.706	-0.25	0.159	0.120	0.781				
D_FCHI	-0.49	0.248	0.046	0.609	-5.3	0.230	0.022	0.590	-0.55	0.237	0.020	0.576	-0.651	0.293	0.026	0.521
S_FCHIB	0.18	0.179	0.310	1.199												
mchid	-0.64	0.203	0.002	0.526	-6.04	0.203	0.003	0.547	-0.69	0.221	0.002	0.499	-0.748	0.261	0.004	0.473
fchid	0.014	0.166	0.934	1.014												
MFC_BAL	0.021	0.062	0.731	1.021												
Health Variables																
DELHP					.153	0.284	0.592	1.165								
DELREL					-.70	0.340	0.038	0.494	-0.56	0.361	0.121	0.572				
DELUNQ					-.38	0.190	0.046	0.685	-0.40	0.213	0.060	0.670	-.197	.246	.422	.821
PLGBRTH					.239	0.333	0.472	1.270								
Socio-economic-Cultural Variables																
INCS									-0.37	0.199	0.063	0.691	-.194	.234	.407	.824
EDU_SCO									0.074	0.100	0.461	1.076				
WJOB									-0.08	0.339	0.799	0.917				
FMLAB_SC									-0.37	0.086	0.000	0.690	-.189	.104	.068	.827
H_SCO									0.297	0.118	0.012	1.345	.227	.135	.093	1.25
FAUTO_SC									0.269	0.100	0.007	1.309	.221	.121	.067	1.24
RELIGION									-0.51	0.212	0.016	0.601	-.467	.248	.059	.627

Explanatory Variables	Demographic Variables			Demographic + Health Variables			Demographic + Health + Socio-economic-cultural Variables			Demographic+Health+ Socio-economic+ Communication Variables		
	B	SE	Sig	Exp (B)	B	SE	Sig	Exp (B)	B	SE	Sig	Exp (B)
EQUIP_SC					0.180	0.064	0.005	1.198	.097	.079	.223	1.102
MCO					0.518	0.190	0.006	1.679	.354	.229	.122	1.424
LAND_PRO					-0.01	0.148	0.933	0.988				
FOODCONS					-0.23	0.115	0.044	0.793	-.307	.143	.031	.736
Communication Variables												
Inflf1-display									0.451	0.619	0.466	1.570
Influf2-interpersonal									0.250	0.152	0.100	1.284
Influf3- mass media									0.484	0.145	0.001	1.622
Inf_score									0.041	0.045	0.359	1.042
F_DFPW									0.227	0.074	0.002	1.254
Husband									0.128	0.026	0.000	1.136
FWA									0.187	0.028	0.000	1.205
Demographic Variables												
Demographic Variables				Demographic +Health +Socio-economic-cultural Variables				Demographic +Health +Socio-economic-cultural + Communication Variables				
% of 'No' correct = 7.7%				% of 'No' correct = 12.2%				% of 'No' correct = 69.5%				
% of 'Yes' correct = 96.6%				% of 'Yes' correct = 96.4%				% of 'Yes' correct = 90.9%				
Overall Percentage = 69.5%				Overall Percentage = 70.6%				Overall Percentage = 84.3%				

As with the ordinary regression analysis here also a bi-variate logistic regression model was run with all the variables entered simultaneously (reason is discussed in section 5.9 of chapter 5) and using the Wald Forward selection method the optimal model was selected. Displayed in table 6.2.2-2 is the final logistic regression model of likelihood of using family planning.

Table 6.2.2-2: Wald Forward Selection Logistic Regression Table for FP Use

N=723				
Explanatory Variables and Category	B	S.E.	Significance	Exp (B)
<i>Demographic Variables:</i>				
Demand for Male Child	-0.58	0.18	0.001	0.56
Male Child Died	-0.48	0.25	0.059	0.62
<i>Health Variables</i>				
DELREL	-0.99	0.41	0.017	0.37
<i>Communication Variables:</i>				
INFLF2-interpersonal	0.24	0.13	0.059	1.27
INFLF3-mass media	0.62	0.14	0.000	1.85
Husband	0.15	0.03	0.000	1.16
FWA	0.19	0.03	0.000	1.20
F_DFPW	0.29	0.07	0.000	1.34
Constant	-0.398	0.193	0.039	0.672

% of 'No' correct = 69.59%
% of 'Yes' correct = 90.27%
Overall percentage correct = 83.86%

From the final model above one can observe that amongst the demographic variables demand for male children and male child died have a significant negative association with the FP use. Thus if the demand for male children and the number of male child died are high then FP use is low. Delivery assistants-relatives (DELREL) is the only health variable that was found to have a significant impact on FP use with a negative effect. None of the socio-economic-cultural variables are found to be significant. Among the communication variables, husband, FWA, interpersonal influencing factors, mass media as influencing factors and frequency of discussing with family planning experts were found to be significantly associated with FP use with positive

effects. This implies that the greater the exposure to these variables, the higher is the probability of using family planning. At this final level, the overall percentage correct is 83.86, where 69.59 per cent of 'no' and 90.27 per cent of 'yes' were correctly classified. Of the communication variables mass media appears to be the most influential in promoting FP use and the next most influential is the frequency of discussion with FP experts. Of the negative influences on FP use - the use of delivery assistants and relatives is the strongest and then demand for more male children. This logistic regression model using Wald Forward Selection is similar to the entry-wise logistic regression model depicting the strong influence of communication variables on FP use.

6.3 Path Modelling

According to Valente (2002), to understand the simultaneous role of multiple dependent and independent variables, to simultaneously model variable measurement and the interrelationships between those measured variables at the same time, a technique referred to as structural equation modelling (SEM) has been developed (Hayduk 1987; Bollen 1989; Jöreskog and Sörbom 1989). The model posits a set of independent variables predicted to impact dependent variables, some of which mediate relationships between other dependent variables. This modelling approach is required here to measure the interactive influence of the two dependent variables (i.e. total number of children and FP use) in the modelling discussed above.

The degree of fit between the theoretical model and data provides a measure of how well the theoretical path model is supported by the data. How well the model fits the data is ascertained by an array of measures (see Bentler 1990). The SEM also provides an adjusted goodness-of-fit index for the overall model and estimates of the strength and significance of all paths in the model. The modelling gives measures of both direct and indirect effects.

In this chapter using Amos 6 (Arbuckle and Wothke 1995-99), the set of independent variables attained from step wise regression analysis for Square Root of the Total Number of Children and another set of independent variables attained from Wald Forward Selection logistic regression analysis for FP use were analysed to measure the simultaneous effects of these independent variables on the two dependent variables- Square Root of the Total Number of Children and FP use. Along with the direct and

indirect influences of the independent variables on the dependent variables, whether either of the dependent variables has any mediating influence on the other was also measured and finally the goodness-of-fit results for the impact model were analysed from the final path model. The full model is displayed in figure 6.3-1.

The degree of effects of each variable upon another is indicated by the path coefficient

$$p_{ij} = b_{ij} \frac{\delta_j}{\delta_i}, \text{ where } b_{ij} \text{ is the regression coefficient of the } i\text{-th variable on the } j\text{-th}$$

variable and δ is the standard deviation and the relationship that shows the path coefficients is:

$$r_{ij} = \sum_q p_{iq} r_{jq}, \text{ where } i \text{ and } j \text{ are the two variables and } q \text{ is an index for all the}$$

variables that have paths leading directly into the variable i and r_{ij} is the correlation coefficient between variables i and j . The initial full path model is displayed in figure 6.3-1 and the path coefficients (p_{ij}) for the full model are presented in table 6.3-1. (The fit statistics of this model is displayed in Appendix 6.

The final model of path analysis was attained through several steps. First the analysis was run with a set of explanatory variables attained from entry-wise regression and logistic regression analysis for SQR_TCH and FP Use. Represented in figure 6.3-1 is the full model with the variables religion, demand for male child, equipment score, micro-credit organisation, husband, family members live abroad score, FWA, female autonomy score, influencing factor2-interpersonal communication, influencing factor3-mass media, death of male child, demand for female child, food consumption, land property, education score, number of family members, sex of first child born, information score, wife's age, and place of giving birth.

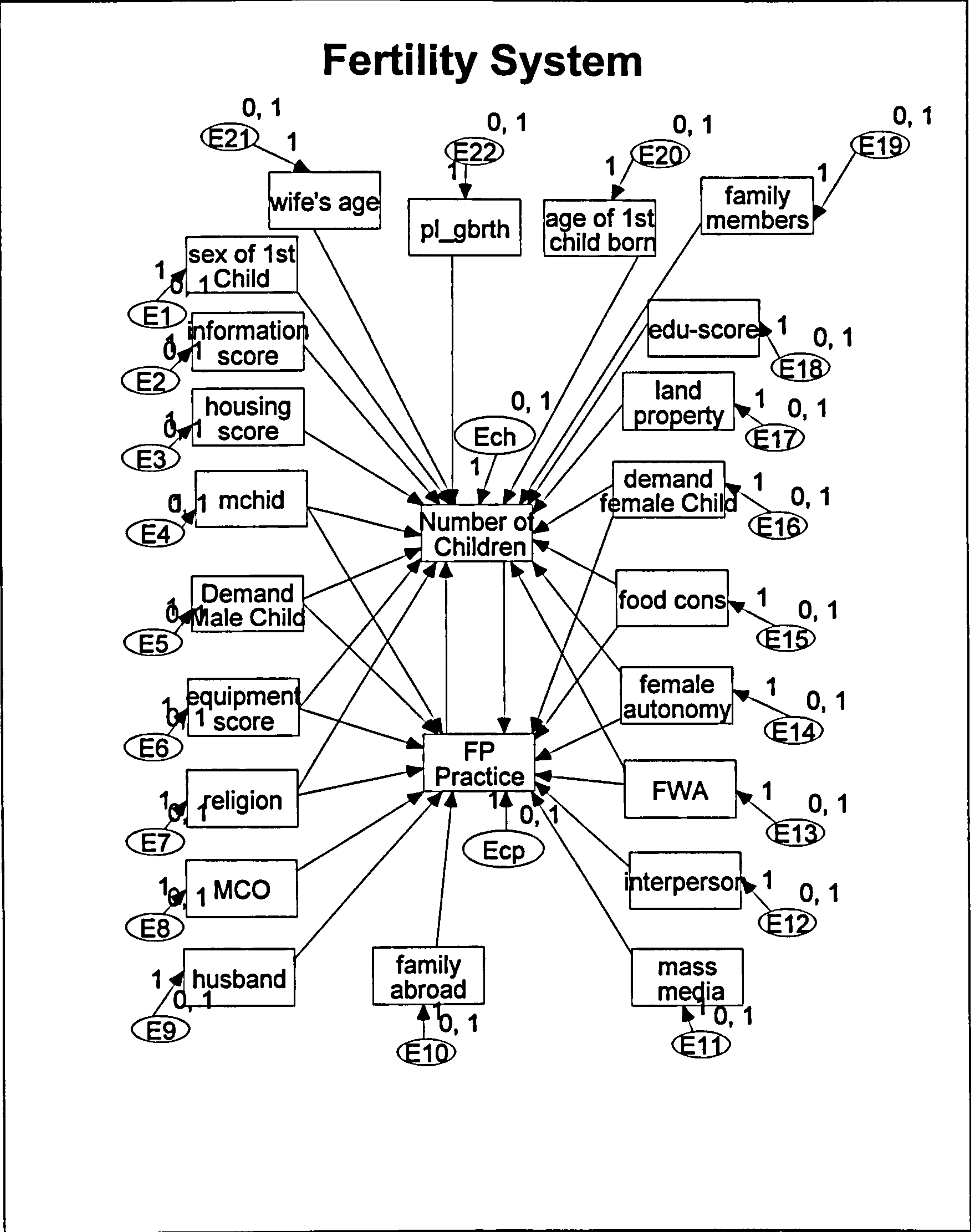


Figure 6.3-1: Full Path Diagram Using Variables Obtained From Entry Wise Regression and Logistic Regression Models

Table 6.3-1: Table of Regression Weight in Entry-wise Full Path Diagram

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P Label
FP_MP	<---	RELIGION	-0.288	0.038	-7.597	***
SQR_TCH	<---	RELIGION	0.024	0.037	0.641	0.521
SQR_TCH	<---	D_MCHI	0.063	0.038	1.665	0.096
FP_MP	<---	D_MCHI	-0.618	0.04	-15.416	***
SQR_TCH	<---	EQUIP_SC	-0.075	0.037	-2.004	0.045
FP_MP	<---	EQUIP_SC	-0.064	0.037	-1.713	0.087
FP_MP	<---	MCO	0.07	0.037	1.876	0.061
FP_MP	<---	INFL_F1	0.011	0.037	0.29	0.772
FP_MP	<---	FMLAB_SC	0.015	0.037	0.39	0.697
FP_MP	<---	INFL_F11	0.02	0.037	0.535	0.593
SQR_TCH	<---	INFL_F11	-0.112	0.037	-2.992	0.003
SQR_TCH	<---	FAUTO_SC	-0.101	0.037	-2.707	0.007
FP_MP	<---	FAUTO_SC	-0.046	0.037	-1.22	0.222
FP_MP	<---	INFLF2	0.079	0.037	2.126	0.033
FP_MP	<---	INFLF3	0.119	0.037	3.173	0.002
SQR_TCH	<---	MCDIED	0.259	0.037	6.946	***
FP_MP	<---	D_FCHI	-0.628	0.04	-15.681	***
SQR_TCH	<---	D_FCHI	0.093	0.038	2.426	0.015
SQR_TCH	<---	FOODCONS	0.129	0.037	3.464	***
FP_MP	<---	FOODCONS	0.057	0.037	1.515	0.13
SQR_TCH	<---	LAND_PRO	0.051	0.037	1.358	0.175
SQR_TCH	<---	EDU_SCO	-0.025	0.037	-0.682	0.495
SQR_TCH	<---	F_MEM	0.032	0.037	0.871	0.384
SQR_TCH	<---	S_FCHIB	0.007	0.037	0.199	0.842
SQR_TCH	<---	INFO_SCO	-0.033	0.037	-0.888	0.375
SQR_TCH	<---	H_SCO	-0.096	0.037	-2.585	0.01
SQR_TCH	<---	W_AGE	0.04	0.037	1.086	0.278
SQR_TCH	<---	AGE_FCH	-0.034	0.037	-0.907	0.365
FP_MP	<---	MCDIED	0.403	0.039	10.226	***
SQR_TCH	<---	PLGBRTH	0.115	0.037	3.075	0.002
SQR_TCH	<---	FP_MP	2.319	0.069	33.375	***
FP_MP	<---	SQR_TCH	-2.256	0.068	-33.287	***

Intercepts: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P Label
MCDIED	0.134	0.037	3.604	***
EQUIP_SC	2.66	0.037	71.34	***
FAUTO_SC	-0.005	0.037	-0.121	0.904
INFL_F11	4.314	0.037	116.021	***
FMLAB_SC	0	0.037	-0.001	1
RELIGION	0.295	0.037	7.908	***
D_MCHI	0.329	0.037	8.842	***
FOODCONS	2.471	0.037	66.462	***
D_FCHI	0.131	0.037	3.529	***
INFLF2	0	0.037	0.002	0.998
INFLF3	0	0.037	0.004	0.997
MCO	0.402	0.037	10.802	***
INFL_F1	4.105	0.037	110.411	***
H_SCO	0.003	0.037	0.081	0.936
LAND_PRO	0.598	0.037	16.072	***
INFO_SCO	6.214	0.037	166.78	***
EDU_SCO	0.011	0.037	0.305	0.76
F_MEM	5.471	0.037	147.153	***
S_FCHIB	1.453	0.037	39.054	***
W_AGE	28.169	0.037	757.645	***
AGE_FCH	17.797	0.037	478.687	***
PLGBRTH	0.927	0.037	24.928	***
SQR_TCH	-0.42	1.298	-0.323	0.746
FP_MP	4.397	0.287	15.343	***

From the default model of Regression Weights displayed in table 6.3-1 it was found that only four variables- demand for male child, death of male child, demand for female child and equipment score- have significant effect on both SQR_TCH and FP use. Whereas husband, female autonomy score, food consumption, housing score and place of giving birth-these five variables have direct significant effects only on total number of children but not on FP use, and interpersonal communication, mass communication and religion-these three variables were found to have significant effects on FP use but not on SQR_TCH. FP use was found to have direct effects on SQR_TCH and vice versa.

Also the sets of explanatory variables obtained from step wise regression analysis for SQR_TCH and the logistic regression model using Wald forward selection method for FP use are used as latent variables in the Path analysis, and the model changes (if there is any) are presented in the figure 6.3-2.

Here also, like the initial model, the same four variables were found to be significant for both SQR_TCH and FP use: demand for male child, death of male child, demand for female child and equipment score. Five variables were found to have direct influence on SQR_TCH but not on FP use: FWA, female autonomy score, food consumption, housing score and place of giving birth, whereas the same three variables of previous model-interpersonal communication, mass communication and religion-were found to have significant effects only on FP use but not on SQR_TCH. Thus this new model is similar to the initial one, only the variable FWA replaced the variable Husband in the previous one. Again, FP use was found to have direct effect on SQR_TCH and vice versa.

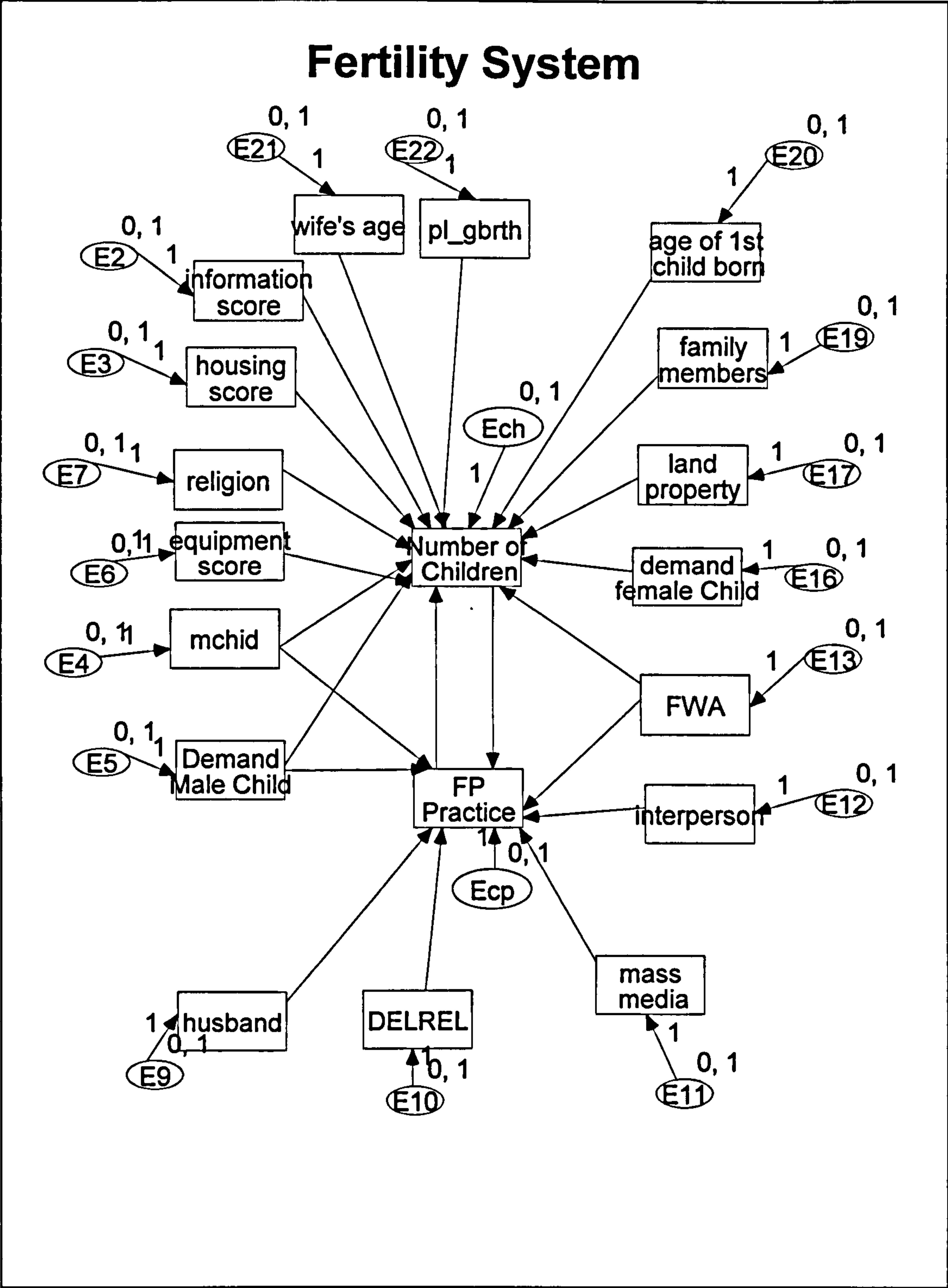


Figure 6.3-2: Path Diagram Using Explanatory Variables from Step Wise Regression and Wald Forward Selection Methods Logistic Regression Analysis

Table 6.3-2: Model of Step Wise Regression Weights

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P Label
FP_MP	<---	RELIGION	-0.288	0.038	-7.597	***
SQR_TCH	<---	RELIGION	0.024	0.037	0.641	0.521
SQR_TCH	<---	D_MCHI	0.063	0.038	1.665	0.096
FP_MP	<---	D_MCHI	-0.618	0.04	-15.416	***
SQR_TCH	<---	EQUIP_SC	-0.075	0.037	-2.004	0.045
FP_MP	<---	EQUIP_SC	-0.064	0.037	-1.713	0.087
FP_MP	<---	MCO	0.07	0.037	1.876	0.061
FP_MP	<---	INFL_F1	0.011	0.037	0.29	0.772
FP_MP	<---	FMLAB_SC	0.015	0.037	0.39	0.697
FP_MP	<---	INFL_F11	0.02	0.037	0.535	0.593
SQR_TCH	<---	INFL_F11	-0.112	0.037	-2.992	0.003
SQR_TCH	<---	FAUTO_SC	-0.101	0.037	-2.707	0.007
FP_MP	<---	FAUTO_SC	-0.046	0.037	-1.22	0.222
FP_MP	<---	INFLF2	0.079	0.037	2.126	0.033
FP_MP	<---	INFLF3	0.119	0.037	3.173	0.002
SQR_TCH	<---	MCDIED	0.259	0.037	6.946	***
FP_MP	<---	D_FCHI	-0.628	0.04	-15.681	***
SQR_TCH	<---	D_FCHI	0.093	0.038	2.426	0.015
SQR_TCH	<---	FOODCONS	0.129	0.037	3.464	***
FP_MP	<---	FOODCONS	0.057	0.037	1.515	0.13
SQR_TCH	<---	LAND_PRO	0.051	0.037	1.358	0.175
SQR_TCH	<---	EDU_SCO	-0.025	0.037	-0.682	0.495
SQR_TCH	<---	F_MEM	0.032	0.037	0.871	0.384
SQR_TCH	<---	S_FCHIB	0.007	0.037	0.199	0.842
SQR_TCH	<---	INFO_SCO	-0.033	0.037	-0.888	0.375
SQR_TCH	<---	H_SCO	-0.096	0.037	-2.585	0.01
SQR_TCH	<---	W_AGE	0.04	0.037	1.086	0.278
SQR_TCH	<---	AGE_FCH	-0.034	0.037	-0.907	0.365
FP_MP	<---	MCDIED	0.403	0.039	10.226	***
SQR_TCH	<---	PLGBRTH	0.115	0.037	3.075	0.002
SQR_TCH	<---	FP_MP	2.319	0.069	33.375	***
FP_MP	<---	SQR_TCH	-2.256	0.068	-33.287	***

Removing the insignificant variables, the parsimonious Path diagram is presented in figure 6.3-3.

This model fitted the data well and all the goodness of fit statistics lie much closer to those of the idealised saturation model than the independent model. These statistics are displayed in Appendix 7 (See Kline 1998 for details on interpretation).

The coefficients of the model presented in figure 6.3-3 are displayed in table 6.3-3.

Table 6.3-3: Regression Weights (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
SQR_TCH<-- D_MCHI	-.086	.038	-2.293	.022	
FP_MP <-- D_MCHI	-.674	.041	-16.341	***	
SQR_TCH<-- MCDIED	.399	.037	10.645	***	
SQR_TCH<-- D_FCHI	-.079	.037	-2.131	.033	
FP_MP <-- MCDIED	.449	.040	11.135	***	
FP_MP <-- INFLF3	.093	.037	2.501	.012	
FP_MP <-- INFL_F11	.030	.037	.804	.421	
FP_MP <-- INFLF_2	.056	.037	1.508	.132	
SQR_TCH<-- EQUIP_SC	-.107	.037	-2.874	.004	
SQR_TCH<-- PLGBRTH	.264	.038	6.991	***	
SQR_TCH<-- INFL_F11	-.113	.037	-3.030	.002	
SQR_TCH<-- FP_MP	2.278	.069	33.116	***	
FP_MP <-- SQR_TCH	-2.139	.065	-33.027	***	

Intercepts: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
MCDIED	.134	.037	3.604	***	
EQUIP_SC	2.660	.037	71.340	***	
INFL_F11	4.314	.037	116.021	***	
D_MCHI	.329	.037	8.842	***	
D_FCHI	.131	.037	3.529	***	
INFLF3	.000	.037	.004	.997	
PLGBRTH	.927	.037	24.928	***	
INFLF_2	.000	.037	-.005	.996	
SQR_TCH	.492	.199	2.475	.013	
FP_MP	4.058	.197	20.630	***	

The total, the direct and the indirect effects of the variables in the final model are displayed in table 6.3-4 below.

Table 6.3-4: Total, Direct and Indirect Effects

Optimal Path Model with Direct and Indirect Effects										
Total Effects (Group number 1 - Default model)										
	PLGBRTH	INFLF2	INFLF3	D_FCHI	MCDIED	INFL_F11	EQUIP_SC	D_MCHI	SQR_TCH	FP_MP
SQR_TCH	0.045	0.036	0.036	-0.013	0.242	-0.009	-0.018	-0.279	-0.83	0.388
FP_MP	-0.096	0.016	0.016	0.029	-0.069	0.046	0.039	-0.085	-0.364	-0.83
Direct Effects (Group number 1 - Default model)										
	PLGBRTH	INFLF2	INFLF3	D_FCHI	MCDIED	INFL_F11	EQUIP_SC	D_MCHI	SQR_TCH	FP_MP
SQR_TCH	0.264	0	0	-0.079	0.399	-0.113	-0.107	-0.086	0	2.279
FP_MP	0	0.092	0.093	0	0.449	0.027	0	-0.682	-2.141	0
Indirect Effects (Group number 1 - Default model)										
	PLGBRTH	INFLF2	INFLF3	D_FCHI	MCDIED	INFL_F11	EQUIP_SC	D_MCHI	SQR_TCH	FP_MP
SQR_TCH	-0.219	0.036	0.036	0.066	-0.157	0.104	0.089	-0.193	-0.83	-1.891
FP_MP	-0.096	-0.076	-0.077	0.029	-0.518	0.019	0.039	0.597	1.776	-0.83

From the table 6.3-4, place of giving birth and death of male children were found to have direct positive effects on the SQR_TCH, whereas demand for male and female children, equipment score and FWA were found to have negative effects on the number of total children meaning that if the equipment score and exposure to FWA are high, the number of total children is low and also the demand for male and female children is high when the number of total children is low.

For FP use, interpersonal communication, mass media, death of male children, FWA were found to have positive effects, and demand for male child and SQR_TCH were found to have negative effects. So, the higher the exposure to interpersonal communication, mass media and FWA then the rate of FP use is high. Conversely if the demand for male children and the number of total children are high then the lower will be the use of FP. These variables were found as the influencing factors through regression and logistic regression analysis also. The SEM confirmed the previous result indicating direct and indirect influences.

Thus the two independent models are forwarded as explanations of the total number of children and family planning use. In the next chapter interpersonal communication within the study areas is modelled and measures of the intensity of this will be derived in this chapter. These measures will be incorporated into the final models, which will be developed in chapter 8.

6.4 Discussion

724 women of mean age 28.2 years were interviewed in this research. Their husbands were on average 8.5 years older than them, and the average marriage age of these women was 15.5 years (3 years less than the government order). The average age at the birth of their first child was 17.8 years (i.e. teenage pregnancy), almost same as the national average of 17.44 years (BDHS 1999-2000). The dominant religion of interviewed women was Islam, 75.5 per cent and the rest were of Hinduism, 24.5 per cent, which is higher than that of the national count of 12 per cent. The residing-year at the current place was on average 11.4, which is an indication that these women lived in their current place after marriage.

6.4.1 Descriptive Statistics

From descriptive statistics, 92.7 per cent of these interviewed women were housewives and 48.9 per cent women neither could read nor write, which is quite similar to the national average of 46 per cent (BDHS 1999-2000). On average 64 per cent of women had no freedom to travel unaccompanied, and only 32.2 per cent of women could make decisions on household matters.

Husband's income was the main source of household income and that was mainly agriculture related. Only 9.7 per cent of the women reported that their husbands had any cultivable land and house materials were mainly tin for the roof (59.1 per cent), jute/bamboo/mud for the walls (62.6 per cent), and mud for the floor (78.5 per cent). The household possession score was very low depicting a very poor economic status. On average families are comprised of 5.47 members, a little higher than that of the national count of 4.7 (Population Census 2001 preliminary report), the reason may be in the national count both the urban and rural household sizes are presented together. More than 55 per cent of the women reported to be in food deficit for either the whole year or some times of the year. More than 90 per cent of the women had no family

member(s) living abroad and 93.4 per cent of the women who have family members abroad never got any financial help from these members.

98.9 per cent of the women interviewed, on average, has at least one child and mean child number is 2.64. Demand for male child is 2.54 times more than that of female child. Also the demand for more children is associated with the sex of first child born, if the sex of first child is female, demand for male child is very high that ultimately increases the number of total children. Around 39 per cent women has gone through the experience of child death after giving birth, female child death is a little higher than male child. 88.8 per cent of women never had any delivery assistance from any qualified health professional, the main birth attendant is village *dia-s*, 96 per cent of unqualified health professionals, and the main reason for not having any assistance from qualified health professionals is reported as “service not needed”. Mainly husbands and in-laws decide the place and assistance at delivery, in 84.4 per cent of cases. Home (either husband’s home or parents home) is the most likely place of delivery. All these statistics reflects the strong son preference and poor health and delivery condition.

The choice of family planning method was a joint decision in only 35.9 per cent of cases and the reason for practicing family planning method was reported to be mainly economic. The desire for more children (i.e. mainly male child) was the main reason for not using FP planning device(s) among the non-practicing women.

The main source of information among the women was found to be interpersonal, i.e. friends and relatives. Among mass media, only radio was an importance source of information. The source of family planning information was mainly interpersonal-family planning field workers and health workers, friends, relatives were found to be much more important source of family planning information than mass media. Radio and television were important sources among mass media. FWA from the public sector was also the main source of supplying family planning devices. 75.5 per cent of the women interviewed perceived FP field workers as the experts in family planning. Again, FWA and husband were found to be the two most important factors influencing fertility behaviour (see figure 6.1.4-5). These point to the women’s lack of access to mass media and the dependence on interpersonal sources for general information,

family planning information, family planning decisions and the collection of family planning devices.

From this descriptive statistics, the image of the demographic, socio-economic-cultural and health conditions one can get of the interviewed women is quite attuned with the image obtained from literature in chapter 4 and does not justify the economic deterministic theories of fertility decline. Yet the reality is, in this overall socio-economic-cultural and health condition along with low status of women and strong son preference, on average 69.3 per cent of the interviewed women had practiced at least one family planning method (the national average is 77.8 per cent among currently married women, including urban rate). Also the knowledge about family planning is almost universal. The use of contraception and thus limiting family size was perceived by these women (in at least 76.67 per cent of the cases reported directly) as the way to overcome the misery of poor economic condition, which is opposite to the popular notion of declining fertility as the outcome of economic advancement, urbanisation and modernisation. The ideational change of adopting a small family norm was found to be at the core of practising family planning, which was diffused by communication in the absence of required socio-economic infrastructure. This prime hypothesis was tested through statistical modelling in this chapter.

6.4.2 Hypothesis Testing

In this chapter statistical modelling has been conducted to allow the testing of the first four hypotheses (see section 1.2.1 in chapter 1). It has been found that regarding communication variables there is a significant impact both on total number of children and likelihood of using FP. When considering the effect of communication on the total number of children, table 6.2.1-2, both FWA (interaction with family planning workers) and information score have significant effects in reducing the total number of children (p values 0.021 and 0.078 respectively). From the logistic regression, table 6.2.2-2, more communication variables were found to influence the uptake of FP. The factors representing interpersonal communication and mass media were important, as were husbands' influence and FWA's. Also important was the frequency of discussion with family planning workers. The higher and positive score of these variables made FP use likely. No socio-economic variable was found to be significant in explaining FP use. Thus it is established that communication has an important role in deciding both the family size and family planning use. Hence, hypothesis one is accepted. This was

confirmed when the interaction between FP use and total number of children were found to be influential in the path models.

Hypothesis 2 stated that communication has more impact than demographic variables. Regarding direct impact on the total number of children a mother has, the effects of communication variables is slight compared to traditional demographic and socio-economic variables. However, from the path model (table 6.3-3), FP use had a strong negative impact on the total number of children and the communication variables directly had a strong impact on the likelihood of adopting FP. From the logistic regression model of FP use (table 6.2.2-2), the combined odd-ratios for communication variables were substantially greater than the demographic variables and only demand for male child and death of male child are significant. No socio-economic variables entered the model. Thus hypothesis 2 is accepted that communication variables are having a greater impact than demographic variables on FP use.

Similarly hypothesis 3 postulated that the effect of communication variables on FP use would be greater than socio-economic variables. This has been clearly demonstrated in table 6.2.2-2, where no socio-economic variable was found to be significant in explaining the likelihood of using family planning, and communication variables husband, FWA, frequency of discussing with family planning workers, interpersonal communication and mass media all were positively associated with family planning use. Again from the final path model in figure 6.3-3, FP use (which is influenced by communication variables) has a direct influence on the total number of children. Thus communication has a greater impact on fertility behaviour than that of socio-economic variables.

Although hypothesis 4, i.e. the impact of interpersonal communication will not be fully tested until chapter 8, from the descriptive statistics and the regression and logistic regression analysis, it appears that mass media and interpersonal communication are important determinants of fertility behaviour.

From descriptive statistics, the main source of information was found to be interpersonal, i.e. friends and relatives (see table 6.1.2.6-1). Then the source of family planning information was mainly interpersonal- family planning field workers and health workers, friends, relatives were found to be much more important source of family planning information than mass media (see table 6.1.4-2). Finally it was found

that the factors that influenced most FP decision-making were also interpersonal. FWA and husband were found to be the two most important factors for influencing fertility behaviour (see figure 6.1.4-5). Interpersonal factors were found to be 7.5 times more influential than mass media factors, which points to the importance of interpersonal communication in determining fertility behaviour.

From the regression model (table 6.2.1-2), two communication variables were found to be significant- FWA and information score. FWA is an interpersonal communication variable and from the descriptive statistics women's information score was mainly constructed on their interpersonal source of information (see table 6.1.2.6-1). From logistic regression analysis (table 6.2.2-2), though mass media had the strongest impact compared to the other communication variables, the effect of interpersonal communication was spread across 4 variables and the combined impact of these is far greater than that of mass media. So hypothesis 4 is tentatively accepted and will be further investigated along with the testing of hypothesis 5 in chapter 8.

Chapter 7

Communication Networks in the Surveyed Areas

The communication network structures of the interviewed women in the seven villages and the district town *mahallah* are examined in this chapter. Data were collected in a full network basis in that one currently married woman with at least one child from each household (*khana*) of the entire village(s) and the *mahallah* was interviewed (for details see chapter 5). To understand the communication structures in the surveyed areas and test the sub-hypotheses (see Appendix 1), collected sociometric data were analysed using Ucinet-6 (Borgatti *et al* 2002). The aim was to identify the cliques, the prominent individuals in the network, the isolates, locate the liaisons (bridges), power actors, the overall position of all the actors within the network and their relation to contraceptive use. Variables representing these will then be derived and incorporated in the SPSS data set for statistical analysis to determine the relationship of various network positions and fertility behaviour. Thus this chapter is comprised of the following sections:

Section 1: selection protocol of network ties;

Section 2: formation of data matrices and measure the intensity of ties among individuals;

Section 3: measure of network properties;

Section 4: results of various network property analyses in each of the surveyed areas and test of sub-hypotheses;

Section 5: discussion.

7.1 Selection Protocol of Network Ties

To collect sociometric data the women were interviewed with a *free recall* (used by Rapoport and Horvath 1961; Moore 1979; Friedkin 1984; for details Wasserman and Faust 1999: 46) and *fixed choice* (Coleman *et al* 1957; for details Wasserman and Faust 1999: 47) questionnaire. The interviewees were asked to name up to five women in the village whom they perceived as their best friends (in the sense that they shared their feelings and emotions with them regularly and felt their opinions and various behavioural practices important in their lives). Almost all the interviewees first mentioned their husband's name as the best friend and tried to convince that other than

their husband they did not confide their problems or share their emotions with anybody. Next to husbands they frequently mentioned their mother-in-law(s) and other elderly ladies of the household as their first friend among women, this trend was very common among young women. The reason may be that normally village women are not permitted to travel freely and unaccompanied, also they are rarely involved in any jobs outside home (for details, see sections 6.1.2.2 and 6.1.2.8 in chapter 6). Besides husbands and elderly relatives of the household, most of the women mentioned the names of other wives of the *Bari* or *Para*. Some households of the same family members construct *Bari*. For example, the five sons of Mr X may live in the adjacent households separately with their wives and children and all those households are called together the “X *Bari*”. Most of the wives of this *Bari* are then *Ja* (husband’s brother’s wife) to each other. Most commonly women mentioned the names of these *ja-es* with whom they interacted. If the family is a very expanded one, sometimes the family itself makes a *Para* like Kazi para, Biswas para, Paul para and so on that means Kazies, Biswases, Pauls live in that area. In Hindu *para-s* within the villages it is also quite common that people of same profession live in the same para- shoe makers live in Rhishi para, pottery makers live in Kumar para or Paul para, black-smiths live in Karmakar para and so on. Normally women (except newly married) were found to have access to the other households within the same *para*. Also women had access to the women of other *para*, if they were relatives.

Though communication ties were recorded in “multiple-category nominal measures of relations”, more specifically for this research in five categories (friend, colleague, relative, opinion leader, FP worker), for simplicity, all the ties mentioned were “binarised” that is any tie mentioned was treated as friend. As the target audience of this research were only the women of reproductive age who were currently married with at least one child (for details, chapter 5), ties to husbands were not recorded and the relations with other elderly women who did not match the set criterion were excluded in the analysis. So at the first stage of data matrix formation,

- 1) ties only with the women who satisfied the set criterion were included; and
- 2) types of relations were treated as friends.

Within this selection protocol some ties were excluded. For example, in Balai Nagar village of Dhaka division 63 women mentioned 194 relations, i.e. 3.08 relations per

person. But after the cleaning procedure, 36 mentioned ties were excluded from the tie-list. So, 81.44 per cent ties mentioned were among the women who were within the network constructed. Following this procedure, the amount of ties among the women in Brhamin Shasan village of Sylhet division was 90.32 per cent, in village Jobra of Chittagong division 85.32 per cent, in Paygram village of Khulna division 84.5 per cent, in village Kamar Para of Rajshahi division 78 per cent, in village Royer Kathi of Barisal division 75 per cent, in Mohugao village of Dinajpur district 85.21 per cent and in Puratan Bazar *Mahallah* in Joypurhat district 75.71 per cent. Shown in table 7.1-1 are the per cent of ties mentioned within the network constructed.

Table 7.1-1: Ties Mentioned within Network Constructed

Study Area	Number of Women	Total Number of Ties	Tie Average	Excluded Ties	Tie within Nwk (%)	Total % of Ties within Network
BN	63	194	3.03	36	81.44	82
BS	74	248	3.51	24	90.32	
Jobra	97	293	3.02	43	85.32	
KP	84	227	2.7	50	78	
MG	81	257	3.17	38	85.21	
PG	197	766	3.9	119	84.5	
RK	98	322	3.29	80	75	
AP	30	70	2.33	17	75.71	

So, on average 82 per cent of ties mentioned were within the village women who at the time of interview were currently married and had at least one child. 18 per cent of the total ties on average were dropped as a result of this selection protocol.

7.2 Forming Data Matrices

Three types of data matrices were formed:

- one-to-one 'contact' matrix – a binary matrix indicating the existence of a tie;
- 'strength' matrix – a matrix depicting the strength of each of the links formed through factor analysis of frequencies of contact;
- 'approval' matrix - a matrix depicting approval of contraception in the links.

7.2.1 “Contact” Matrix

First, a one-to-one digraph matrix was formed in UCINET. The sociometrix of a digraph is constituted of elements x_{ij} equal to 1 if there is an arc from row node n_i to column node n_j , and 0 otherwise. Here the “choice” from i to j is substantively different from the “choice” from j to i , the entry in x_{ij} may be different from the entry in x_{ji} . Here, if actor i chose actor j , but j did not reciprocate, there would be a 1 in the x_{ij} cell and a 0 in the x_{ji} cell (for details, Wasserman and Faust 1994: 152). Digraph matrix was chosen due to the fact that in a communication system many may nominate one popular member but she (the popular member) does not necessarily also nominate all of them. The type of tie whether friend, colleague, relative and so on was ignored, simply whether a tie exists for the dyad and the direction (from who to whom) was recorded and presented as a square matrix.

	a	b	c	d	e	f
a	-	1	1	0	1	0
b	1	-	1	0	1	1
c	0	1	-	1	0	0
d	1	1	1	-	0	0
e	1	0	1	1	-	1
f	1	0	1	1	1	-

7.2.2 “Strength” Matrix

According to the communication network analysis literature, strong ties are important means of influence and control over the individual’s behaviour (Rogers and Kincaid 1981; Epstein 1961; Horwitz 1977). So another matrix was formed to represent tie-strength among the linked actors. This tie-strength was measured through a factor analysis of three network components:

- “meeting frequency (in an ordinal scale, daily=4, weekly=3, monthly=2, others=1)”;
- “frequency of seeking advice for mundane problems (never =1, seldom=2, often=3 and always = 4)”;
- “the perceived influence in personal decision making (in an ordinal scale, never=1, seldom=2, often=3 and always=4)”.

The score produced from this factor analysis using SPSS was then transformed into a non-negative scale using the arbitrary transformation:

$$\text{Strength} = (\text{factor analysis score for the actor}) * 3 + 10$$

This strength was then presented in a sociomatrix of valued digraphs. In a valued digraph the entry in cell x_{ij} is the value associated with the arc from n_i to n_j (for details, Wasserman and Faust 1999: 153). However, an imaginary example of a valued digraph structure may be as follows:

	a	b	c	d	e	f
a	-	12	19	0	11	0
b	25	-	11	0	21	17.5
c	11	10	-	29	0	0
d	9	11	13	-	7.5	10
e	9	0	11	11.75	-	12
f	11	0	7	21	19	-

To measure who is connected with whom with what strength and its influence on personal behaviour is the aim of forming this “strength” matrix. These strength-ties allow examination of the quality of relationships (Brass 1992) and the positions of actors within the networks (Wellman and Gulia 1999).

Here, value 1 was assigned to “never” with the consideration that all the “zero” were coded as missing values that is ‘no contact’ and may be person X does not go to person Y for mundane problem advice but talks to and considers Y as a good friend. For a field example, comparatively elderly women mention their younger ties as good friends, talk always with them but sometimes (though in a few cases) they told that they were not turning for mundane problem advice to her or even that they were discussing but not being influenced by their decisions. To address these unique cases (that is existence of ties but not dependency) values were assigned this way.

7.2.3 “Approval” Matrix

Another valued digraph sociomatrix was formed with the result extracted from the question whether the tie mentioned did “approve family planning (in an ordinal scale, never=1, seldom=2, often=3 and always=4)”. This valued digraph is given a name “approval” matrix, which is depicting approval of contraception among the links. The “approval” matrix is formed with the aim of a comparison reason, to check if there is any similarity with the people who are central and those who approve family planning. The structure of an approval matrix is similar to the strength matrix because it is depicting the strength of family planning approval among the actors. Following is an imaginary digraph of the approval matrix:

	a	b	c	d	e	f
a	-	4	1	0	3	0
b	2	-	4	1	0	3
c	1	2	-	4	0	0
d	4	1	3	-	2	0
e	3	0	0	2	-	0
f	0	3	0	0	0	-

Here also the value “1” was assigned to “never” in a similar way to the strength matrix, in order to avoid the situation of having good ties but having no access to discussion on this. In rural cultural settings of Bangladesh, person A and B can be very much alike in many characteristics and they both mention having strong ties with one another. But they can be involved in a type of relation (for example, one among them is an aunt-in-law to the other), which does not permit any discussion on a ‘taboo’ topic like family planning. To avoid the problem of mixing up with “0” in the matrix as missing value, “never” was assigned with “1” rather than “0”.

However, the aim of formation of these three matrices is to:

- ascertain the pattern of connectedness of the network members to give an overall picture of the network structure (cliques and so on);
- measure the *in-degree*, *out-degree* centrality and the *between-ness* centrality of the network members;

- iii. use bonacich power index to measure the power of actors in the network;
- iv. identify isolates and pendants in the network;

7.3 Measures of Network Properties

To examine the network patterns in each area, the basic properties of communication network analysed in this research were: actor centrality, actor power and clique structure. The concept is that the more central and the more popular actors have greater influence on the group's behaviour, either position implies that the association between friend's behaviour and a respondent's behaviour will be stronger when the respondent is located in a more central position within the friendship network. Also there should be an association between friend's behaviour and a respondent's behaviour. To attain this goal:

First, the actor centrality was measured by simply counting the nominations per actor using descriptive statistics in SPSS. Then also the *degree centrality* (both *in-degree* and *out-degree*) and *betweenness* centrality were measured of all the three matrices using UCINET 6 (Borgatti *et al* 2002).

Secondly, the cliques were identified using the non-valued symmetrised "contact" matrix.

Thirdly, the network structure was analysed to see the overall relational pattern.

Finally, profiles of some core actors are then summarised and presented.

7.3.1 Degree Centrality: The degree centrality measures the centrality of each actor in the network and summarises this result as proportion of the maximum possible degree for all actors. The way of measuring a person's degree centrality is simply to count the number of individuals that person is tied with. Actors who have more ties to other actors may be in an advantaged position and according to Hanmann (in UCINET-6 2002:), "because they have many ties, they are often third parties and deal makers in exchanges among others...So, a very simple, but often very effective measure of an actor's centrality and power potential is their degree". For directed data, it is again important to distinguish centrality based on *in-degree* and *out-degree*. Actors, who receive many ties, are perceived to be prominent or to have high prestige in that the

other actors mention their ties because they are important. This is *in-degree* centrality of an actor. Whereas the actors, who give many nominations to other actors, are perceived to be able to exchange to many others, or make many others aware of their views and thus they are perceived to be influential actors. This is *out-degree* centrality. With the “strength” matrix and the “approval” matrix, both *in-degree* and *out-degree* centrality were measured and the “contact” matrix data were symmetrised and an overall *degree centrality* score was computed.

7.3.2 Betweenness Centrality: The *betweenness* centrality measures the number of times (in this research the number of links) an actor remains between other disconnected actors. As many times that an actor is at this position that is the measure of that person’s *betweenness* centrality. Also the more that person holds this position, the more people are dependent on her/him to make connections with other people and thus that actor plays a central role. Unlike directed data in *degree* centrality, both incoming and outgoing nominations are used in making calculations for *betweenness* centrality.

7.3.3 Bonacich Power Index: The argument of Bonacich is, having the same degree (number of connections) does not necessarily make the actors equally important. Bonacich questioned the idea of “more central actors are more likely to be more powerful actors” (quoted in Hannemann 2000: 72). Bonacich proposed that both *centrality* and *power* were a function of the connections of the actors in one’s neighbourhood. The more connections the actors in any actor’s neighbourhood have, the more *central* that actor is. But the fewer the connections among the actors in one’s neighbourhood, the more *powerful* that actor is. The Bonacich power index was measured using all the three matrices for each village network constructed.

7.4 Results of Network Property Analysis: Communication Structures in Villages

As stated in section 7.3, the results of network property analyses in seven villages and the middle town *mahallah* are discussed in this section, which is presented below.

7.4.1 Balai Nagar: To determine the nominations each actor got from her fellow network members, a simple frequency measure was counted using SPSS. ID20 was found to receive the highest nominations. She got 9 nominations. Then ID63 got 7 nominations, ID17 got 6 nominations and both ID14 and ID22 got 5 nominations. In

addition, eight women got 4 nominations, seven women 3 nominations, 21 women got 2 nominations and the rest of the respondents got just one nomination. From this descriptive analysis it seems that women were tied mostly in small local groups. For more precise results, *degree centrality*, *betweenness centrality* and *Bonacich power index* are also computed and these are discussed in the following sections.

7.4.1.1 Degree Centrality: Both the *in-degree* and *out-degree* centrality were measured using the valued matrices, and the non-valued matrix. For the *degree* centrality measure with valued asymmetric data of both the “strength-matrix” and the “approval-matrix” it was found that for the *in-degree* centrality (that is nominations one actor gets from other actors), the 10 most central actors are almost the same actors for both matrices. More remarkably the ten most *degree* central actors in the symmetrised “contact matrix” are also almost the same people. ID20, ID63, ID22, ID17, ID55, ID47, ID52, ID21 are 8 common central actors in all the three matrices, irrespective of asymmetric or symmetric data. In addition, ID14 is common in both the asymmetric data, ID61 is common both in the *in-degree* centrality measure in the “strength matrix” and the symmetrised “contact matrix”. ID3 is common in the *in-degree* centrality measure in both the “approval matrix” and the symmetrised “contact matrix”. Only ID41 is a new inclusion in the symmetrised “contact matrix”. That means central actors in terms of *in-degree* centrality are also the actors who approve family planning.

For the *in-degree* centrality of the “strength matrix”, table 7.4.1.1-1, the mean and the standard deviation are 50.93 and 60.27 respectively, which means there is a lot of variability amongst the actors. Also for the *in-degree* centrality of the asymmetric “approval matrix”, the standard deviation (7.33) is higher than the mean (6.22), thus there is a lot of variation amongst the central and the periphery actors. The mean *degree* centrality measure for the symmetric data of the “contact-matrix” is 3.02 and the standard deviation is 2.44.

Table 7.4.1.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Balai Nagar

Strength Matrix		Approval Matrix		Contact Matrix	
In-degree Centrality		In-degree Centrality		Degree Centrality	
Mean	50.93	Mean	6.22	Mean	3.02
Standard Dev	60.27	Standard Dev	7.33	Standard Dev	2.44
Network Centralisation = 314.86%		Network Centralisation = 38.97%		Network Centralisation = 13.3%	
				Homogeneity = 2.63%	

For the *out-degree* centrality measure, 6 actors are common in both the “strength matrix” and the “approval matrix” among the 10 most central actors in the respective data matrices. These six actors are: ID41, ID28, ID39, ID17, ID42 and ID27. Thus 60 per cent of the 10 most *central* actors who nominate other actors, that is who have *out-degree* contacts, are common. This can be interpreted, as those who have more *out-degree* centrality are more likely to approve of family planning. But there is a considerable difference between the central actors who are sending and who are receiving higher nominations. Among the 10 most *central* actors in respect of the *out-degree* centrality, only three were common among the 10 most central actors of the *in-degree* centrality count within the “strength matrix”. For the “approval matrix”, 4 of the most central actors are common in both the *in-degree* and *out-degree* centrality. Hence there is a difference between the *prestigious* actors and the *influential* actors.

Table 7.4.1.1-2: Descriptive Statistics for *Out-degree* Centrality in Balai Nagar

Strength Matrix		Approval Matrix	
Mean	50.93	Mean	6.22
Standard Dev	34.49	Standard Dev	4.18
Network Centralisation= 139.65%		Network Centralisation = 16.03%	

As per the descriptive statistics, table 7.4.1.1-2, the mean for the *out-degree* centrality of the “strength matrix” is 50.93, and the standard deviation is 34.49. For the “approval matrix”, the mean of the *out-degree* centrality is 6.22 and the standard deviation is 4.18. This points to less variation within *out-degree* central actors in both the cases.

7.4.1.2 Betweenness Centrality: The 10 most *betweenness*-central actors are exactly the same in both the “strength matrix” and in the “approval matrix”. These 10 betweenness central actors are: ID 17, ID 63, ID 15, ID 25, ID 14, ID 3, ID 20, ID 55, ID 39, ID 47. This means that the 10 most influential actors are the same people who also approve family planning. For the symmetric “contact matrix”, 6 out of the 10 most

betweenness central actors are same in both the “strength” and the “approval” matrices. Thus the actors who are in the position of controlling information are at the same time the central actors who are approving family planning.

Table 7.4.1.2-1: Descriptive Statistics for *Betweenness* Centrality in Balai Nagar

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	85.11	Mean	84.75	Mean	66.84
Standard Dev	160.00	Standard Dev	158.23	Standard Dev	123.78
Network Centralisation =15.8%		Network Centralisation = 15.8%		Network Centralisation= 31.57%	

For the “strength matrix”, see table 7.4.1.2-1, the mean *betweenness* is 85.11 and the standard deviation is 160 - almost double that of the mean. Thus there is a huge diversity among the actors’ *betweenness* centrality positions. Among the 63 actors, only 33 actors have any type of *betweenness* position. For the “approval matrix”, the mean *betweenness* is 84.75 and the standard deviation is 158.23, around double the mean. Thus a huge diversity is evident among the *betweenness* central actors. The difference in *betweenness* scores with the most central actor and the 4th ranking actor is more than 200, i.e. 672.67 and 462.5 respectively. Here also only 33 actors among 63 have any type of *betweenness* position. For the “contact matrix”, the standard deviation is around double the mean *betweenness* in the “approval matrix”. Thus only a few actors are at the *betweenness* central positions in all three matrices.

From both the *degree* centrality and *betweenness* centrality measures, one thing is clear so far, there is a positive relationship between centrality positions and family planning approval, as the more central and influential are the actors, the more they approve of family planning, i.e., more connected actors approve family planning more.

7.4.1.3. Bonacich Power Index: According to the Bonacich Power Index measure, 6 actors among the 10 most *powerful* actors in the “strength” matrix are the same in the “approval” matrix. Also six actors among the 10 most *powerful* actors in the symmetrised “contact” matrix are the same in the “approval” matrix. So, on average 60 per cent of the most *powerful* actors in all the three matrices are similar and these approve of family planning.

Table 7.4.1.3-1: Descriptive Statistics for *Bonacich Power Index* in Balai Nagar

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	51.15	Mean	6.22	Mean	3.02
Standard Dev	34.72	Standard Dev	4.18	Standard Dev	2.44

As per the descriptive statistics, the mean *power* is higher than the standard deviation in all the three matrices, see table 7.4.3.1-1. Thus the diversity among the *powerful* actors is less than that of the *in-degree* central actors, and the *power* structure is likely to be more local than central.

7.4.1.4 Network Structure: To obtain an overall picture of all the actor positions and the relation of these positions to fertility behaviour, the full network was drawn from the “contact matrix” using Netdraw. The central actors (*degree*, *betweenness* and *power*), pendants (actors who have only one contact) and the isolates are identifiable from this picture. For example, from the figure 7.4.1.4-1, one can easily identify the most nominated *in-degree* central actors like ID20, ID22, ID63, ID55, ID47, ID52 and ID 3; the *out-degree* central actors like ID41, ID28, ID39 and ID 15; actors who are at *betweenness* central positions like ID17, ID63, ID15, ID25, ID14, ID3, ID20 and ID55; and also the *powerful* actors like ID41, ID28, ID39, ID15, ID17 and ID 22. To see the impact of these network positions on fertility behaviour, actors who practise family planning were identified with blue colour, and those who do not practise are coloured with red. More importantly for this research, all those who do not practice family planning are either isolates or pendants. The only isolate practising family planning is actor ID56, see figure 7.4.1.4-1.

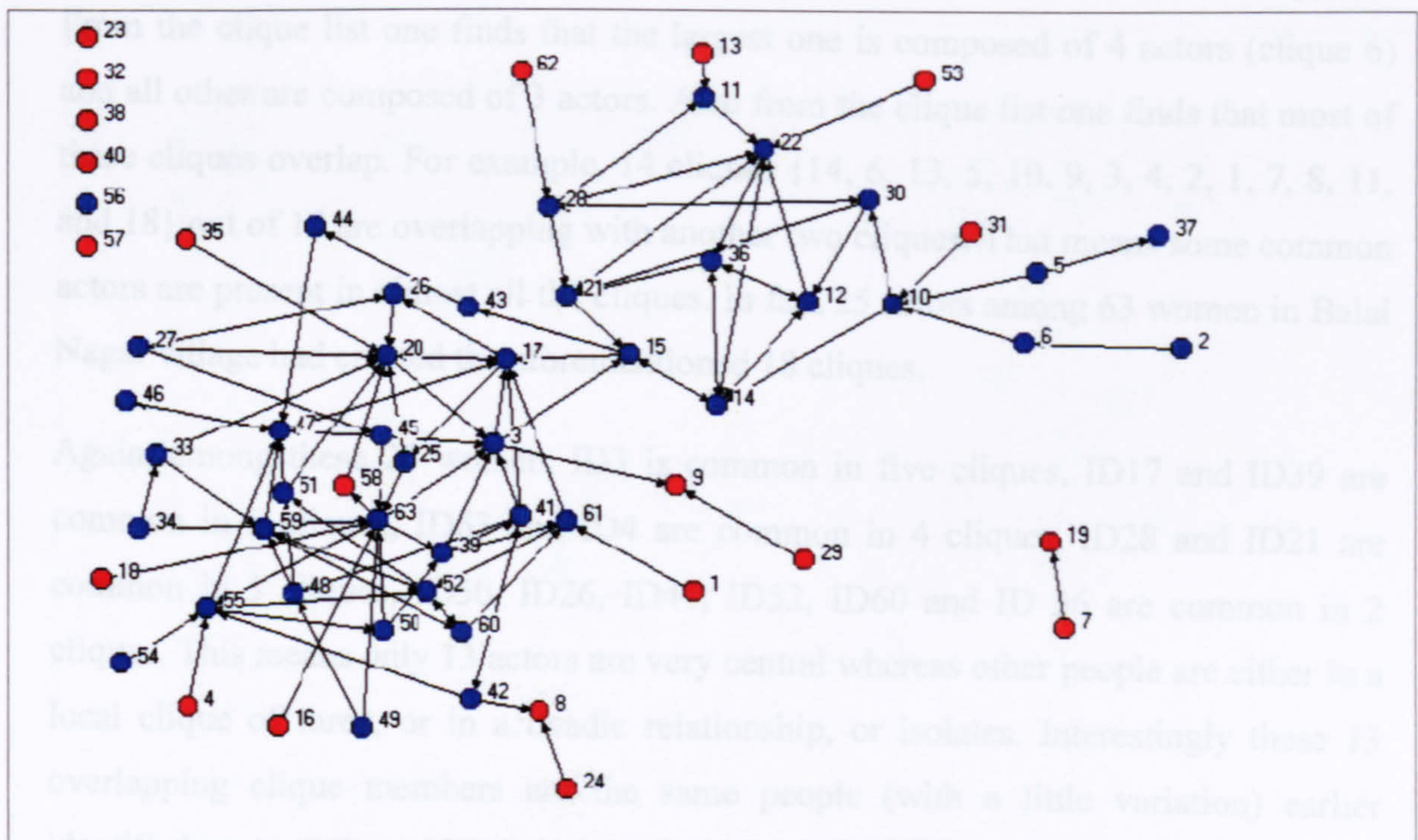


Figure 7.4.1.4-1: Network structure of Symmetric Ties in Balai Nagar

Note: Line lengths and angles in the sociogram have no analytical significance.

7.4.1.5 Cliques and Subgroups: A clique is a sub-set of actors who are more closely tied to each other than they are to the other actors of the network. The idea of sub-structures or groups or cliques within a network is a powerful tool for understanding social structure and the embeddedness of individuals. To reveal this embeddedness the clique-structures have been analysed using the symmetrised “contact matrix”. Altogether 18 cliques were found these are:

- 1: 3 39 63
- 2: 3 45 63
- 3: 39 50 63
- 4: 50 55 63
- 5: 11 22 28
- 6: 12 14 22 36
- 7: 3 15 17
- 8: 3 17 20
- 9: 17 20 25
- 10: 17 20 26
- 11: 3 17 41
- 12: 20 26 27
- 13: 21 22 28
- 14: 21 22 36
- 15: 21 28 30
- 16: 3 39 41
- 17: 52 59 60
- 18: 52 60 61

From the clique list one finds that the largest one is composed of 4 actors (clique 6) and all other are composed of 3 actors. Also from the clique list one finds that most of these cliques overlap. For example, 14 cliques {14, 6, 13, 5, 10, 9, 3, 4, 2, 1, 7, 8, 11, and 18} out of 18 are overlapping with another two cliques. That means some common actors are present in almost all the cliques. In fact 25 actors among 63 women in Balai Nagar village had created the aforementioned 18 cliques.

Again, among these 25 women, ID3 is common in five cliques, ID17 and ID39 are common in 5 cliques, ID63 and ID4 are common in 4 cliques, ID28 and ID21 are common in 3 cliques, ID50, ID26, ID41, ID52, ID60 and ID 36 are common in 2 cliques. This means only 13 actors are very central whereas other people are either in a local clique of three, or in a dyadic relationship, or isolates. Interestingly these 13 overlapping clique members are the same people (with a little variation) earlier identified as central people in *degree* centrality and *betweenness* centrality measures. This actor-by-actor overlapping through cliques is displayed in figure 7.4.1.5-1. 26 actors are not members of a clique. They are ID1, ID2, ID4, ID5, ID6, ID7, ID8, ID9, ID10, ID13, ID16, ID18, ID19, ID23, ID24, ID29, ID31, ID33 and ID34. The association between the clique structures and family planning practice is also displayed in figure 7.4.1.4-1. Actors who practise family planning are coloured with green and the non-practitioners are marked with red.

Two points are worth mentioning that i) in clique analysis using UCINET 6 all the ties become symmetrised automatically (shows the reciprocal relationship only), so isolates identified with directed and asymmetric data and the isolates with these symmetrised data are not the same, and ii) actors who are not in any clique whatever their link numbers are, remain as isolates and pendants.

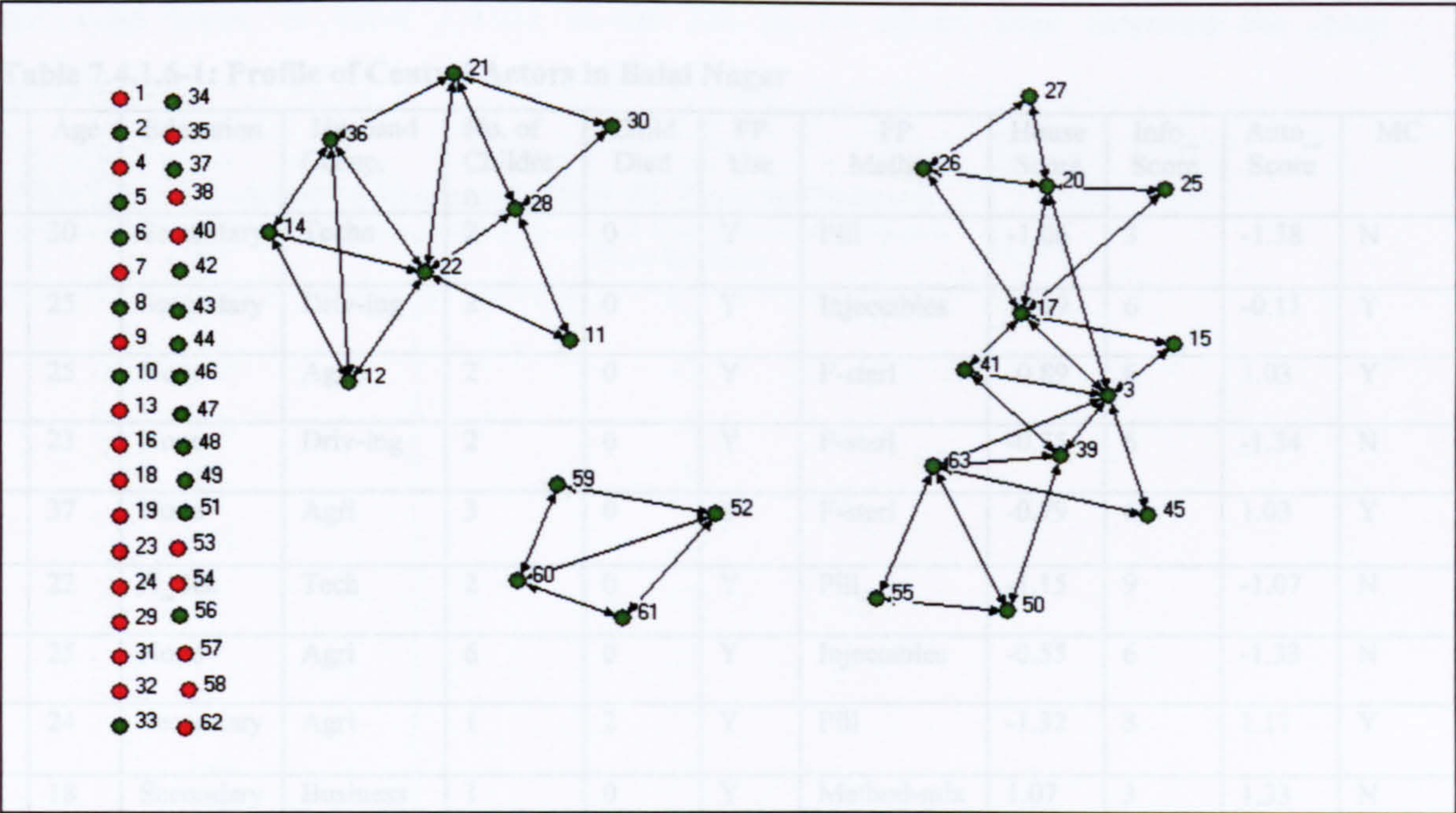


Figure 7.4.1.5-1: Actor-by-actor Clique Overlapping Structure in Balai Nagar Network

Interestingly, all the actors in cliques and the overlapping cliques in the figure 7.4.1.5-1 practise family planning.

7.4.1.6. Profile of Central Actors: Reviewing all the *degree central*, *betweenness central* and *powerful* actors in Balai Nagar village, some socio-economic and demographic characteristics of the 13 most connected actors are presented in table 7.4.1.6-1.

From the table 7.4.1.6-1, the mean age of the central 13 actors is 25.38 years, which is almost the same as the network mean of 25.94 years. So as per age, these central actors represent the average women age of this network construct. 7 central actors out of the 13 have no education (53.85 per cent), which is even a little higher than that of the network average of 46 per cent. For the level of education, 4 have secondary education, 30.76 per cent against the network average of 23 per cent and 7.69 per cent have higher secondary education against the network average of 3.2. Husband's occupation of 8 central actors is agriculture or agriculture related (61.53 per cent) against the network average of 77.8 per cent. So, in terms of husband's occupation, the rate of involvement in agricultue is a little lower than that of network average. The average number of children of these central actors is 2.23, similar to the network average of 2.22. Only one central actor has the experience of child death whereas 11.2 per cent of the women in the network have this experience.

Table 7.4.1.6-1: Profile of Central Actors in Balai Nagar

Actor	Age	Education	Husband Occup.	No. of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 17	30	Secondary	Techn	2	0	Y	Pill	-1.06	3	-1.38	N
ID 3	25	Secondary	Driv-ing	2	0	Y	Injectables	-1.39	6	-0.11	Y
ID 14	25	None	Agri	2	0	Y	F-sterl	-0.89	6	1.03	Y
ID 15	23	None	Driv-ing	2	0	Y	F-sterl	-0.75	6	-1.34	N
ID 22	37	None	Agri	3	0	Y	F-sterl	-0.79	6	1.03	Y
ID 20	22	H_Sec	Tech	2	0	Y	Pill	-1.15	9	-1.07	N
ID 63	25	None	Agri	6	0	Y	Injectables	-0.55	6	-1.33	N
ID 47	24	Secondary	Agri	1	2	Y	Pill	-1.32	8	1.17	Y
ID 39	18	Secondary	Business	1	0	Y	Method-mix	1.07	3	1.33	N
ID 27	19	Primary	Agri	2	0	Y	Pill	-1.22	7	0.81	N
ID 41	25	None	Agri	2	0	Y	F-sterl	-0.73	7	1.25	Y
ID 52	32	None	Agri	2	0	Y	M-sterl	-0.26	6	0.9	Y
ID 55	25	None	Agri	2	0	Y	Pill	-0.77	6	-0.06	Y
Village average/ mode	26	None	Agri	2.22	0.13	Y (66.7 %)	Pill (34.9%)	-0.78	6.5	0.49	Y (69.1 %)

All the central actors (100 per cent) practise family planning, which is much higher than the network average of 66.7 per cent, and they are using modern methods. The highest used method in the network is pill, 34.9 per cent, and pill is also the highest used method among the central actors. Housing score among the central actors is -0.75, which is very close to the network average of -0.78. The information score of the central actors is 6.07 and the network average of this is 6.48. Interestingly the average female autonomy score among the central actors is 0.17, which is much lower than that of the network average of 0.49. Affiliation with any type of micro-credit organisation is highest in Balai Nagar compared to other villages, 69.1 per cent. Among the 13 central actors, 7 are affiliated with a micro-credit organisation. Thus except for FP use rate and child death score there are not many significant characteristics that make these central actors different from average network actors.

7.4.2 Paygram: Paygram is a big village where 197 women were interviewed in the network constructed. Nominations to central actors are also higher compared to other

surveyed areas. In table 7.4.2-1 is the list of 14 actors who received the most nominations:

Table 7.4.2-1: Nomination Frequency Table for Paygram Network

ID	Nominations
176	23
111	17
196	16
16	16
140	14
33	12
57	12
157	11
164	10
132	9
174	9
153	9
187	8
179	8

Besides these actors, 3 other actors got 7 nominations, 3 actors got 6 nominations, 5 actors got 5 nominations, 16 got 4 nominations, and 24 actors got 3 nominations. The others were either with 2 or 1 nominations. Only two actors were found to be isolates: ID 30 and ID 43. From this simple frequency count one can observe that there are some very central actors form the local cliques.

7.4.2.1 Degree-centrality: For both the valued asymmetric matrices, i.e. the “strength” and the “approval” matrices, and the symmetric “contact” matrix the 15 most *in-degree* central actors were almost the same. They are ID76, ID196, ID16, ID140, ID57, ID179, ID153, ID164, ID33, ID174, ID116, ID111, ID157, ID132, ID187 and ID51. However, ID132 and ID51 are not common in the “strength” matrix, and ID51 is not common in the “contact” matrix. Thus the *in-degree* central actors are the actors who are perceived to approve of family planning.

Table 7.4.2.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Paygram

Strength Matrix		Approval Matrix		Contact Matrix	
In-degree Centrality		In-degree Centrality		Degree Centrality	
Mean	71.35	Mean	9.04	Mean	4.31
Std dev	80.86	Std dev	12.54	Std dev	3.26
Network Centralisation= 173.72%		Network Centralisation = 43.06%		Network Centralisation = 9.64%	
				Homogeneity = 0.80	

From the table 7.4.2.1-1, as the mean for the *in-degree* centrality of the “strength” matrix is 71.35 and the standard deviation is 80.86, actors in this village are embedded with overall more than 71 per cent tie density and there is a lot of variation within *in-degree* central actors. Some people are very central. Also for the *in-degree* centrality of the asymmetric “approval” matrix, the standard deviation 12.54 is much higher than that of the mean 9.04, which indicates that there exists a lot of variation amongst the central and the peripheral actors. The mean of *degree-centrality* measure for the symmetric “contact” matrix is 4.31 and the standard deviation is 3.26. Only for the “contact” matrix, actors are embedded with greater tie density than the diversity among actors.

For the *outdegree* centrality measure, both for the “strength” and the “approval” matrices central actors are totally different from the *in-degree* centrality measure. Only ID153 in the “strength” matrix, and ID153 and ID152 in the “approval” matrix are common in the *in-degree* centrality measures. But there is similarity in *outdegree* central actors between both the valued matrices.

Table 7.4.2.1-2: Descriptive Statistics for *Out-degree* Centrality Measure in Paygram

Strength Matrix		Approval Matrix	
Out-degree Centrality		Out-degree Centrality	
Mean	71.35	Mean	9.04
Std dev	35.75	Std dev	4.05
Network Centralisation = 51.1%		Network Centralisation = 4.59%	

The mean for the *out-degree* centrality of the “strength” matrix is 71.35 and the standard deviation is 35.75. For the “approval” matrix, the mean 9.04 is greater than the standard deviation 4.05. Hence, there is less variation among actors who send

nominations than among those who receive nominations. Thus overall the variation of *out-degree* central actors is less than that of the *in-degree* central actors in both cases.

7.4.2.2 Betweenness Centrality: The 15 *betweenness* central actors are exactly the same for both the “strength” and the “approval” matrices. They are ID157, ID76, ID140, ID136, ID 111, ID182, ID196, ID74, ID153, ID164, ID158, ID16, ID01, ID174 and ID150. For the “contact” matrix all except two of the central actors are the same as in these two matrices. Instead of ID158 and ID136 in the “strength” and the “approval” matrices, ID69 and ID57 are the other two *betweenness* central actors in the “contact” matrix. So the actors who are most influential having the position of controlling information are also the central actors of approving family planning.

Table 7.4.2.2-1: Descriptive Statistics for *Betweenness* Centrality Measure

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	487.18	Mean-	486.84	Mean-	271.07
Std dev	743.61	Std dev-	741.46	Std dev-	509.15
Network Centralisation = 9.53%		Network Centralisation = 9.51%		Network Centralisation = 19.96%	

From table 7.4.2.2-1, the standard deviations for all the three matrices, i.e. “strength” 743.61, “approval” 741.46 and “contact” 509.15 are much higher than that of the mean *betweenness*, which are 487.18, 486.84, and 271.07 respectively. So, there is a huge diversity in *betweenness* centrality. Among the 197 actors, regarding both the “strength matrix” and the “approval matrix”, there is no *betweenness* position for 57 of the women, whereas for the “contact matrix” only 6 have no *betweenness* position.

7.4.2.3 Bonacich Power Index: In all the three matrices, the mean actor *power* is almost double the standard deviation, see table 7.4.2-1. Thus, *power* structure is described as local rather than central. Though the central *power* actors are similar in all the three matrices, they are different from the *degree* central and *betweenness* central actors. Very few actors from the *centrality* measures are common in Bonacich’s Power Index.

Table 7.4.2-1: Descriptive Statistics of Bonacich Actor Power in Paygram

Strength matrix		Approval matrix		Contact matrix	
Mean	70.73	Mean	70.73	Mean	4.29
Std Deviation	35.94	Std Deviation	35.94	Std Deviation	3.26

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1: 60 76 111
2: 75 76 111
3: 76 85 111
4: 76 89 111
5: 63 64 76
6: 63 68 76
7: 64 66 76
8: 74 75 76
9: 76 80 81
10: 76 89 90
11: 4 16 32
12: 1 4 16
13: 6 16 17
14: 9 10 16
15: 10 11 16
16: 1 10 16
17: 11 16 17
18: 14 51 57 98
19: 16 17 18 20
20: 15 16 17
21: 16 45 46
22: 28 29 33
23: 42 94 96
24: 42 123 132
25: 49 51 57
26: 51 57 61
27: 51 57 58
28: 79 111 157
29: 84 85 111
30: 89 91 111
31: 91 111 116
32: 91 93 116
33: 92 93 116
34: 94 96 97
35: 99 111 114
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38: 108 109 112 115
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61: 161 162 163 164
62: 164 167 168
63: 164 167 170

64:	164	166	170
65:	166	170	171
66:	170	171	174
67:	170	174	182
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69:	172	174	182
70:	174	175	179
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76:	183	187	196
77:	183	190	196
78:	183	184	196
79:	184	191	196
80:	185	187	191
81:	187	191	195 196
82:	187	188	195
83:	187	192	196
84:	189	194	197
85:	189	192	197

Presented in figure 7.4.2.5-1 is the overlapping clique-structure of symmetrised ties in the Paygram network constructed. As Paygram is a big village, there are several *paras*. Careful observation shows that proximity is the main characteristics of these overlapping cliques. Some central people are also common in overlapping cliques. As the village is a very big one with 197 actors, it was difficult to present the real clique structures. However from the clique-overlapping figure it was found that cliques {22 and 37} are isolate cliques who do not overlap with any other clique. Cliques {34, 36, 38, 41, 43, 44, and 85} overlap at least another clique. The other cliques overlap more than one clique.

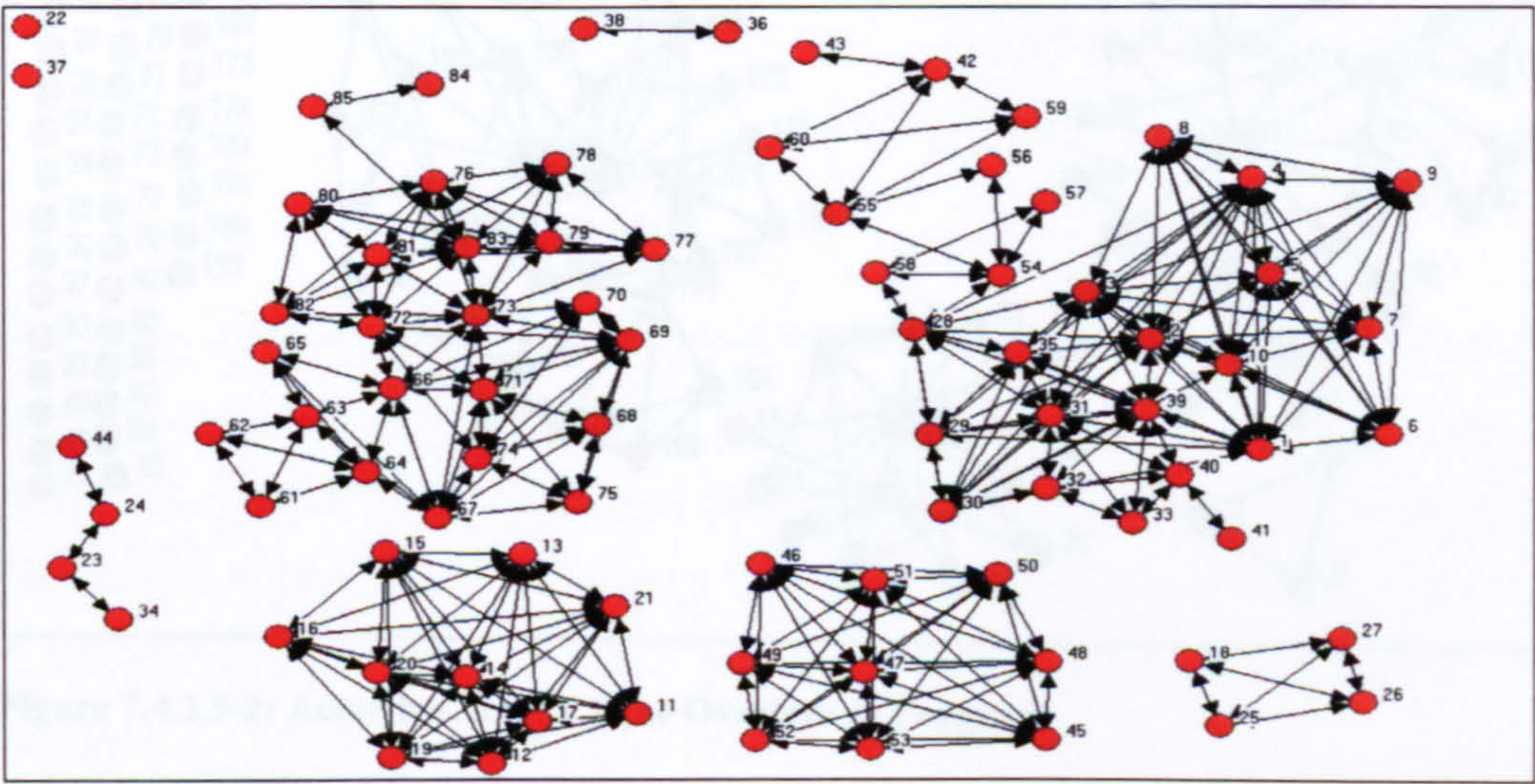


Figure 7.4.2.5-1: Clique-by-clique overlap in Paygram

From the clique list and the figure 7.4.2.4-2, it was again found that in this village some central actors are overlapping many cliques. For example, the most central actors ID76 and ID111 are overlapping 10 cliques, ID16 is overlapping 9 cliques, ID140, ID174, ID196 are overlapping 7 cliques and so on. Whereas ID2, ID3, ID5, ID7, ID8, ID12, ID13, ID19, ID21, ID22, ID23, ID24, ID25, ID26, ID27, ID30, ID31, ID34, ID35, ID36, ID37, ID38, ID39, ID40, ID41, ID43, ID44, ID47, ID48, ID50, ID52, ID53, ID54, ID55, ID56, ID59, ID62, ID65, ID67, ID69, ID70, ID71, ID72, ID73, ID77, ID78, ID82, ID83, ID86, ID87, ID88, ID95, ID104, ID105, ID106, ID110, ID113, ID119, ID124, ID126, ID128, ID129, ID130, ID138, ID148, ID165, ID169, ID173, ID178, ID180, ID181, ID186 and ID193, all together 73 actors, were found to be isolates in the sense they were not part of any clique. The significance of this clique structure is, in the Paygram network 29 actors do not practise any type of family planning method and 24 of these 29 non-practitioners are isolates or pendants. However, among the 4 clique-actors who do not practise family planning, 3 of them are the members of only one clique (see figure 7.4.2.5-2).

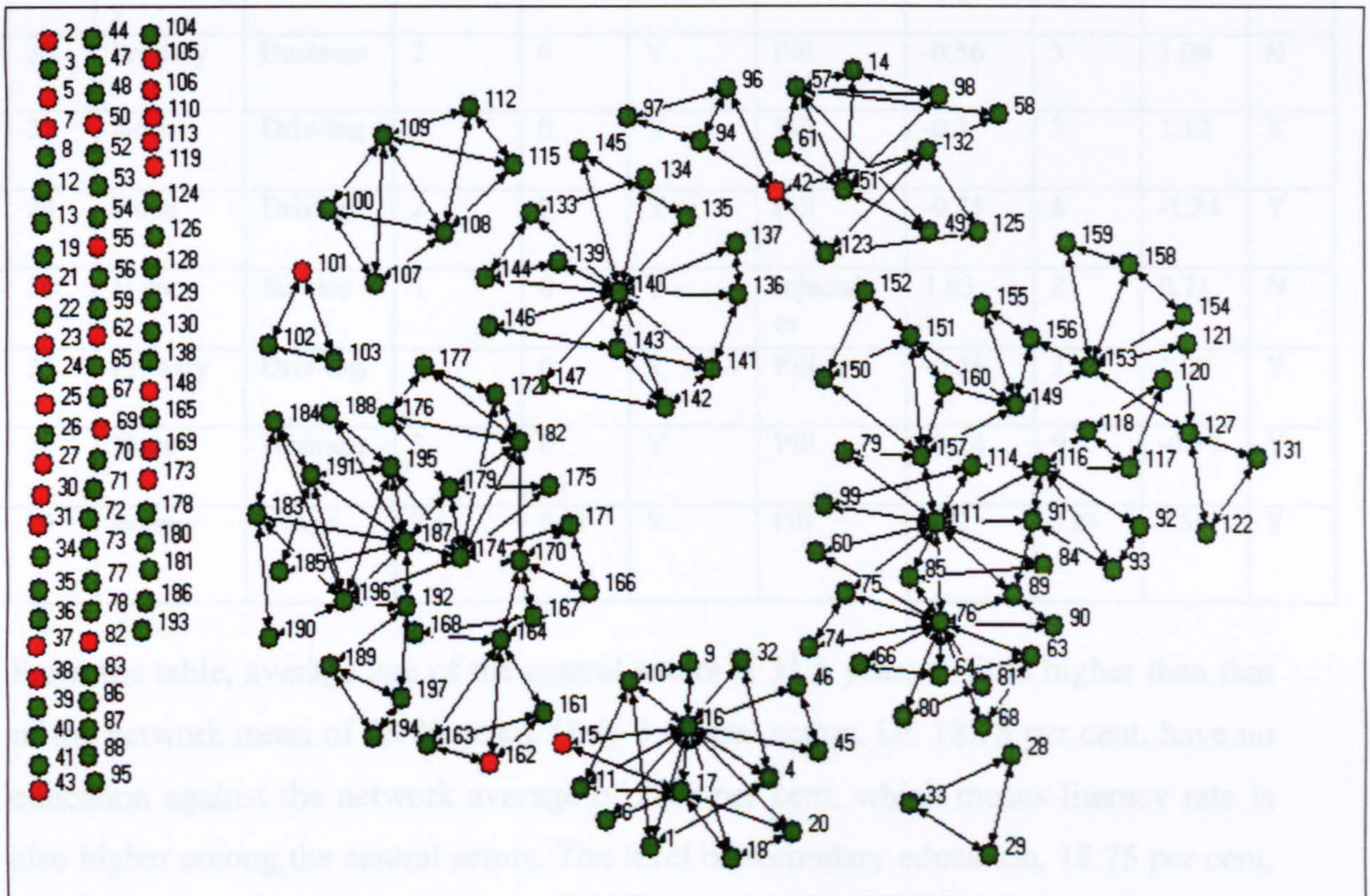


Figure 7.4.2.5-2: Actor-by-Actor Clique Overlaps in Paygram

7.4.2.6 Profile of Central Actors: The socio-economic and demographic characteristics of the 15 most central actors are presented in table 7.4.2.6-1.

Table 7.4.2.6-1: Profile of Central Actors in Paygram

Name	Age	Education	Husband Occup.	Number of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 76	27	Degree	Service	2	0	Y	Pill	2.24	12	0.9	N
ID 153	35	Primary	Labourer	5	0	Y	Pill	-0.56	3	1.09	Y
ID 196	35	Primary	Business	2	0	Y	Pill	-0.12	3	1.36	Y
ID 16	27	H-sec	Business	1	0	Y	Pill	-0.73	11	0.00	Y
ID 140	35	Primary	Service	3	0	Y	Pill	-0.56	2	1.09	N
ID 57	38	Primary	Agri	2	0	Y	Pill	1.43	12	0.92	Y
ID 164	36	Secondary	Service	3	0	Y	Pill	1.69	3	1.36	N
ID 174	28	Secondary	Jobless	1	0	Y	Pill	2.06	3	1.00	Y
ID 111	38	Degree	Business	3	1	Y	Pill	2.08	8	1.21	N
ID 157	21	Secondary	Business	1	0	Y	Pill	1.43	3	1.13	N
ID 132	30	Primary	Business	2	0	Y	Pill	-0.56	3	1.09	N
ID 116	35	None	Driving	2	0	Y	Pill	-0.1	3	1.12	Y
ID 80	24	None	Driving	2	0	Y	Pill	-0.75	6	-1.34	Y
ID 51	30	H-sec	Service	1	0	Y	Injectables	1.63	8	0.71	N
ID 127	35	Primary	Driving	2	0	Y	Pill	-0.56	3	1.09	Y
ID 112	30	None	Business	3	0	Y	Pill	-0.24	9	-0.37	Y
Village average /mode	29	Primary	N-Agri	2.6	0.18	Y	Pill	0.42	5.23	0.35	Y

From the table, average age of the central actors is 31.5 years, a little higher than that of the network mean of 28.86 years. Only 3 central actors, i.e. 18.75 per cent, have no education against the network average of 29.6 per cent, which means literacy rate is also higher among the central actors. The level of secondary education, 18.75 per cent, is more than double the network mean of 7.7 per cent. Also the levels of higher secondary, 12.5 per cent, and degree level, 12.5 per cent, are much higher than that of the network means of 2.6 and 2.0 respectively. Only one central actor's husband is involved in an agriculture related job. The mean number of children, 2.18, is also a

little lower than the network-mean, 2.59. Only one central actor experienced the death of a child that is 6.25 per cent, which is half of the network mean of 12.7 per cent. Family planning practice rate among the central actors is 100 per cent, which is much higher than that of the network mean of 85.3 per cent and all these actors use modern methods: 93.75 per cent of the central actors use pill whereas the network average is 64.5 per cent. Central actors average housing score is 0.52, information score is 5.75 and female autonomy score is 0.72; these are higher than the network means of 0.42, 5.23 and 0.35 respectively. 9 out of the 16 most central actors, 56.25 per cent, are affiliated with micro-credit organisation, which is quite similar to the network mode.

7.4.3 Kamar Para: Among 84 women of Kamar Para village network constructed, the top 16 nominated actors are listed below, table 7.4.3-1, while the others got 3 or less nominations, (16 actors got no nomination).

Table 7.4.3-1: Nomination Frequency Table for Kamarpara Network

ID	Nominations
18	12
5	10
53	10
76	6
22	6
25	5
60	5
59	5
32	5
36	4
62	4
10	4
43	4
33	4
15	4
35	4

7.4.3.1 Degree Centrality: For the asymmetric data of both the “strength” matrix and the “approval” matrix, 14 actors among the 15 *in-degree* central actors were the same. Only ID23 in the “strength” matrix and ID24 in the “approval” matrix were different in these two matrices. Also the *degree central* actors are almost the same. Only ID11 and ID12 in the “contact” matrix are not common in the lists of 15 most nominated *in-degree* central actors in valued matrices. It is clear that actors who are *in-degree* central are also the *central* actors of approving family planning in the Kamarpara network.

For both the “strength” and “approval” matrices, the standard deviations are greater than the mean *in-degree* centrality, see table 7.4.3.1-1. Thus there is a large diversity between the *in-degree* central actors.

Table 7.4.3.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Kamar Para

Intensity Matrix		Approval Matrix		Contact Matrix	
In-degree Centrality		In-degree Centrality		Degree Centrality	
Mean	53.73	Mean	5.95	Mean	3.07
Std deviation	65.26	Std deviation	7.46	Std deviation	2.68
Network Centralisation 286.93%		Network Centralisation 36.64%		Network Centralisation 12.25%	

For *out-degree* centrality, 10 central actors are common in both the “strength” and the “approval” matrices among the 15 most *out-degree* central actors, i.e. around 67 per cent are common. That means, of the actors who have most *out-degree* contacts, 67 per cent of them are also the actors who approve family planning. These *out-degree* central actors who are common in both the matrices are: ID11, ID9, ID34, ID36, ID20, ID18, ID33, ID24, ID25, and ID56. Though there is a significant difference among the actors who are *in-degree* central and who are *out-degree* central, 7 among the 15 most *out-degree* central actors are also the *in-degree* central actors in the “strength” matrix. Thus for the “strength” matrix, actors who are popular are also influential. For the “approval” matrix, 7 among the 15 *out-degree* central actors are also the *in-degree* central actors. This indicates that some of the *in-degree* central actors who approve family planning are also the *out-degree* central actors who approve family planning.

As per the descriptive statistics, table 7.4.3.1-2, in both the “strength” and “approval” matrices, the means 53.73 and 5.95 are greater than the standard deviations of 43.08 and 4.69 respectively. Diversity among the *out-degree* central actors is less than that of the *in-degree* central actors.

Table 7.4.3.1-2: Descriptive Statistics of Out-degree Centrality in Kamarpara

Intensity Matrix		Approval Matrix	
Mean	53.73	Mean	5.95
Std dev	43.08	Std dev	4.69
Network Centralisation = 84.612%		Network Centralisation = 9.813%	

7.4.3.2 Betweenness Centrality: For betweenness centrality, the 15 most *betweenness* central actors are similar for both the “strength” and the “approval” matrices. Only ID9 in the “strength” matrix is not common in the “approval” matrix, but has been replaced with actor ID17. Except for ID76, ID45 and ID17, all these *betweenness* central actors are the same as the *in-degree* central actors. So almost all the popular actors are also positioning at the role of controlling information. For the symmetrised “contact” matrix 9 *betweenness* central actors are the same as in the “strength” and the “approval” matrices.

For the *betweenness* centrality measure, in all three matrices, the standard deviation is around twice as much as the mean *betweenness*, see table 7.4.3.2-1. There is a huge variation among *betweenness* central actors.

Table 7.4.3.2-1: Descriptive Statistics for *Betweenness* Centrality Measure in Kamarpara

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	77.37	Mean	79.41	Mean	62.91
Stand dev	141.40	Stand dev	145.12	Stand dev	132.82
Network Centralization = 23.38%		Network Centralization = 24.31%		Network Centralization = 23.76%	

7.4.3.3 Bonacich Power Index: Bonacich Power analysis shows that for both the asymmetric “strength” and “approval” matrices and the symmetric “contact” matrix, the mean is greater than the standard deviation, table 7.4.3.3-1. So it is presumed that *power* structure is more local than central.

Table 7.4.3.3-1: Bonacich Power Index in Kamarpara

Intensity Matrix		Approval Matrix		Contact Matrix	
Mean	53.73	Mean	5.95	Mean	3.07
St dev	43.08	St dev	4.69	St dev	2.68

11 out of the 15 most *powerful* actors in the “strength” matrix are same in the “approval” matrix and 10 out of the 15 most *powerful* actors in the “strength” matrix are same in the “contact” matrix. So, most of the central *powerful* actors are the *powerful* actors who approve of family planning. The central powerful actors who are virtually common across all the three matrices are: ID11, ID9, ID34, ID36, ID59, ID20, ID18, ID33, ID24, ID56, ID14, ID32, ID25, ID53, ID20, ID23 though ID60, ID62 and ID12 in the “contact” matrix, ID23, ID40, ID3 and ID6 in the “approval” matrix, and ID32 and ID51 in the “strength” matrix are not common. Thus the central

actors irrespective of the *degree*, *betweenness* and *powerful* actors are similar in the Kamarpara network.

7.4.3.4 Network Structure: Figure 7.4.3.4-1 shows the network structure of Kamarpara, from which the *in-degree* central actors ID5, ID18, ID53, ID59, and ID56; *betweenness* central actors ID18, ID53, ID59, ID40, ID36, ID33, and ID76; *powerful* actors like ID24, ID11, ID25, ID33, ID53, ID18, and ID34 are visible. Also visible are the isolates. ID21, ID26, ID28, ID41, ID42, ID44, ID46, ID48, ID49, ID54, ID55, ID70, ID82, ID83 and ID84 are the isolates in this network.

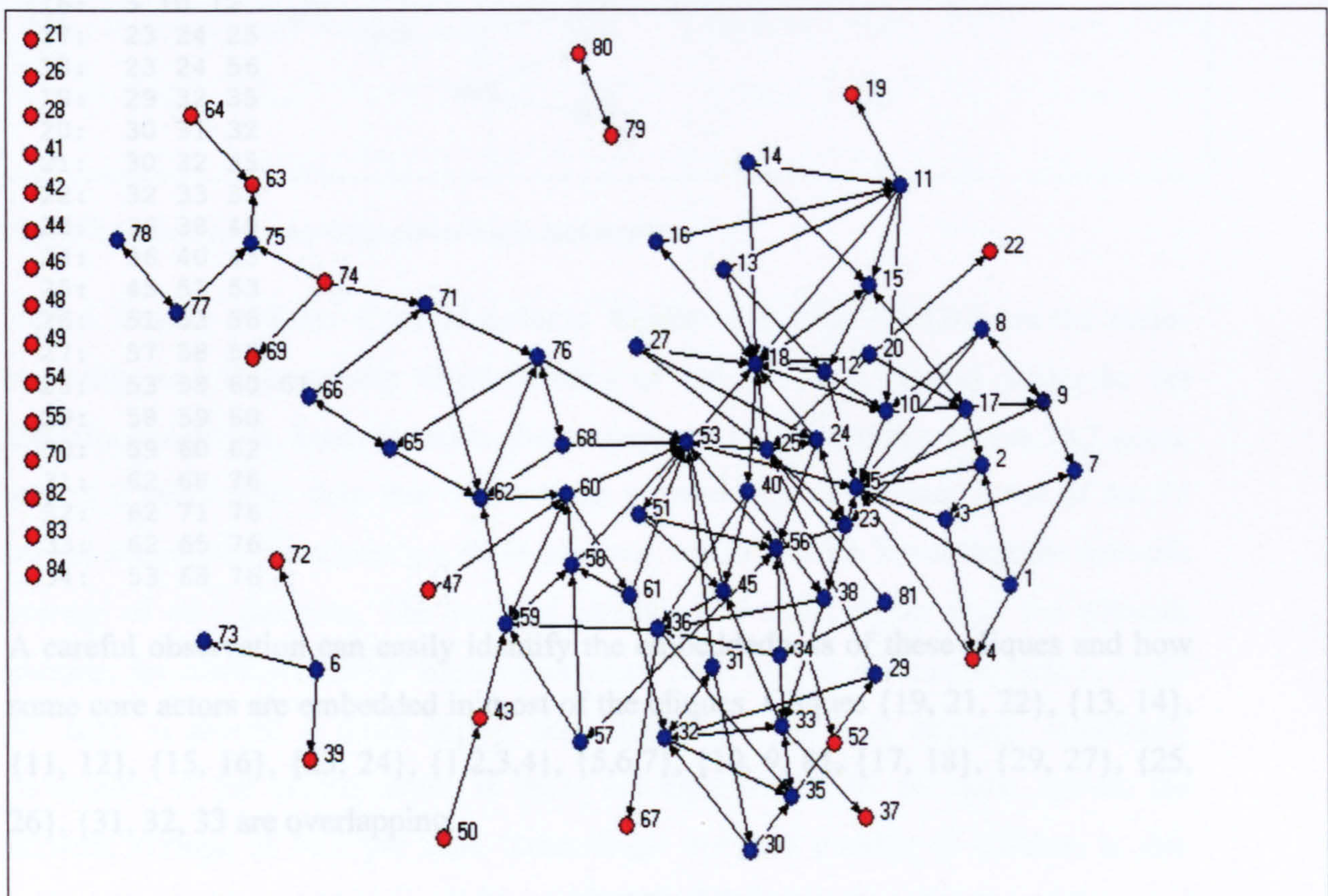


Figure 7.4.3.4-1: Network Structure in Kamarpara

The significance of this network structure and the structural positions of the central actors in fertility behaviour are also clear from this figure 7.4.3.4-1. Actors displayed in blue colours are the actors who practise family planning and actors with red do not practise. It is clear that isolates and pendants are the actors who do not practise family planning and the actors at the central positions practise family planning.

7.4.3.5 Cliques and Subgroups: Analysing symmetrised “contact” data 34 cliques were found. They were:


```

1:  11 14 15 18
2:  11 13 18
3:  10 11 18
4:  11 16 18
5:  10 12 18
6:  12 13 18
7:  12 15 18
8:  18 20 25
9:  18 24 25 27
10: 18 25 53
11:  2 3 5
12:  1 2 5
13:  3 4 5
14:  3 4 7
15:  5 8 9 10
16:  5 10 12
17: 23 24 25
18: 23 24 56
19: 29 32 35
20: 30 31 32
21: 30 32 35
22: 32 33 35
23: 36 38 40
24: 36 40 45
25: 45 51 53
26: 51 53 56
27: 57 58 59
28: 53 58 60 61
29: 58 59 60
30: 59 60 62
31: 62 68 76
32: 62 71 76
33: 62 65 76
34: 53 68 76

```

A careful observation can easily identify the embeddedness of these cliques and how some core actors are embedded in most of the cliques. Cliques {19, 21, 22}, {13, 14}, {11, 12}, {15, 16}, {23, 24}, {1,2,3,4}, {5,6,7}, {10, 9, 8}, {17, 18}, {29, 27}, {25, 26}, {31, 32, 33} are overlapping.

The actors who are overlapped in these cliques are recognisable in Figure 7.4.3.5-1. Also the actors who are sharing only one clique are shown here. Among 84 actors, 42 actors are forming and overlapping cliques. From the clique list and the actor-by-actor clique overlaps it is found that central actor ID18 is overlapping 10 cliques, ID53 and ID5 are overlapping 5 cliques, ID11, ID76, ID62 and ID12 are overlapping 4 cliques and so on. Another 42 actors are isolates or pendants, not part of any clique. In the Kamarpara network, 32 women do not use any family planning method. Among them, 31 are isolates in terms of clique membership, i.e they are out of any clique. Among the 42 clique members, only one actor ID 4 does not practice any family planning method.

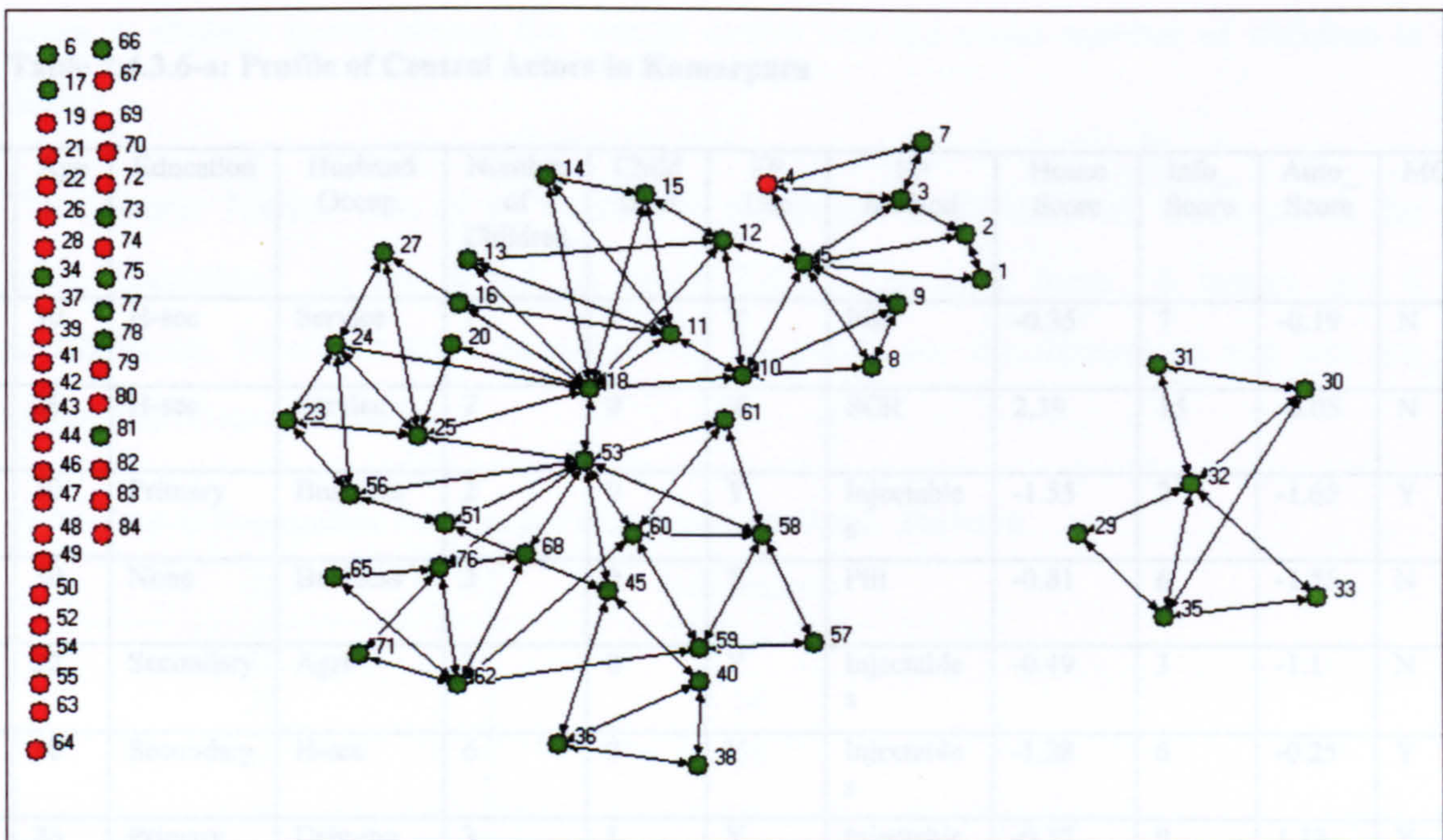


Figure 7.4.3.5-1: Actor-by-CliqueOverlap in Kamarpara

7.4.3.6. Profile of Some Central Actors: displayed in table 7.4.3.6-1 are the socio-economic and demographic characteristics of the 15 most *central* actors in the Kamarpara network. From the table, the average age of the central actors is 30.2 years, around 2 years more than that of the mean network age of women. 7 out of the 15 central actors have no education, 46.66 per cent, which is much lower than the network average of 60.7 per cent. The level of education is much higher than the network average, for example, rate of higher secondary level among the central actors, 13.33 per cent, is around 6 times higher than that of the network average. Husband's occupation of the central actors is more non-agricultural, 60 per cent, against the network average of 51.2 per cent. Interestingly the total number of children is also higher among the central actors, 3.06 against 2.7 of the network average, and the mean child-death, 0.4, is a little lower than that of the network average, which is 0.52. Use of family planning methods is 100 per cent among the central actors, much higher than that of the network average of 61.9 per cent, and the most used method is injection. 60 per cent of these central actors use injections while the network average of using injections is 29.8 per cent. There is no difference between housing scores, -0.26 is the central actors average and -0.25 is the network average. Information score is lower among the central actors, 4.88 against the network score of 5.86.

Table 7.4.3.6-a: Profile of Central Actors in Kamarpara

Name	Age	Education	Husband Occup.	Number of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 5	30	H-sec	Service	1	0	Y	Pill	-0.35	7	-0.19	N
ID 18	26	H-sec	Service	2	0	Y	SCR	2.39	15	-0.05	N
ID 53	30	Primary	Business	2	0	Y	Injectable s	-1.55	2	-1.65	Y
ID 56	30	None	Business	3	0	Y	Pill	-0.81	6	-1.56	N
ID 25	32	Secondary	Agri	7	0	Y	Injectable s	-0.49	3	-1.1	N
ID 62	30	Secondary	H-sec	6	0	Y	Injectable s	-1.28	6	-0.25	Y
ID 32	26	Primary	Driv-ing	3	1	Y	Injectable s	-0.37	9	1.13	Y
ID 15	30	Primary	Agri	4	0	Y	Pill	-1.18	3	1.21	Y
ID 60	30	None	Business	4	1	Y	Injectable s	0.65	6	-1.16	N
ID 59	25	None	Agri	2	0	Y	Pill	0.45	4	0.03	N
ID 36	38	None	Labo urer	3	3	Y	Injectable s	-0.07	6	-0.15	Y
ID 24	35	None	Agri	1	0	Y	Pill	-0.06	6	-1.25	N
ID 33	25	N	Labourer	2	0	Y	Injectable s	-0.06	6	-1.25	N
ID 9	30	Primary	Agri	2	0	Y	Injecables	-0.49	3	-1.47	N
ID 10	36	None	Agri	4	1	Y	Injectable s	-0.73	6	1.25	N
Village average /mode	29	None	Agri	2.7	0.52	Y	Pill	-0.25	5.86	-0.43	N

The female autonomy score, -0.43, is a little higher among the central actors than the network average of -0.54 but this difference is negligible. On average 33.33 per cent of the central actors are affiliated with micro-credit organisation, while the network average is 20.2 per cent. So compared to the network profile, the central actors are relatively maturer in terms of age, both their literacy rate and the level of schooling are higher, husband's occupation is more non-agricultural, the mean children death is lower, their family planning usage rate is 100 per cent and also their female autonomy score and micro-credit affiliation is higher. But the information score and the housing

score is slightly lower among the central actors and the mean number of children is higher

7.4.4 Royer Kathi: Out of 98 women in the Royer Kathi network constructed, the most nominated 14 are listed in table 7.4.4-1. Besides these, 8 actors got 4 nominations, 16 actors got 3 nominations, 28 actors got 2 nominations and rest got either one or no nomination.

Table 7.4.4-1: Nomination Frequency Table for Royer Kathi Network

ID	Nominations
37	15
51	14
48	10
9	9
18	6
2	5
60	5
79	4
16	4
65	4
68	4
25	4
27	4
22	4

7.4.4.1 Degree Centrality: With the asymmetric “strength” and the “approval” matrices, 13 *in-degree* central actors are the same. Only ID77 and ID78 in the “strength” matrix are not common in the “approval” matrix, which are replaced by ID42 and ID35. For symmetric “contact” matrix, only ID66 replaces ID42 of the “approval” matrix and ID66 and ID35 replace ID77 and ID78 of the “strength” matrix. Thus both the *in-degree* central actors and the *degree* central actors are also the *in-degree* central actors who approve of family planning.

For the *in-degree* centrality, the standard deviation is greater than the mean for both the valued matrices, see table 7.4.4.1-1. For the symmetric “contact” matrix, the mean *degree* centrality is slightly higher than the standard deviation. For both the “strength” and the “approval” matrices, there is a large variation in the *centrality* among network members.

Table 7.4.4.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Royer Kathi

Intensity Matrix		Approval Matrix		Contact Matrix	
In-degree Centrality		In-degree Centrality		Degree Centrality	
Mean	43.97	Mean	5.29	Mean	2.71
Std dev	77.89	Std dev	9.52	Std dev	2.6
Network Centralisation 436.564%		Network Centralisation 53.863%		Network Centralisation 13.98%	
				Homogeneity 1.96%	

For the *out-degree* centrality, 10 out of the 15 most *out-degree* central actors are common in both the “strength” and the “approval” matrices. Around 67 per cent of the *out-degree* central actors are also the *out-degree central* actors regarding family planning approval. As per descriptive statistics, the mean *out-degree* centrality is greater than the standard deviation in both the cases, see table 7.4.4.1-2. Also overall, the variation of the *out-degree* central actors is less than that of the *in-degree* central actors.

Table 7.4.4.1-2: Descriptive Statistics for *Out-degree* Centrality Measure in Royer Kathi

Strength Matrix		Approval Matrix	
Mean	43.97	Mean	5.29
Std dev	34.86	Std dev	4.15
Network Centralisation	77.16%	Network Centralisation	12.20%

7.4.4.2 Betweenness Centrality: For the “strength” and the “approval” matrices, the 15 most *betweenness* central actors are exactly the same actors. For the symmetric “contact” data, 10 central *betweenness* actors are same as the valued matrices. ID51, ID66, ID1, ID64, ID16, ID39, ID60 replaced ID36, ID35, ID33, ID72, ID78 and ID77 of the valued matrices. However, at least 10 *betweenness* central actors are the same actors who are *degree-central*. So, the actors who are popular are also at the position of controlling power. Or in otherwords, popular actors are at the same time bridges, liaisons in Royer Kathi.

As per descriptive statistics, for all the three matrices, the standard deviation is around three times higher than the mean, table 7.4.4.2-1. So the influencing actors in the position of controlling information are very much diversified and there exist some very central actors in terms of *betweenness* centrality.

Table 7.4.4.2-1: Descriptive Statistics for *Betweenness* Centrality in Royer Kathi

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	57.35	Mean	59.26	Mean	105.19
Std Dev	149.10	Std Dev	152.86	Std Dev	237.77
Network Centralisation = 8.80%		Network Centralisation = 8.95%		Network Centralisation = 27.27%	

7.4.4.3 Bonacich Power Index: 10 out of the 15 most *powerful* actors in Royer Kathi are the same in both the “strength” and the “approval” matrices. So most of the *powerful* actors are also the most *powerful* actors for approving family planning. For the symmetric “contact” matrix, most *powerful* actors are more similar to the *degree-central* and *betweenness* central actors than the *powerful* actors in the “strength” and the “approval” matrices.

As per descriptive statistics, the mean *power* is higher than the standard deviation in all the three matrices, table 7.4.4.3-1. So, variation in central *powerful* actors is less. It means here also *power* actors are very much local than central.

Table 7.4.4.3-1: Descriptive Statistics for Bonacich Power Index in Royer Kathi

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	44.42	Mean	5.29	Mean	2.71
Std Dev	34.7	Std Dev	4.1	Std Dev	2.6

7.4.4.4 Network Structure: From this network, figure 7.4.4.4-1, popular actors, bridges and liaisons and also the pendants and the isolates are identifiable. The centrality of ID51, ID37, ID48, ID 18, ID34, ID60, ID16, ID89 are easily identifiable and at the same time identifiable are pendants like ID90, ID93, ID85, ID38, ID4, ID61, ID52, ID81, ID11, ID80, ID96, ID44, ID24 and isolates ID3, ID5, ID6, ID8, ID19, ID23, ID53, ID54, ID67, ID73, ID75, ID88, ID95 and ID98.

In the Royer Kathi network, blue coloured actors practise family planning and red coloured do not practise. It is clear that actors who do not practise family planning are either isolates or pendants. None of the isolates practice family planning. Another interesting point is that actor ID48 is very central and although ID44 and ID96 are connected with ID48 they do not practise family planning. They are pendants and only speak with ID48. Both of them reported having a type of relation with ID48 that does not permit them to speak about family planning: ID48 is an aunt-in-law to both ID44 and ID96.

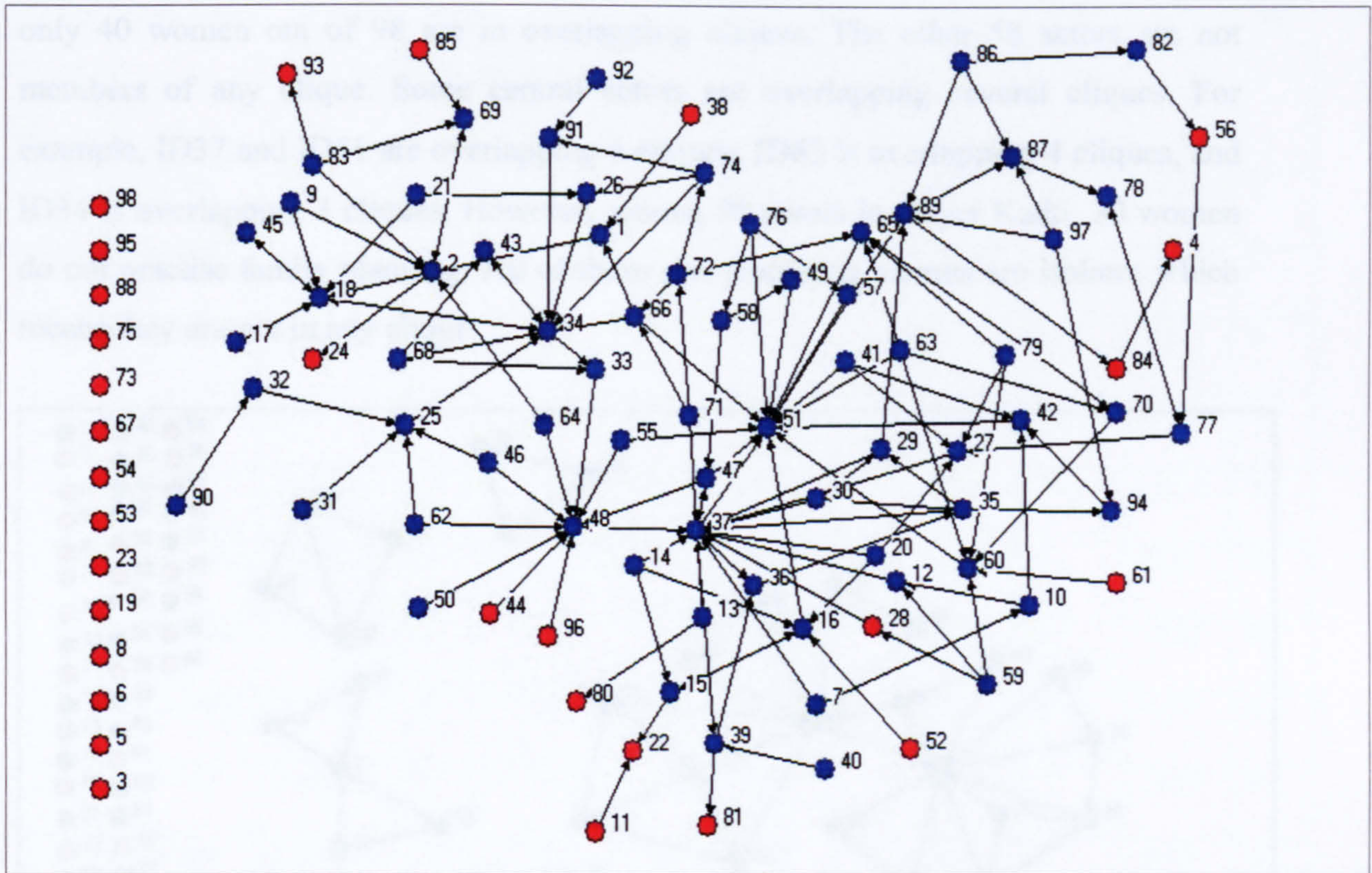


Figure 7.4.4.4-1: Network Structure in Royer Kathi

7.4.4.5 Cliques and Subgroups: Analysing symmetric “contact” data, 22 cliques were found. They are:

- 1: 29 30 35 37
- 2: 35 36 37
- 3: 20 27 37
- 4: 36 37 39
- 5: 37 47 48
- 6: 37 47 51
- 7: 2 9 18
- 8: 2 69 83
- 9: 14 15 16
- 10: 26 34 74
- 11: 33 34 68
- 12: 34 43 68
- 13: 34 74 91
- 14: 41 42 51
- 15: 51 57 76
- 16: 51 60 63
- 17: 60 63 70
- 18: 51 63 65
- 19: 63 65 70
- 20: 66 71 72
- 21: 86 87 89
- 22: 87 89 97

It is clear through the clique list that cliques {9 and 20} are isolate cliques, cliques {7 and 8}, and {21 and 22} are pendant cliques. Other cliques are more or less

overlapping. The clique patterns are presented in figure 7.4.4.5-1. From the clique list, only 40 women out of 98 are in overlapping cliques. The other 58 actors are not members of any clique. Some central actors are overlapping several cliques. For example, ID37 and ID51 are overlapping 5 cliques, ID63 is overlapping 4 cliques, and ID34 is overlapping 3 cliques. However, among 98 actors in Royer Kathi, 30 women do not practise family planning. All of these non-practising women are isolates which means they are not in any clique.

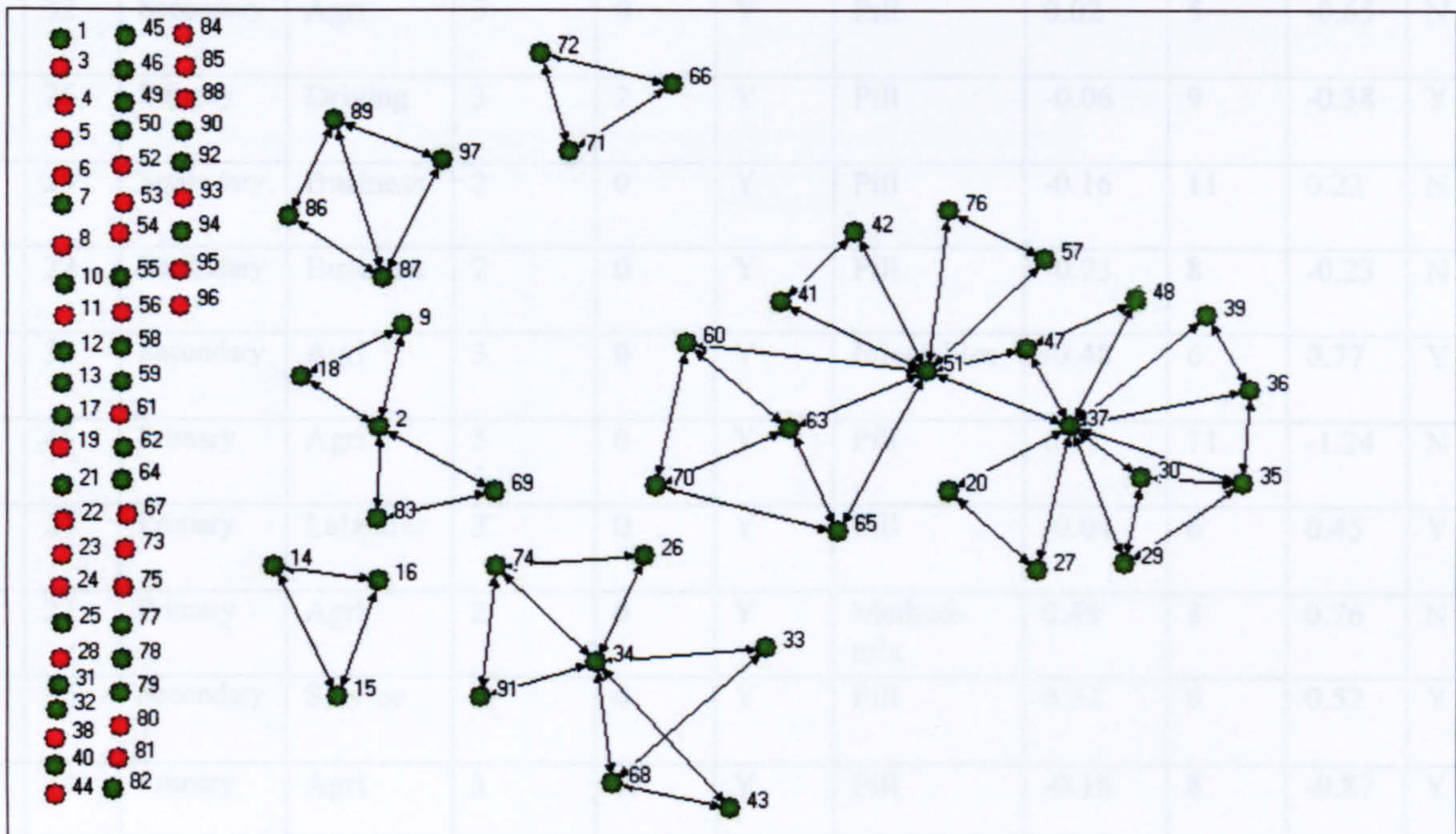


Figure 7.4.4.5-1: Actor-by-actor CliqueOverlap in Royer Kathi

7.4.4.6 Profile of Some Central Actors: Reviewing all the *degree* central, *betweenness* central and central *powerful* actors in the Royer Kathi network, some socio-economic and demographic characteristics of the 14 most central actors are listed here to show their profile, see Table 7.4.4.6-1. In the Royer Kathi network, as presented in figure 7.4.4.6-1, average age of the central actors is 30.57 years, which is around 2 years more than that of the network average. School attendance is 100 per cent among the central actors, whereas the network average is around 86.7 per cent. Also the level of education is higher among the central actors, for example, 35.71 per cent of the central actors have education of secondary level against the network average of 28.6 per cent.

Table 7.4.4.6-1: Profile of the Central Actors in Royer Kathi

Name	Age	Education	Husband Occup.	Number of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 37	35	Primary	Agri	3	0	Y	Pill	-0.01	11	-1.19	Y
ID 51	35	Primary	Agri	6	0	Y	Injectables	-0.87	5	0.93	Y
ID 48	37	Degree	Property	2	0	Y	SCR	2.16	15	0.92	N
ID 34	32	Secondary	Agri	3	0	Y	Pill	0.02	5	-0.65	N
ID 60	26	Primary	Driving	3	2	Y	Pill	-0.06	9	-0.38	Y
ID 02	25	Secondary	Business	2	0	Y	Pill	-0.16	11	0.22	N
ID 25	22	Secondary	Business	2	0	Y	Pill	-0.03	8	-0.23	N
ID 18	37	Secondary	Agri	3	0	Y	Injectables	-0.48	6	0.77	Y
ID 89	45	Primary	Agri	5	0	Y	Pill	0.31	11	-1.24	N
ID 16	27	Primary	Labourer	3	0	Y	Pill	-0.04	6	0.45	Y
ID 14	22	Primary	Agri	2	0	Y	Method-mix	0.48	8	0.76	N
ID 47	36	Secondary	Service	3	0	Y	Pill	0.52	6	0.52	Y
ID 20	24	Primary	Agri	3	0	Y	Pill	-0.18	8	-0.87	Y
ID 87	25	Primary	Agri	3	1	Y	Pill	-0.05	6	0.56	N
Village average /mode	29	Primary	Agri	2.53	0.28	Y	Pill	0.14	7.43	-0.25	N

Agriculture as husband's occupation among the central actors is 64.28 per cent, much higher than the network average of 40.8 per cent. The mean number of children is higher among the central actors, 3.07 compared to the network average of 2.53. The mean children death, 0.21, is a little lower among the central actors than the network average of 0.27. The use of family planning method is 100 per cent among the central actors, the network average is 68.4 per cent. 71.42 per cent of the central actors use the pill as the family planning method, this rate is 49 per cent for the network average though the pill is the highest used method in the Kamarpara network. Both the information score, 8.21, and female autonomy score, 0.4, are higher among the central actors than the network average, which are 7.43 and -0.25 respectively but the housing score is lower than the network average. The central actors micro-credit organisation

affiliation, 50 per cent, is higher than the network average of 41.8 per cent. So, in the Royer Kathi village network, on average the central actors are more mature in age, their education rate and level both are higher, number of children is higher and the children death rate is lower, usage of family planning is much higher and also higher is the information score, female autonomy score and micro-credit organisation affiliation rate compared to the network average.

7.4.5 Mohugaon: The ten most nominated actors in the Mohugaon village network constructed were:

Table 7.4.5-1: Nomination Frequency for Mohugaon Network Constructed

ID	Nominations
55	16
34	10
49	6
1	6
81	6
22	4
44	4
28	4
8	4
3	4
60	4
21	4
63	4
35	4

Besides these highly nominated actors, 14 actors got 3 nominations each, 27 actors got two nominations, 24 actors got one nomination and 14 actors got zero nomination. However, *degree centrality*, *betweenness centrality* and *power centrality* will show more clearly the central actors of the network.

7.4.5.1 Degree Centrality: For the *in-degree* centrality measure, 12 actors out of the 15 most *in-degree* central actors in the “strength” matrix are same as the *in-degree* central actors in the “approval” matrix. ID81, ID22 and ID11 of the “approval” matrix replace ID62, ID80 and ID54 of the “strength” matrix. Also 10 actors out of the 15 most *degree* central actors in the “contact” matrix are the same as the *in-degree* central actors in the “strength” matrix and this number is 12 for the “approval” matrix. So,

both the *in-degree* central and *degree* central actors are similar to the *in-degree* central actors of the “approval” matrix. Thus most of the popular actors in this network also are the actors who approve of family planning.

The mean *in-degree* centrality in the “strength” matrix is 62.78 and the standard deviation is 59.291, the mean is slightly higher than the standard deviation. For the “approval” matrix, the mean is 7.41 and the standard deviation is 7.64. In the “contact” matrix, the mean *degree* centrality is higher than the standard deviation. Thus the actors are embedded with greater tie density than the variance. From the descriptive statistics in table 7.4.5.1-1, it is clear that actors who approve of family planning are more diverse than the actors who are popular.

Table 7.4.5.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Mohugaon

Intensity Matrix			Approval Matrix			Contact Matrix		
In-degree Centrality			In-degree Centrality			Degree Centrality		
Mean	62.78		Mean	7.41		Mean	3.70	
Stand Dev	59.29		Stand Dev	7.64		Stand Dev	2.63	
Network Centralisation	=		Network Centralisation	=		Network Centralisation	=	
374.51%			56.44%			17.04%		
						Homogeneity = 1.86%		

For the *out-degree* centrality measure, 10 actors out of the 15 most *out-degree* central actors in the “strength matrix” are also common in the “approval” matrix. Thus there is a moderate (60 per cent) similarity between the actors of the “strength” matrix and the “approval” matrix regarding the sending of information. But in both the cases, some new actors were found who never were not amongst either the 15 most *in-degree* central actors or the 15 *degree-central* actors. These new actors are ID79, ID46, ID68, ID37, ID13, ID29, ID15, ID77 and ID45. Hence there is a considerable difference among the *in-degree* and *out-degree* central actors.

The mean *out-degree* centrality is greater than the standard deviation in both the cases, see table 7.4.5.1-2. So, the *out-degree* tie-density is greater than the diversity among the *out-degree* central actors.

Table 7.4.5.1-2: Descriptive Statistics for *Out-degree* Centrality in Mohugaon

Intensity Matrix		Approval Matrix	
Mean	62.78	Mean	7.41
Stand Dev	35.19	Stand Dev	4.08
Network Centralisation = 103.147%		Network Centralisation = 12.141%	

7.4.5.2 Betweenness Centrality: For the asymmetric valued “strength” and “approval” matrices, all the 15 *betweenness* central actors are the same. So, the powerful liaisons at information controlling position are the same actors of family planning approval. But for non-valued symmetric “contact” matrix, only 7 actors are common out of the 15 *betweenness* central actors. ID08, ID34, ID69, ID74, ID79, ID22, ID21 and ID37 in the symmetric “contact” matrix are different from the other 8 most *betweenness* central actors in the valued matrices. However, there is an overall similarity among the *degree* central actors and the *betweenness* central actors for all the three matrices. Thus the actors who are popular and at the position of controlling information, are similar to the actors who are approve of family planning in the Mohugaon network.

The standard deviation is much higher than the mean *betweenness* centrality, see table 7.4.5.2-1. There is a large diversity among *betweenness* central actors in this network.

Table 7.4.5.2-1: Descriptive Statistics for *Betweenness* Centrality Measure in Mohugaon

Strength Matrix		Approval Matrix		Contact matrix	
Mean	242.17	Mean	241.73	Mean	71.77
Std Dev	351.96	Std Dev	351.60	Std Dev	118.19
Network Centralisation = 15.68%		Network Centralisation = 15.65%		Network Centralisation = 20.91%	

7.4.5.3 Bonacich Power Index: 11 out of the 15 most *powerful* actors in the “strength” matrix are the same as the “approval” matrix. Only 8 are common in the symmetrised “contact” matrix. Though not all the *powerful* actors are like the *degree* central or *betweenness* central actors, there are also some actors common both in the *centrality* measure and the *power* index. The mean *power* is much greater than the standard deviation. Thus the power structure is local rather than central, table 7.4.5.3-1.

Table 7.4.5.3-1: Descriptive Statistics of *Bonacich Power Index* in Mohugaon

Intensity Matrix		Approval Matrix		Contact Matrix	
Mean	62.73	Mean	7.41	Mean	3.70
Stand Dev	35.6	Stand Dev	4.08	Stand Dev	2.63

7.4.5.4 Network Structure: From this network structure the *in-degree* central actors like ID55, ID34, ID60, ID1, ID49, ID28, ID44, ID27, and ID21; the *betweenness* central actors like ID81, ID60, ID55, ID44, ID11, ID63, and ID68; the central *powerful* actors like ID21, ID60, ID79, ID46, and ID49 are easily identifiable. Also identifiable are the isolates and the pendants. Decoding the IDs another interesting feature of cliques is apparent from this sociograph, that is Ghosh(s) are in clique with Ghosh(s), Roy(s) with Roy(s), Das(s) with Das(s), Sarkar(s) with Sarkar(s) and so on. This explains the reason why the *betweenness* central actors and the *powerful* actors are more local than central. In fact, Roy(s) choose another Roy to be an influential; Ghosh(s) choose another Ghosh and so on, this is evident in figure 7.4.5.5-1. This reflects another important feature of communication pattern among Hindu women in Bangladesh, i.e. they are networked generally with their relatives rather than outside friends. Presented in figure 7.4.5.4-1 is the network of Mahugaon village.

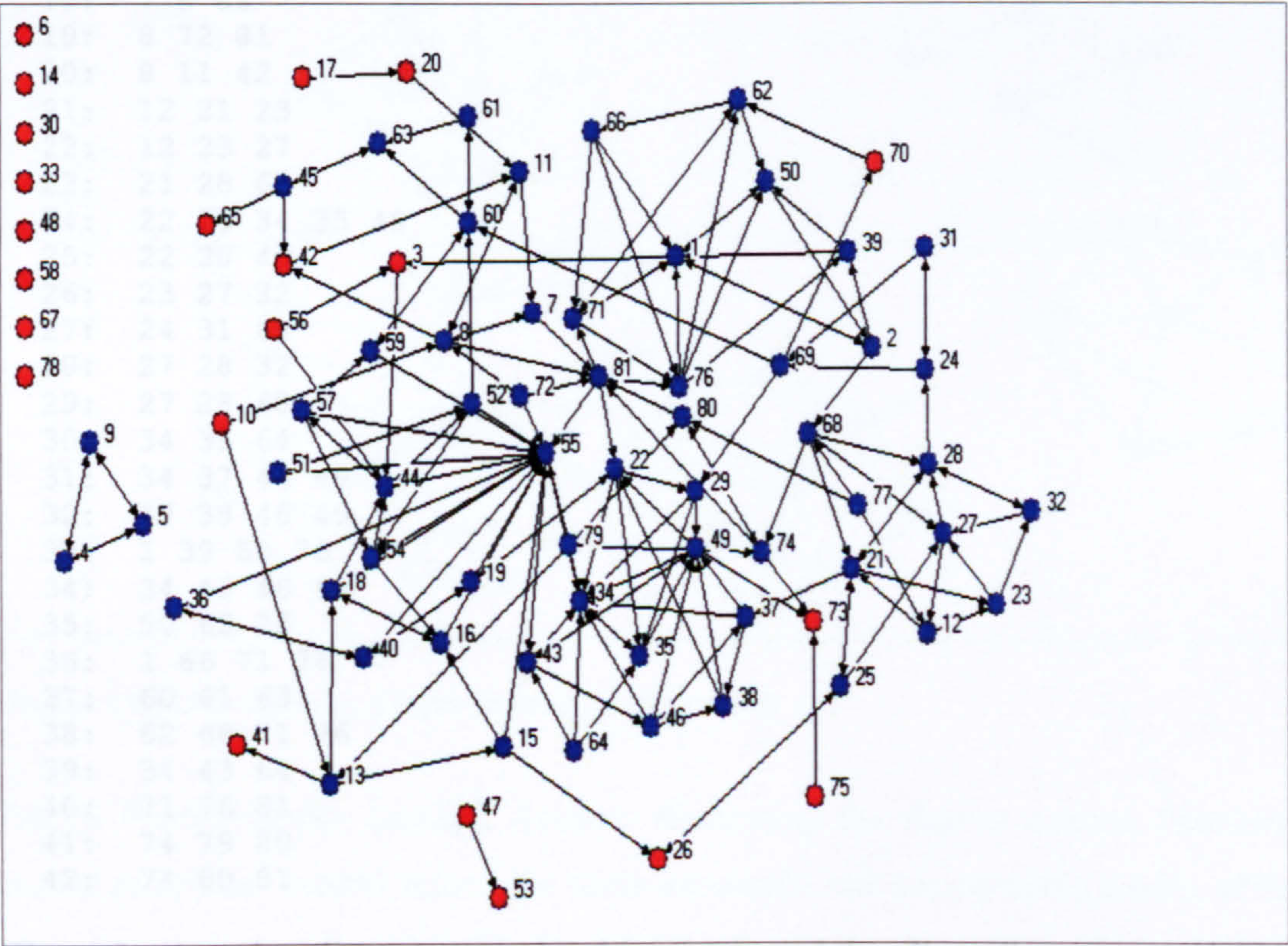


Figure 7.4.5.4-1: Network Structure of Mohugaon

In the network structure, blue coloured actors depict those who practise family planning, whereas actors with red represent the actors who do not practise family planning. Thus the most significant outcome is that the actors who are at the central positions practise family planning. Isolates and pendants do not practise family planning.

7.4.5.5 Cliques and Subgroups: Analysing the non-valued symmetrised “contact” matrix 42 cliques were found among 81 actors. They are:

```

1:  44 52 54 55
2:  44 54 55 57
3:  18 44 55
4:  16 18 55
5:  15 16 55
6:  16 54 55
7:  19 40 55
8:  34 43 55
9:  34 55 79
10: 36 40 55
11: 51 52 55
12: 55 57 59
13: 55 72 81
14: 1 2 39 50
15: 3 44 56
16: 4 5 9
17: 7 8 11
18: 7 8 81
19: 8 72 81
20: 8 11 42
21: 12 21 23
22: 12 23 27
23: 21 28 68
24: 22 29 34 35 49
25: 22 38 49
26: 23 27 32
27: 24 31 69
28: 27 28 32
29: 27 28 68
30: 34 35 64
31: 34 37 46 49
32: 37 38 46 49
33: 1 39 50 76
34: 34 43 46 49
35: 50 62 76
36: 1 66 71 76
37: 60 61 63
38: 62 66 71 76
39: 34 43 64
40: 71 76 81
41: 74 79 80
42: 74 80 81

```

Through clique-by-clique co-membership matrix and the clique list, cliques {1,2}, {31, 32, 34}, {14, 33}, {38, 36} are overlapping 3 other cliques. Cliques {21, 22}, {26, 28}, {32, 29}, {7, 10}, {3}, {4,5,6}, {24, 25}, {8,9}, {30, 39}, {40}, {34}, {13, 19},

{17, 18} and {41, 42} shared two cliques and so on. Also the cliques 16, 27, and 37 are isolates in the sense they do not overlap with other cliques.

The overlapping actors in cliques are presented in the figure 7.4.5.5-1. Among 81 actors in this network, 69 have cliques. Among them ID55 overlaps 13 cliques; ID34 overlaps 7 cliques; ID49, ID76 and ID81 overlap 5 cliques; ID8, ID44 and ID27 overlap 4; ID1, ID16, ID23, ID43, ID46, ID49, ID50 and ID54 overlap 3 cliques; ID7, ID11, ID12, ID18, ID21, ID22, ID31, ID32, ID35, ID38, ID39, ID40, ID52, ID57, ID62, ID64, ID66, ID68, ID72, ID74 and ID80 overlap 2 cliques and others are the members of one clique. 12 actors are not members of any clique.

Among the 81 actors in the Mohugaon network, 22 do not practice family planning. The significance of these clique structures is, out of the 22 non-practicing actors 19 are isolates, i.e they are not members of any clique. ID13 and ID25 are the two isolates who practise family planning. Whereas among the clique members who do not practise family planning are ID3 and ID42 and they are the members of only one clique.

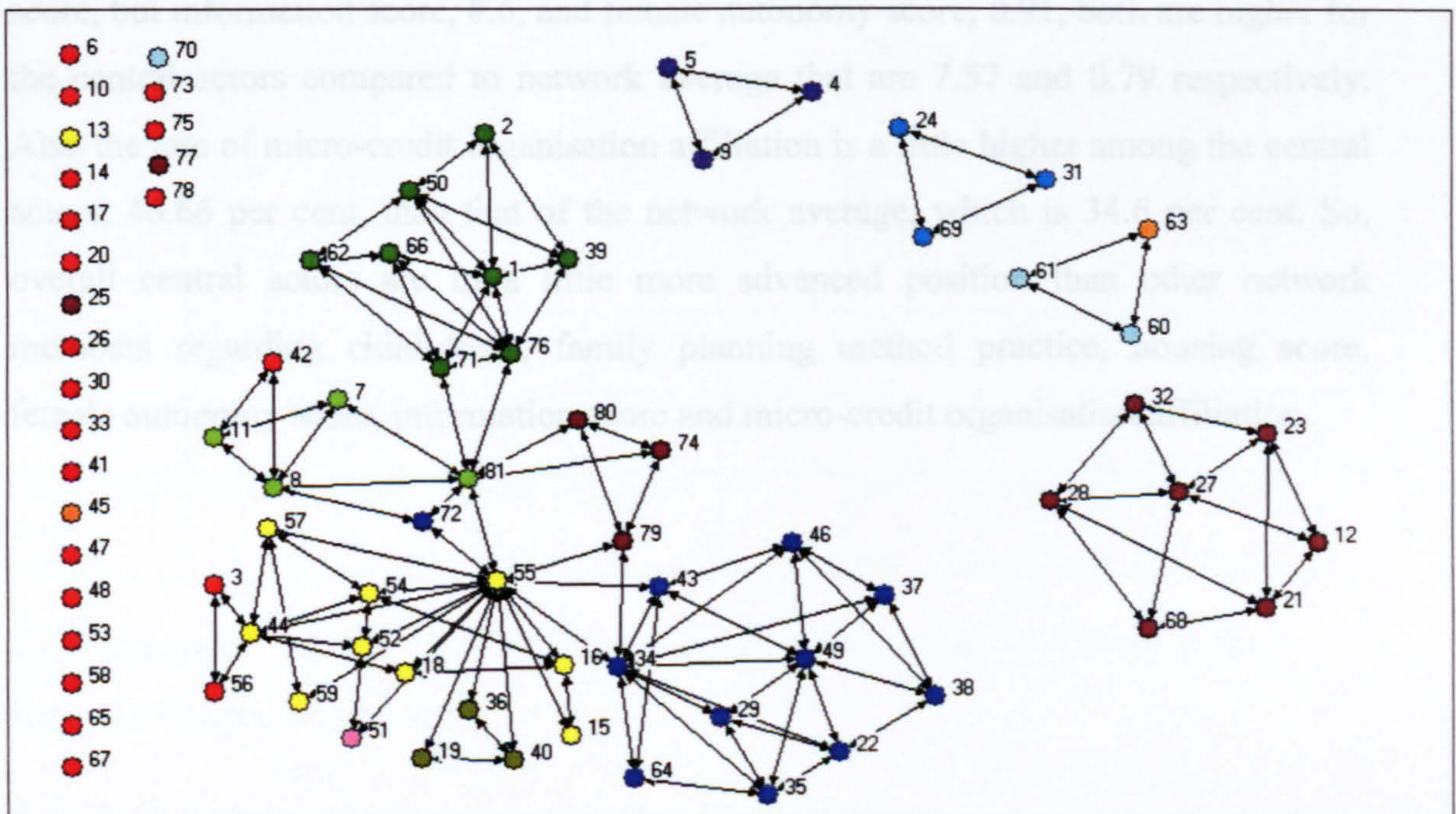


Figure 7.4.5.5-1: Actor-by-Clique Overlap in Mohugaon

7.4.5.6 Profile of the Central Actors: Reviewing the *degree* central, *betweenness* central and *power* central actors, the socio-economic and demographic profile of the 15 central actors is presented in table 7.4.5.6-1.

From the table 7.4.5.6-1, average age of the central actors and the network average age are exactly the same, 28.06 years for both. 8 out of the 15 central actors have no

education, i.e. 53.33 per cent, which is much lower than the network average, 64.2 per cent. Also 33.33 per cent of the central actors have secondary level of education, this is much higher than that of the network average of 14.8 per cent. Thus for both the education rate and level, the central actors are advanced compared to the other network members. Husband's occupation is mainly agriculture or agriculture related in Mohugaon, around 87.7 per cent. Husbands of the central actors are also not different; agriculture is the occupation of 86.66 per cent of the central actors. So regarding husband's occupation there is no difference between the central actors and other network members. The mean number of children among the central actors, 2.26, is only a little higher than the network average, 2.2. Overall child-death rate is very low in Mohugaon network, 3.7 per cent and this is 0 for the central actors. Family planning practice rate among the central actors is 100 per cent, which is far higher than the network average of 72.8 per cent. The highest used family planning method in Mohugaon is the pill, 60.5 per cent. The pill is the highest used method among the central actors as well, 86.66 per cent. There is no significant difference in housing score, but information score, 8.6, and female autonomy score, 0.91, both are higher for the central actors compared to network average that are 7.57 and 0.79 respectively. Also the rate of micro-credit organisation affiliation is a little higher among the central actors, 46.66 per cent, than that of the network average, which is 34.6 per cent. So, overall central actors are in a little more advanced position than other network members regarding child-death, family planning method practice, housing score, female autonomy score, information score and micro-credit organisation affiliation.

Figure 7.4.5.6-1: Central Actors Profile in Mohugaon

Name	Age	Educatio n	Husband Occup.	Numbe r of Childre n	Child Died	FP Use	FP Method	House Score	Info_ Score	Auto - Score	MC
ID 55	25	H-second	Agri	1	0	Y	Pill	1.64	12	1.35	N
ID 49	20	None	Agri	1	0	Y	Pill	2.15	6	-0.98	N
ID 1	22	Secondar y	Service	1	0	Y	Pill	0.65	9	1.3	N
ID 21	24	None	Agri	1	0	Y	Pill	-0.89	10	1.03	N
ID 28	30	None	Agri	4	0	Y	Pill	-0.73	6	1.25	Y
ID 44	35	None	Agri	2	0	Y	Pill	-0.00	12	1.03	N
ID 60	25	Secondar y	Service	1	0	Y	Pill	-0.26	6	1.31	Y
ID 22	26	None	Agri	2	0	Y	Pill	-0.73	12	1.25	Y
ID 27	34	None	Agri	2	0	Y	Pill	-0.7	6	0.93	Y
ID 29	22	Primary	Agri	2	0	Y	Injecta bles	-1.2	8	0.54	N
ID 46	28	Secondar y	Agri	2	0	Y	Pill	-0.25	12	1.3	N
ID 68	36	None	Agri	3	0	Y	Injecta bles	-0.86	3	0.71	N
ID 34	25	Secondar y	Agri	3	0	Y	Pill	-0.98	12	0.57	Y
ID 79	34	Secondar y	Agri	5	0	Y	Pill	-0.85	9	0.82	Y
ID 8	35	None	Agri	4	0	Y	Pill	-0.73	6	1.25	Y
Village averag e/mode	28	None	Agri	2.2	0.05	Y	Pill	-0.37	7.57	0.79	N

7.4.6 Brahmin Shasan: The 10 most nominated actors among 74 women in the Brahmin Shasan network are:

Table 7.4.6-1: Nomination Frequency in Brahmin Shasan Network

ID	Nominations
74	9
16	8
7	7
31	7
40	7
10	6
60	5
6	5
12	5
73	5

Besides these most central actors, 15 actors got 4 nominations, 9 actors got 3 nominations, 20 actors got 2 nominations, 16 actors got just one nomination, and only 4 actors got no nomination.

7.4.6.1 Degree Centrality: 9 actors among the 10 *in-degree* central actors in the “strength” matrix are common in the “approval” matrix and 7 are common in the non-valued symmetrised “contact” matrix. Therefore in Brahmin Shasan village, the *in-degree* central actors or *degree* central actors are almost the same actors who are perceived as central actors in approving family planning.

The mean *in-degree* centrality of the “strength” matrix is 69.66 with the standard deviation of 63.48 and for the “approval” matrix, the mean *in-degree* centrality is 9.06 and the standard deviation is 7.80, see table 7.4.6.1-1. In both the cases, the mean *in-degree* centrality is higher than that of the standard deviation, which means that diversity among the network actors is less than the mean tie-density though for the *in-degree* centrality measure, the standard deviation is high. For the symmetric “contact” matrix, the mean *degree* centrality is also higher than the standard deviation. So, the diversity among the central actors is low in this network when computed to *degree* centrality.

Table 7.4.6.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Brahmin Shasan

Strength Matrix			Approval Matrix		Contact Matrix		
In-degree Centrality			In-degree Centrality		Degree Centrality		
Mean	69.66		Mean	9.06	Mean	3.92	
Std Dev	63.48		Std Dev	7.80	Std Dev	2.35	
Network Centralisation	=	308.28%	Network Centralisation =38.79%		Network Centralisation	=	9.97%
					Homogeneity = 1.84%		

For the *out-degree* centrality, 6 out of the 10 most *out-degree* central actors in the “strength” matrix are the same in the “approval” matrix. Thus 60 per cent of the *out-degree* central actors are also the actors who approve of family planning.

For descriptive statistics, in both the matrices, the mean tie density is higher than the standard deviation, which means diversity among *out-degree* central actors is less than the average *out-degree* tie-density, see table 7.4.6.1-2.

Table 7.4.6-2: Descriptive Statistics for *Out-degree* Centrality Measure in Brahmin Shasan

Strength Matrix		Approval Matrix	
Mean	69.66	Mean	9.07
Std Dev	39.08	Std Dev	5.11
Network Centralisation = 109.87%		Network Centralisation = 16.57%	

7.4.6.2 Betweenness Centrality: Among the 10 most *betweenness* central actors in the “strength” matrix, 8 are common in both the asymmetric “approval” and the symmetric “contact” matrices. Thus *betweenness* central actors are almost the same in all the three matrices, which means that central influential actors in the network are also the actors who approve of family planning. Though some *betweenness* central actors are also similar with *in-degree* central, *out-degree* central and *degree* central actors, some actors are very different from those of the *degree* centrality measure.

The mean *betweenness* centrality in the “strength” matrix is 171.77 and the standard deviation is 209.55; for the “approval” matrix, the mean *betweenness* centrality is 169.24 and the standard deviation is 212.60; and for the symmetric “contact” matrix the mean is 80.68 and the standard deviation is 112.50. For all the three matrices a few actors are dominating the network as actors of controlling information.

Table 7.4.6.2-1: Descriptive Statistics for *Betweenness* Centrality Measure in Brahmin Shasan

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	171.77	Mean	169.24	Mean	80.68
Std Dev	209.55	Std Dev	212.60	Std Dev	112. 50
Network Centralisation = 15.54%		Network Centralisation = 16.08%		Network Centralisation =21.15%	

7.4.6.3 Bonacich Power Index: Among the 10 most *powerful* actors in the “strength” matrix, only 3 actors are common in the “approval” matrix, which means the *powerful* actors are not necessarily the actors who also approve family planning. But for the symmetric “contact” matrix, six actors among the most *powerful* actors are also common in the “approval” matrix. So the central *powerful* actors in the symmetric “contact” matrix are more likely to be the actors who approve of family planning. But one interesting observation is that there is similarity between the *powerful* actors and the other *degree* and *betweenness* central actors.

For all the three matrices, the mean *power* is greater than the standard deviation, see table 7.4.6-1, so the *power* structure is more local than central.

Table 7.4.6.3-1: Descriptive Statistics for *Bonacich Power Index* for Brahmin Shasan

Intensity Matrix		Approval Matrix		Contact Matrix	
Mean	69.45	Mean	9.07	Mean	3.92
Stad Dev	39.31	Stad Dev	5.11	Stad Dev	2.3

7.4.6.4 Network Structure: Displayed in figure 7.4.6.4-1 is the network structure of Brahmin Shasan. From this figure the structural positions of popular actors like ID74, ID16, ID69, ID7, ID40 and ID31; betweenness central actors, i.e. liaisons like ID40, ID6, ID74, ID16, ID60, ID70 and ID 10; central *powerful* actors ID60, ID62, ID70, ID6, ID61, ID56, ID40 and ID 31 are identifiable. Also clearly identifiable are the 6 isolates: ID24, ID26, ID27, ID32 and ID 49.

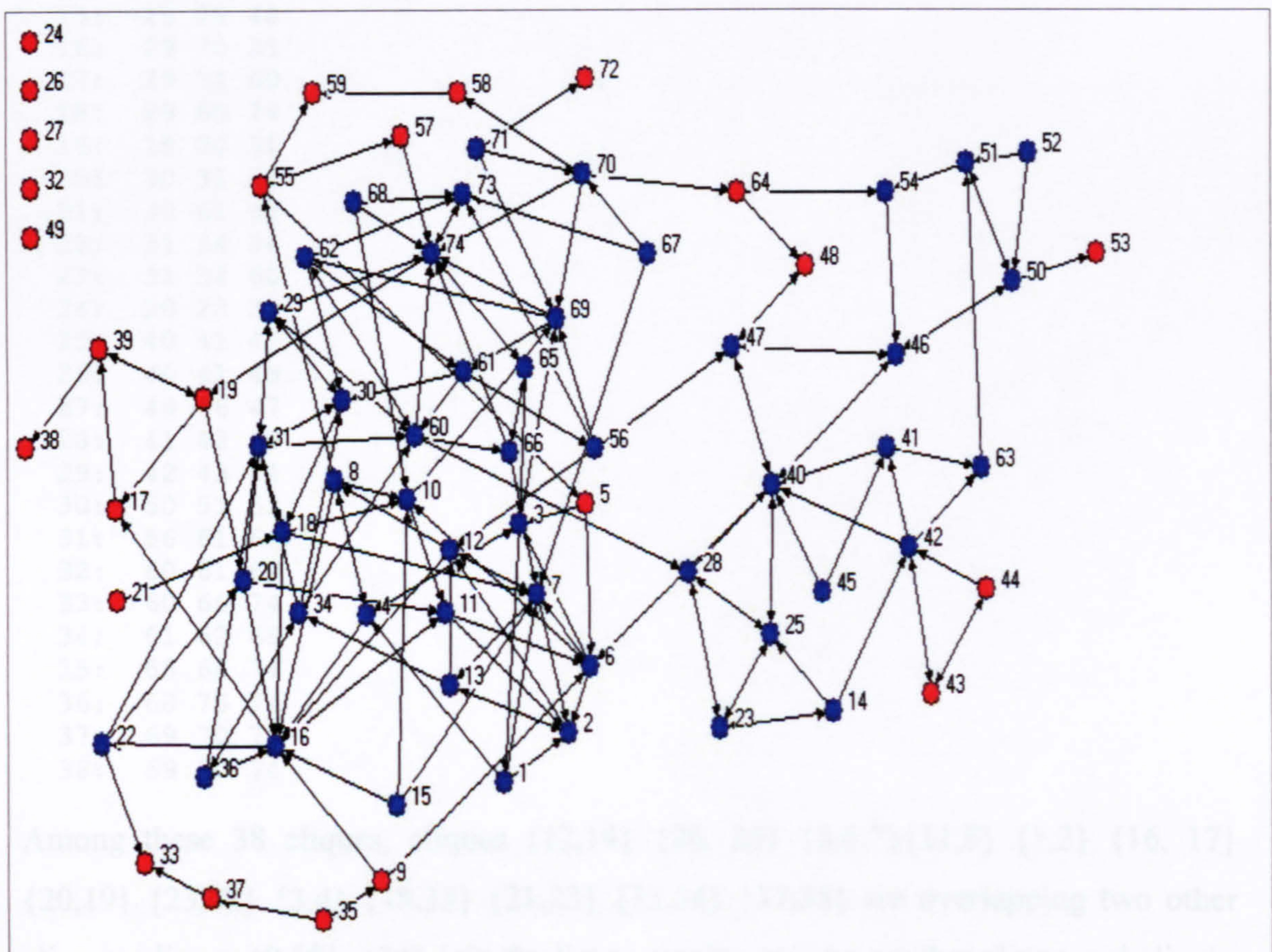


Figure 7.4.6.4-1: Network Structure of Village Brahminshahan

The significance of this network structure is the display of influence of these network positions in family planning behaviour. It is clearly shown that non-practising actors (red coloured) are either isolates, or pendants or at the position of periphery, whereas

all actors (actors with blue colour) who are practicing family planning methods are at various central positions.

7.4.6.4 Cliques and Sub-groups: Analysing the symmetric “contact” matrix, 38 cliques were found. They are:

```

1:  4  8 16
2:  8 12 16
3: 11 16 20
4: 16 20 22
5:  2  7 12 13
6:  2  6  7
7:  1  2  7
8:  2  6 11
9:  1  3  4
10:  3  5  6
11:  6 10 11
12: 14 23 25
13: 17 19 39
14: 23 25 28
15: 25 28 40
16: 29 30 31
17: 29 31 60
18: 29 60 74
19: 18 30 31
20: 30 31 34
21: 30 61 62
22: 31 34 36
23: 31 34 60
24: 20 22 31
25: 40 41 42
26: 40 41 45
27: 40 46 47
28: 41 42 63
29: 42 43 44
30: 50 51 52
31: 56 61 69
32: 60 61 62
33: 60 66 74
34: 61 62 69
35: 65 66 74
36: 68 73 74
37: 69 70 71
38: 69 70 74

```

Among these 38 cliques, cliques {12,14} {26, 25} {5,6,7}{11,8} {1,2} {16, 17} {20,19} {23,22} {3,4} {18,33} {21,23} {31,34} {37,38} are overlapping two other cliques, cliques {9,10}, {36} join the list to overlap at least another clique and cliques {13} and {30} are isolates.

From the clique list and the actor-by-actor co-membership matrix, it was found that among the 74 actors in the Brahmin Shasan network, 53 actors are members of cliques and overlapping cliques and 21 actors are not members of any clique. ID31 overlaps 5

cliques; ID60 overlaps 5 cliques; ID2, ID6, ID16, ID30, ID40, ID61, ID69 and ID74 overlap 4 cliques; ID7, ID11, ID20, ID25, ID29, ID34, ID41, ID42 and ID62 overlap 3 cliques; ID1, ID3, ID4, ID8, ID12, ID22, ID23, ID28, ID66 and ID70 overlap 2 cliques. Other clique members share only one clique. Whereas ID9, ID15, ID21, ID24, ID26, ID27, ID2, ID33, ID35, ID37, ID38, ID48, ID49, ID53, ID54, ID55, ID57, ID58, ID59, ID64 and ID72 are not the members of any cliques. This actor-by-actor clique co-membership pattern is presented in the figure 7.4.6.4-1.

Among the 74 network members in Brahmin Shasan, 24 actors do not practise family planning. Out of these 24 non-practising actors, 19 are not the members of any clique. ID5, ID17, ID19, ID39, ID43 and ID44 are the six non-practising actors who are members of cliques but all of them are the members of only one clique and none of them overlap any other clique. The non-clique actors who practise family planning are ID54 and ID67.

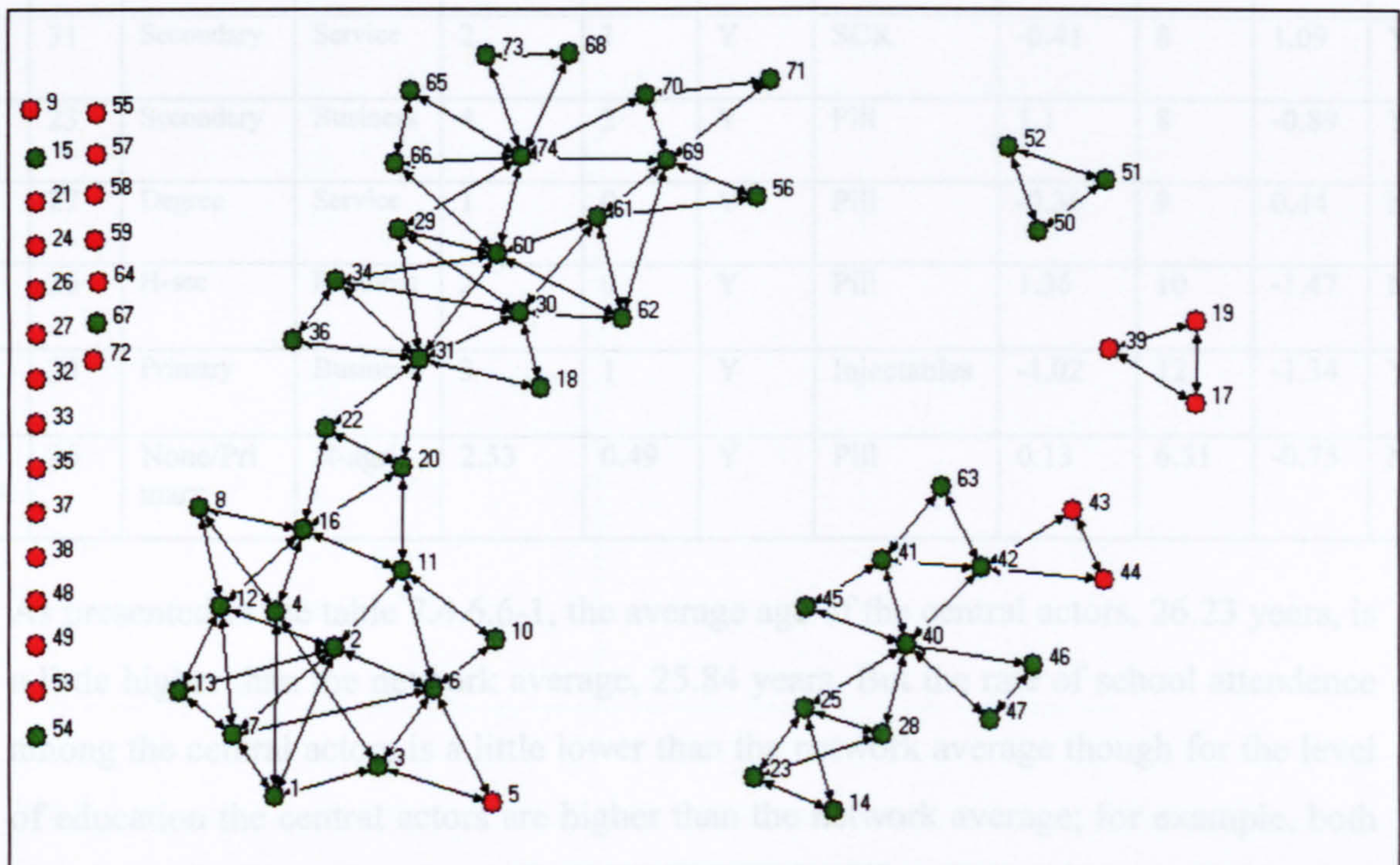


Figure 7.4.6.5-1: Actor-by-actor Clique Overlap in Brahmin Shasan

7.4.6.6 Profile of Some Central Actors: Reviewing the *degree* central, *betweenness* central and *powerful* actors, some of socio-economic and demographic characteristics of the 15 most central actors are presented in table 7.4.6.5-1.

Table 7.4.6.6-1: Profile of Central Actors in Brahmin Shasan

Name	Age	Education	Husband Occup.	Number of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 74	22	None	Driving	1	0	Y	Pill	-0.12	6	-1.47	N
ID 30	35	None	Tech	5	0	Y	Pill	-0.12	9	-1.47	N
ID 16	22	None	Driving	1	0	Y	Method-mix	-0.43	3	-0.9	N
ID 6	22	Primary	Service	3	2	Y	Injectables	-1.2	3	0.54	Y
ID 7	21	None	Tech	1	0	Y	Pill	-0.00	5	0.169	N
ID 69	35	Primary	Business	5	0	Y	Pill	-1.14	9	-1.06	N
ID 40	22	Primary	Business	2	1	Y	SCR	0.15	2	-1.55	N
ID 31	30	None	Driving	4	1	Y	Pill	0.95	5	-1.58	N
ID 46	31	Secondary	Service	2	1	Y	SCR	-0.41	8	1.09	Y
ID 03	23	Secondary	Business	4	2	Y	Pill	1.1	8	-0.89	Y
ID 42	27	Degree	Service	1	0	Y	Pill	-0.36	9	0.44	N
ID 73	26	H-sec	Business	2	0	Y	Pill	1.36	10	-1.47	N
ID 70	25	Primary	Business	3	1	Y	Injectables	-1.02	12	-1.34	Y
Village average /mode	26	None/Pri mary	N-agri	2.53	0.49	Y	Pill	0.13	6.51	-0.75	N

As presented in the table 7.4.6.6-1, the average age of the central actors, 26.23 years, is a little higher than the network average, 25.84 years. But the rate of school attendance among the central actors is a little lower than the network average though for the level of education the central actors are higher than the network average; for example, both the rate of higher-secondary and degree level education among the central actors is 7.69, which is higher than network average of 1.4 and 2.7 respectively. Both the mean number of children (2.6) and the mean child death (0.62) are slightly higher than the network average of 2.53 and 0.49 respectively. All the central actors use family planning methods, so the rate of FP use is much higher than the network average, which is 67.6 per cent. The pill is the mostly used family planning method among the central actors, 61.53 per cent. On the contrary, only 29.7 per cent of the network members use the pill, though the pill is the highest used method among the network

members. Regarding the housing score and the female autonomy score overall, network averages are higher than the central actors scores. The information score and the micro-credit organisation affiliation rate are higher among the central actors, 6.85 per cent and 30.77 per cent, than the average scores of network members, 6.51 per cent and 23 per cent respectively. The central actors of the Brahmin Shasan network are mature in age and their family planning practice rate, information score and micro-credit organisation affiliation are higher than the network average.

7.4.7 Jobra: The most nominated 12 actors among the 97 actors in the network of village Jobra are presented in table 7.4.7-1. Besides these, 9 actors got 4 nominations, 16 actors got 3 nominations, 19 actors got 2 nominations, 32 actors got only one nomination and 8 actors got no nomination.

Table 7.4.7-1: Nomination Frequency of Central Actors in Jobra Network

ID	Nominations
81	10
72	10
64	9
26	9
14	9
43	7
90	7
36	6
27	6
4	5
94	5
22	5
71	5

7.4.7.1 Degree Centrality: 12 actors out of the most *in-degree* central 15 actors in the “strength” matrix are common in the “approval” matrix. Also 12 actors from the 15 most *degree* central actors are common in the “approval” matrix. Thus the most popular actors in this network are the actors who also approve of family planning.

From the table 7.4.7.1-1, the mean for the “strength” matrix is higher than the standard deviation but for the “approval” matrix, the standard deviation is higher than the mean. For *degree* centrality, the mean is again much higher than the standard deviation. It is

clear that, diversity among popular actors who approve of family planning is more than that of the mean *in-degree* or *degree* central actors.

Table 7.4.7.1-1: Descriptive Statistics for *In-degree* Centrality Measure in Jobra

Strength In-degree Centrality	Approval In-degree Centrality	Contact Degree Centrality
Mean 71.21	Mean 6.37	Mean 4.17
Stand Dev 63.55	Stand Dev 7.68	Stand Dev 2.53
Network Centralisation = 219.11%	Network Centralisation = 31.19%	Network Centralisation= 8.33%
		Homogeniety = 1.41%

For the *out-degree* centrality, only five actors among the 15 most *out-degree* central actors of the “strength” matrix are common in the “approval” matrix, which means there is a big difference between the central actors who are communicating with other actors in the network and the central actors who approve of family planning.

From the table 7.4.7.1-2, the mean *out-degree* centrality is higher than the standard deviation for the “strength” matrix, almost double. For the “approval” matrix, the mean and the standard deviation are close though the mean is a little higher than the standard deviation.

Table 7.4.7.1-2: Descriptive Statistics for *Out-degree* Centrality Measure in Jobra

Strength Matrix		Approval Matrix	
Mean	71.21	Mean	6.37
Stand Dev	36.30	Stand Dev	5.01
Network Centralisation = 81.22%		Network Centralisation = 11.19%	

Comparing tables 7.4.7.1-1 and 7.4.7.1-2, two points appear. The first is that the diversity among the *out-degree* central actors who approve of family planning is more than the mean *out-degree* central actors of the “strength” matrix. The second is that actors send more nominations than they receive.

7.4.7.2 Betweenness Centrality: From the *betweenness* centrality measure, 14 actors out of the 15 most *betweenness* central actors in the “strength” matrix are common in the “approval” matrix. The 11 most *betweenness* central actors in the symmetrised “contact” matrix are also common in the “approval” matix. This means actors in the position of controlling information are similar to those actors who approve of family

planning. There is also similarity between the actors of *indegree* centrality and *betweenness* centrality in the “strength” matrix, the actors of *indegree* centrality and the *betweenness* centrality in the “approval” matrix, and the actors of *degree* centrality and the *betweenness* centrality in the “approval” matrix with a few exceptions.

For all the three matrices the standard deviation is greater than the mean *betweenness* centrality, which indicates diversity among the central actors of *betweenness* position. Thus a few actors dominate the network.

Table 7.4.7.2-1: Descriptive Statistics for Betweenness Centrality Measure in Jobra

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	235.16	Mean	244.88	Mean	110.31
Stand Dev	311.99	Stand Dev	319.78	Stand Dev	150.17
Network Centralisation = 13.32%		Network Centralisation = 13.55%		Network Centralisation= 14.84%	

7.4.7.3 Bonacich Power Index: For the Bonacich’s Power Index measurement, only seven actors out of the 15 most *powerful* actors in the “strength” matrix are common in the “approval” matrix. So the most *powerful* actors are not necessarily the actors who approve family planning. For the symmetric “contact” matrix, this number is a little higher. 9 actors out of the 15 most *powerful* actors in the “contact” matrix are common in the “approval” matrix. Thus there is similarity between the *powerful* and the *central* actors.

From the table 7.4.7.3-1, the mean *power* is higher than the standard deviation in all the three matrices. From this it can be postulated that *powerful* actors are more local than central. Another important observation is that although the mean *power* is almost double the standard deviation in both the “strength” and the symmetrised “contact”matrices, the standard deviation is much closer to the mean in the “approval”matrix, which suggests that diversity of *power* among actors in the “approval” matrix is greater than the actors in other matrices.

Table 7.4.7.3-1: Descriptive Statistics for *Bonacich Power Index* Measure in Jobra

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	71.21	Mean	6.37	Mean	4.17
Stand Dev	36.30	Stand Dev	5.01	Stand Dev	2.53

7.4.7.4 Network Structure: From this network structure in figure 7.4.7.4-1, the *in-degree* central actors ID64, ID26, ID81, ID14, ID27, ID72 and ID43, the *betweenness* central actors ID81, ID14, ID36, ID42, ID90, ID72 and ID51, and the central *powerful* actors ID9, ID5, ID2, ID4, ID43, ID81, ID72 and ID90 are identifiable and their fertility behaviour is also understandable. ID25, ID65, ID80 and ID84 are the isolates and they do not practise family planning. Pendants such as ID34, ID60, ID58 and ID 91 do not practise family planning either.

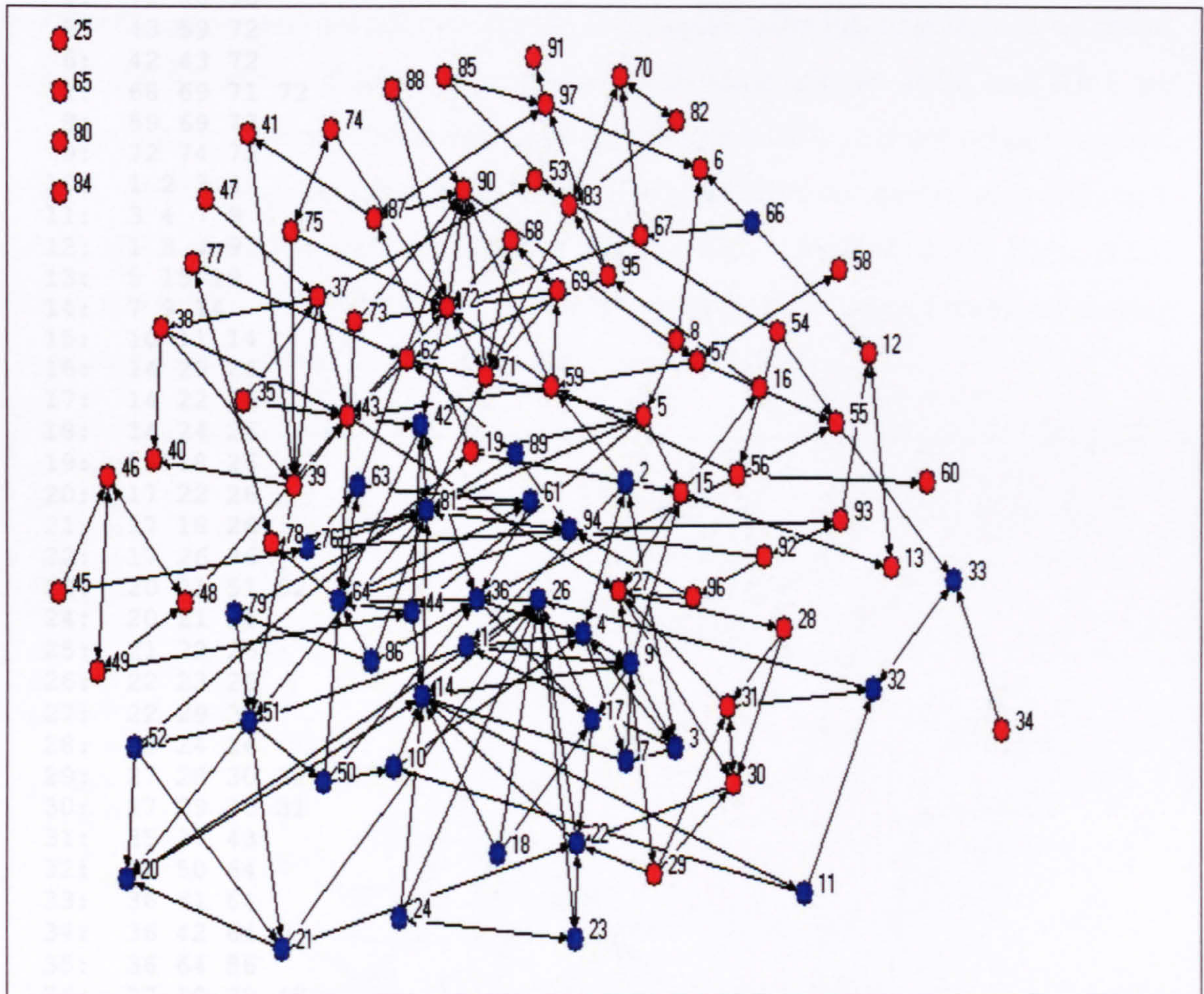


Figure 7.4.7.4-1: Communication Network in Jobra

Jobra is a village in Chittagong division, which is perceived as the most “conservative” area of Bangladesh (see section 5.6.4 in chapter 5). In the present research, the contraceptive prevalence rate was found to be lowest in this village (see table 6.1.4-1). Here the influence of the central actors sometimes worked in reverse. How the non-practising central actors’s influence affects connected members can be traced out in the network structure in figure 7.4.7.4-1. For example, from the figure 7.4.7.4-1, very central actors such as ID72, ID90, ID27, ID43 and ID59 do not practise family

planning and the related actors with them also do not practise family planning. The influence of the central actors and the structural positions of these actors in this network are inhibiting the use of family planning.

7.4.7.5 Cliques and Subgroups: Analysing the symmetrised “contact” matrix, 49 cliques are found:

- 1: 59 72 90
- 2: 71 72 90
- 3: 72 73 90
- 4: 72 88 90
- 5: 43 59 72
- 6: 42 43 72
- 7: 68 69 71 72
- 8: 59 69 72
- 9: 72 74 75
- 10: 1 2 3 4
- 11: 3 4 7 9
- 12: 1 3 4 9
- 13: 5 15 19
- 14: 7 9 14
- 15: 10 11 14
- 16: 14 20 26
- 17: 14 22 26
- 18: 14 24 26
- 19: 14 18 26
- 20: 17 22 26
- 21: 17 18 26
- 22: 17 26 36
- 23: 20 21 51 52
- 24: 20 21 26
- 25: 21 22 26
- 26: 22 23 26
- 27: 22 29 30
- 28: 23 24 26
- 29: 27 28 30 31
- 30: 27 29 30 31
- 31: 35 37 43
- 32: 36 50 64
- 33: 36 61 64
- 34: 36 42 64
- 35: 36 64 86
- 36: 37 38 39 43
- 37: 38 39 40
- 38: 42 44 64
- 39: 46 48 49
- 40: 51 79 81
- 41: 54 55 56
- 42: 57 59 90
- 43: 61 63 64
- 44: 70 82 83
- 45: 76 81 94
- 46: 79 81 86
- 47: 81 89 94
- 48: 92 93 94
- 49: 92 94 96

From the clique-by-clique co-membership matrix, the clique-by-clique overlapping was counted. It was found that cliques {10,12} {29, 30} are sharing 3 cliques. Cliques {31, 36} {1,2,3, 4} {5, 6} {7, 8} {23, 24} {20, 21, 22} {16, 17, 18, 19} {25, 26} {32, 33, 34, 35} {40, 46} {45, 47} {48, 49} share 2 cliques and cliques {9, 14, 43} share at least another clique. Only cliques {13, 39, 41, and 44} are the isolate cliques.

Again, from the actor-by-clique co-membership matrix, actors overlapping through the cliques are shown in figure 7.4.7.5-1. From this figure actors overlapping patterns as well as the actors who are not overlapping any clique can be identified easily. 69 actors out of the 97 actors of Jobra network are involved in cliques. ID26 and ID64 are overlapping 11 cliques; ID36 is overlapping 10 cliques; ID72 is overlapping 9 cliques; ID14 is overlapping 6 cliques; ID22, ID42, ID43 and ID90 are overlapping 5 cliques; ID59, ID81 and ID94 are overlapping 4 cliques; ID3, ID4, ID9, ID17, ID20, ID21, ID30, ID37, ID38, ID39, ID61 and ID86 are overlapping 3 cliques. Others are sharing in either 2 or one clique. 28 actors have no clique affiliation.

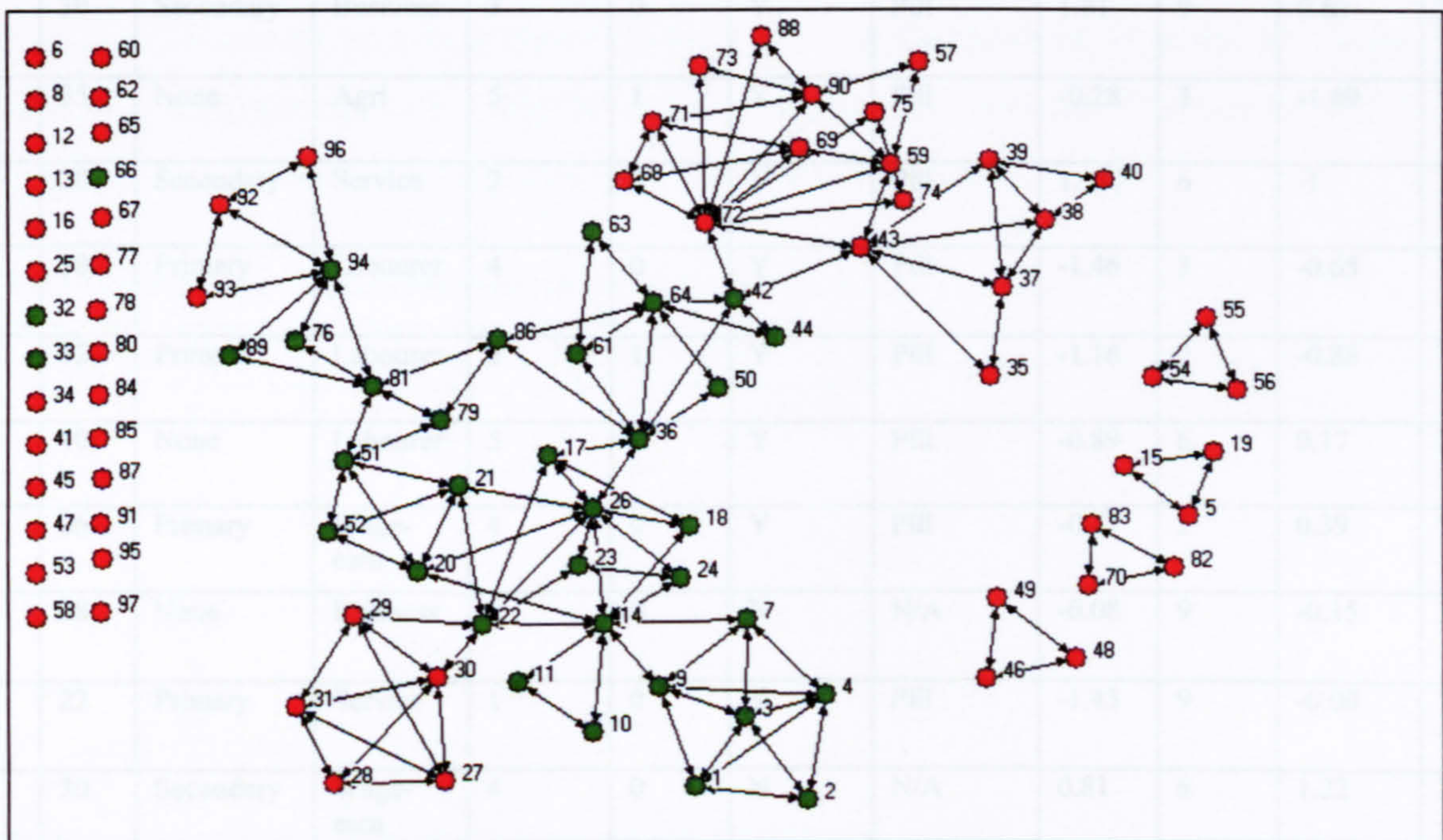


Figure 7.4.7.5 -1: Actor-by-actor Cliqueoverlap in Jobra

In the Jobra network, 62 actors out of 97 actors do not practise family planning. Among these non-practicing 62 actors, only 25 actors are isolates. So, 37 actors who are members of one or more cliques do not practise family planning. Though 23 out of these 37 actors are just members of one clique, there are some very central actors who also do not practise family planning. For example, ID72 overlaps 9 cliques, ID43 and

ID90 overlap 5 cliques, ID59 overlaps 4 cliques and they do not practise family planning and the actors related with them also do not practise family planning.

7.4.7.6 Profile of Some Central Actors: Reviewing the *degree* central, *betweenness* central and *powerful* actors, some of the socio-economic and demographic characteristics of the 14 central actors are presented in table 7.4.7.6-1.

Table 7.4.7.6-1: Profile of Central Actors in Jobra

Name	Age	Education	Husband Occup.	Number of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 81	23	Secondary	Business	3	0	Y	Pill	-0.98	6	0.24	N
ID 72	27	Primary	Wage-earn	1	0	N	N/A	-0.81	8	-1.49	N
ID 14	22	Secondary	Business	2	0	Y	Pill	-1.19	9	-0.24	N
ID 94	24	Secondary	Service	1	0	Y	Injectables	-0.89	6	-0.2	N
ID 26	30	Secondary	Business	3	0	Y	Pill	1.81	9	0.63	N
ID 36	35	None	Agri	5	1	Y	Pill	-0.28	3	-1.69	N
ID 22	20	Secondary	Service	2	0	Y	Pill	1.93	6	-1	N
ID 64	30	Primary	Labourer	4	0	Y	Pill	-1.46	3	-0.65	N
ID 9	32	Primary	Labourer	3	1	Y	Pill	-1.16	2	-0.88	N
ID 51	40	None	Labourer	5	0	Y	Pill	-0.89	6	0.17	N
ID 42	26	Primary	Wage-earn	4	0	Y	Pill	-0.77	2	0.39	N
ID 83	28	None	Business	3	0	N	N/A	-0.08	9	-0.15	N
ID 4	22	Primary	Service	1	0	Y	Pill	-1.43	9	-0.00	N
ID 43	30	Secondary	Wage-earn	4	0	N	N/A	0.81	6	1.22	N
Village average /mode	29	None	Agri	3.65	0.46	N	Pill	-0.31	5.59	-0.43	N

In the Jobra network, from the table 7.4.7.6-1, the average age of the central actors, 27.78 years, is less than the network average of 28.62 years. Literacy rate among the central actors, 78.57 per cent, is much higher than the network average of 39.2 per cent. The level of education is also higher among the central actors. For example,

42.85 per cent of the central actors have secondary education whereas the network average for the secondary education is 17.5 per cent.

Husband’s occupation of 92.85 per cent of the central actors is non-agricultural and the network average is 74.2 per cent. The average number of children among the central actors, 2.92, is lower than the network average of 3.65. The rate of family planning method use, 78.54 per cent, is higher among the central actors than the network average of 63.9 per cent. Around 71.43 per cent of the central actors use the pill, whereas the use of the pill among other network members is 27.8 per cent. There is no appreciable differences in housing score and information score between the central actors and the network members, female autonomy score is a little higher among the central actors, -0.26, against the network average of -0.43. None of the interviewed women in this village reported having any affiliation with any micro-credit organisation.

7.4.8 Akkelpur: Puratun Bazar is a *mahallah* of Akkelpur Union in Joypurhat district. This is an area in a typical district town in Bangladesh. It is not a village, neither a metropolitan city. Only 30 actors made up this network. The most cited 7 actors (as the network is a very small one) are displayed in table 7.4.8-1:

Table 7.4.8-1: Nomination Frequency in Akkelpur Network

ID	Nominations
4	6
5	6
9	5
19	4
1	4
20	3
21	3

Besides these, 8 actors received 2 nominations and 7 actors had only one nomination. 8 actors received no nomination. Nomination frequency is lower here compared to other networks discussed earlier.

7.4.8.1 Degree Centrality: For the *in-degree* centrality measure, 6 actors out of the 7 most *in-degree* central actors in the “strength” matrix are same in the “approval” matrix, which means actors who are most prestigious, also approve of family planning.

For the symmetrised “contact” matrix, 6 out of the 7 most *degree* central actors are also the most *in-degree* central actors in the “approval” matrix. Thus the *in-degree* and the *degree* central actors are almost the same actors who approve of family planning (both with the valued asymmetric and the non-valued symmetric matrices).

For the “strength” and the “approval” matrices the standard deviation is higher than the mean *in-degree* centrality, see table 7.4.8.1-1. Thus the diversity is large as per centrality among the actors, which means that a few actors control the network. For the symmetrised “contact” matrix, the mean *degree* centrality is higher than the standard deviation. Hence when the relationship is symmetrised diversity among the central actors is reduced.

Table 7.4.8.1-1: Descriptive Statistics for *Indegree* Centrality Measure in Akkelpur

Strength Matrix		Approval Matrix		Contact Matrix	
Indegree Centrality		Indegree Centrality		Degree Centrality	
Mean	50.45	Mean	6.97	Mean	2.73
Standard Dev	52.65	Standard Dev	7.36	Standard Dev	1.79
Network Centralisation = 403.62%		Network Centralisation = 64.328%		Network Centralisation = 15.76%	
				Homogeneity = 4.76%	

For the *out-degree* centrality measure, only 3 actors among the 7 most *out-degree* central actors are common in both the “strength” and the “approval” matrices. So, the central actors who are sending messages are not the same central actors who are approving family planning: actors in centrality are different as regards *out-degree* centrality.

Considering the descriptive statistics, table 7.4.8.1-2, the mean *out-degree* centrality is much higher than the standard deviation. Therefore the actors who send nominations are less diversified than the actors who get nominations.

Table 7.4.8.1-2: Descriptive Statistics for *Outdegree* Centrality Measure in Akkelpur

Strength Matrix		Approval Matrix	
Mean	50.45	Mean	6.97
Standard Dev	28.48	Standard Dev	3.92
Network Centralisation = 277.53%		Network Centralisation = 32.22%	

7.4.8.2 Betweenness Centrality: All the 7 most *betweenness* central actors were the same in both the “strength” and the “approval” matrices. Thus the actors who are at the

central position of controlling information are also the actors who approve of family planning. For the symmetrised “contact” matrix, only 3 actors out of the 7 most *betweenness* central actors are common in the “approval” matrix. So for reciprocal relationship *betweenness* central actors are quite different from the actors who approve of family planning. Among the 30 actors within this network, 17 actors have no *betweenness* position in both the “strength” and the “approval” matrices, and 12 actors have no *betweenness* position in the “contact” matrix. Hence very few actors are in the position of *betweenness*.

The standard deviations for all the matrices are much higher than the mean *betweenness* centrality, which strengthens the observation that only a few actors are dominating the network, diversity among actors is very high, see table 7.4.8.2-1.

Table 7.4.8.2-1: Descriptive Statistics for *Betweenness* Centrality Measure in Akkelpur

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	3.33	Mean	3.33	Mean	23.23
Standard Dev	6.21	Standard Dev	6.21	Standard Dev	38.00
Network Centralisation = 2.29%		Network Centralisation = 2.29%		Network Centralisation = 28.80%	

7.4.8.3 Bonacich Power Index: Only 3 out of the 7 most *powerful* actors in the “strength” matrix are same in the “approval” matrix. So, a considerable difference is evident among the actors who are *powerful* in terms of strength and who are *powerful* in terms of approving family planning. Also for the “contact” matrix, only 3 actors from the “contact” matrix are common in the “approval” matrix.

Considering the descriptive statistics, the mean *power* in all the three matrices are much higher than the standard deviation, which means *powerful* actors are more local rather than central.

Table 7.4.83-1: Descriptive Statistics for *Bonacich Power Index* Measure in Akkelpur

Strength Matrix		Approval Matrix		Contact Matrix	
Mean	50.45	Mean	6.97	Mean	2.73
Standard Dev	28.48	Standard Dev	3.92	Standard Dev	1.79

7.4.8.4 Network Structure: Shown in figure 7.4.8.4-1 is the network structure drawn from the asymmetric “contact” matrix using Netdraw. From this figure it is identifiable that there is a bigger network with some sub-groups overlapping. This

main network is made up of Muslim actors which is connected with another small group of Hindus by actor ID14 who is not a member of any clique, neither is she a popular actor as nobody nominated her, but she nominated ID5, who is one of the most popular actors in this network, and ID12 who is connected with ID30 of that small Hindu sub-network. There is another small cluster of Hindu actors who are not connected with the main Muslim network. ID11 is the only actor within the network who neither nominated any other actor nor was nominated by any in the network, the perfect isolate. The centrality of ID5, ID9, ID4, ID1, ID6, ID19 and ID20 are clearly identifiable from the picture. But the various structural positions in this network do not explain their influence on fertility behaviour as in other village networks because irrespective of actors' structural positions in the network, all the actors practise family planning. But this result has other significance in that the influence of social network appears to be different in urban areas from that of rural areas, even if it is a *mahallah* in a small town.

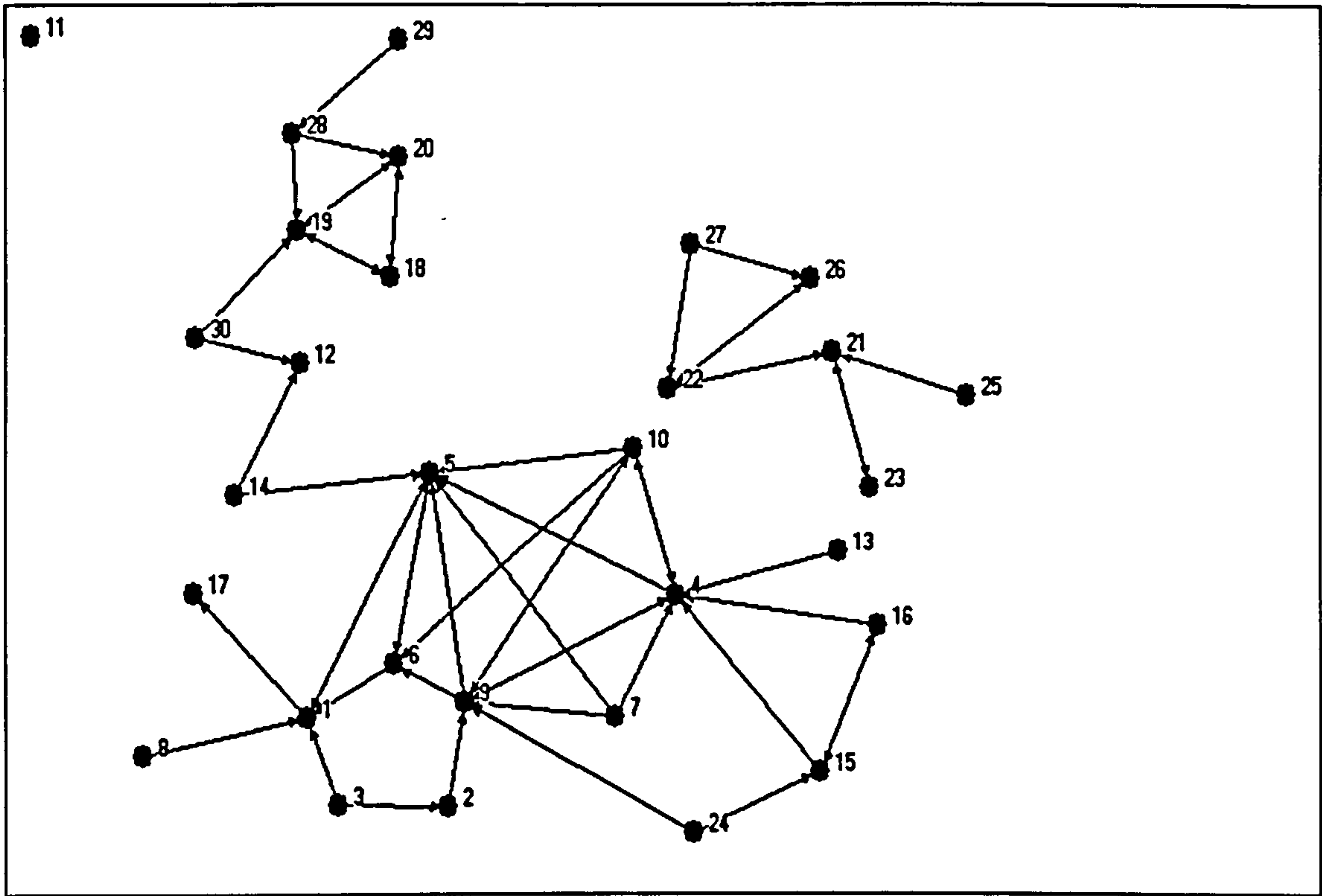


Figure 7.4.8.4-1: Communication Network in Akkelpur

7.4.8.5 Cliques and Sub-groups: Analysing symmetrised “contact” matrix 8 cliques were found.

- 1: 4 5 7 9
- 2: 4 5 9 10
- 3: 4 15 16

4: 1 5 6
5: 5 6 9 10
6: 18 19 20
7: 19 20 28
8: 22 26 27

From the clique-by-clique co-membership matrix, clique overlap pattern is easily understandable. Cliques {1 and 2} are overlapping with 3 other cliques, with them cliques {5, 6, 7} are joining and they all overlap with other two cliques. Only clique 8 is an isolate who does not overlap with any other clique.

From the clique list and the actor-by-actor co-membership matrix, the actor-overlapping pattern is understandable. Among 30 actors, 16 are involved in cliques. ID5 is overlapping with 4 cliques; ID9 and ID4 are overlapping 3 cliques; ID1, ID6, ID10, ID19 and ID20 are overlapping 2 cliques. ID7, ID15, ID16, ID18, ID22, ID26, ID27 and ID28 are just the members of their own clique. This actor-by-actor clique overlap is displayed in figure 7.4.8.5-1. 14 actors are not members of any clique; they are either isolates or pendants.

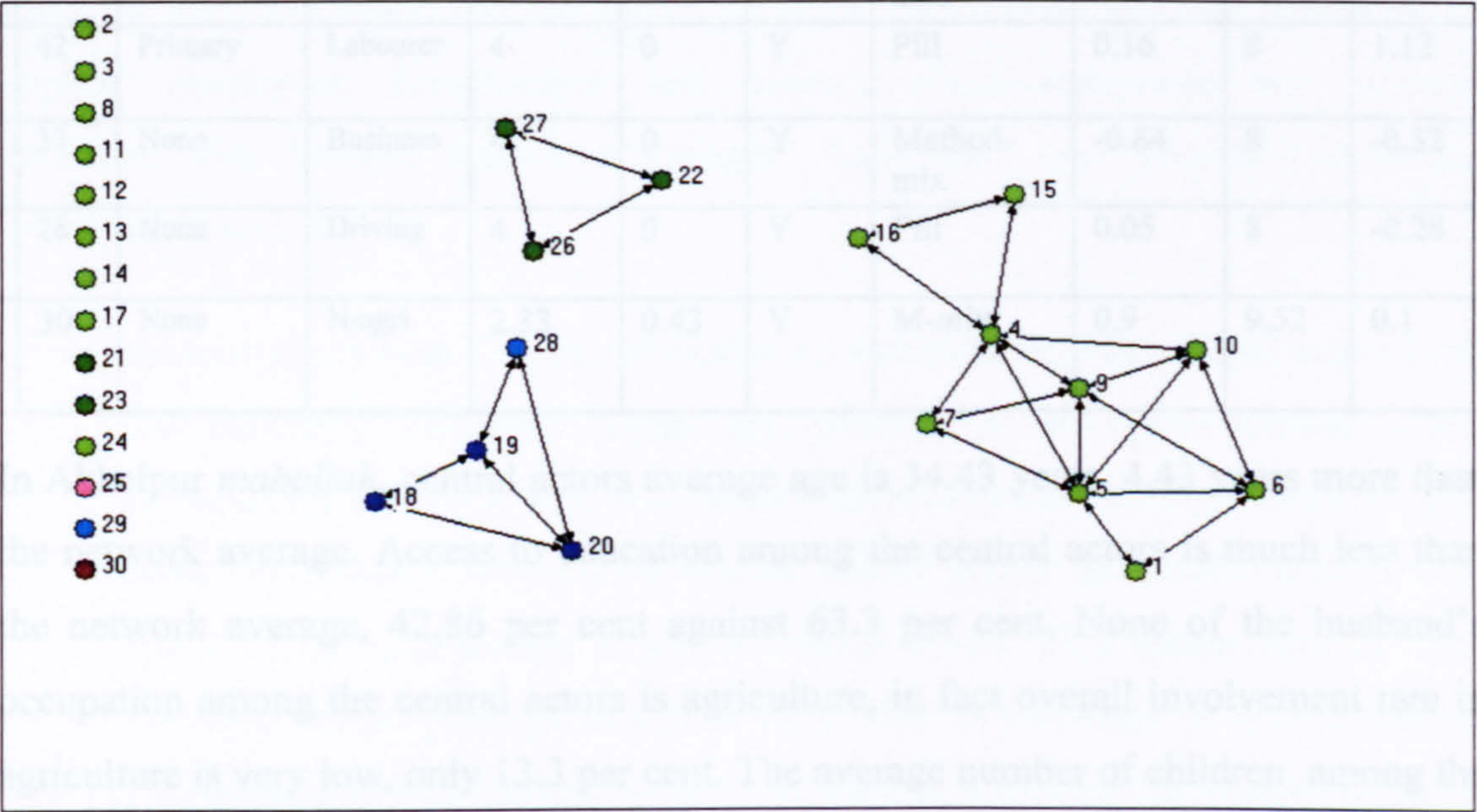


Figure 7.4.8.5-1: Actor-by-Actor CliqueOverlap in Akkelpur Network

In the figure 7.4.8.5-1, green represents the “Rabi Das” community, blue represents the “Chouhan” community, sky blue represents the “Rabi-Sahu” community, maroon represents the “Gowala” community and light green represents the Muslim community. Thus it is clear that here cliques are formed on religion and caste (among Hindus) basis.

Though this actor-by-actor clique overlap displays the link pattern of the *mahallah* women, it does not point to any significant result for the present research. Because, irrespective of actors' clique structures or isolate positions, each actor practises family planning.

7.4.8.6 Profile of the Central Actors: Some socio-economic-cultural and demographic characteristics of some central actors are displayed in table 7.4.8.6-1.

Table 7.4.8.6-1: Profile of Central Actors in Akkelpur

Name	Age	Education	Husband Occup.	Number of Children	Child Died	FP Use	FP Method	House Score	Info_Score	Auto_Score	MC
ID 5	39	None	Labourer	3	1	Y	Pill	1.78	8	-0.00	Y
ID 9	27	Primary	Driving	2	4	Y	Pill	0.69	9	1.34	Y
ID 1	37	Secondary	Driving	4	0	Y	Method-mix	1.48	8	-1.14	Y
ID 4	35	None	Labourer	3	1	Y	Method-mix	-0.00	8	0.17	N
ID 6	42	Primary	Labourer	4	0	Y	Pill	0.16	8	1.12	Y
ID 19	33	None	Business	4	0	Y	Method-mix	-0.84	8	-0.32	Y
ID 10	28	None	Driving	4	0	Y	Pill	0.05	8	-0.28	Y
Village average /mode	30	None	N-agri	2.33	0.43	Y	M-mix	0.9	9.52	0.1	Y

In Akkelpur *mahallah*, central actors average age is 34.43 years, 4.43 years more than the network average. Access to education among the central actors is much less than the network average, 42.86 per cent against 63.3 per cent. None of the husband's occupation among the central actors is agriculture, in fact overall involvement rate in agriculture is very low, only 13.3 per cent. The average number of children among the central actors is 3.42, which is much higher than the network average of 2.33 and the mean child death, .085, is almost double among the central actors than the over all network average, 0.44.

Use of family planning is 100 per cent among the central actors, this rate in Akkelpur network is also 100 per cent and they all use modern method(s). The pill is the highest used method among the central actors, 57.14 per cent but methodmix is the most used method(s) in the network, 56.7 per cent. Interestingly housing score, 0.47, and

information score, 8.14, both are lower among the central actors than the network average, 0.9 and 9.52 respectively. Female autonomy score is a little higher among the central actors, 0.13, than the network average, 0.1 and the rate of micro-credit affiliation, 85.71 per cent, is also much higher than the network average of 53.3 per cent. So, in the case of Akkelpur there is no set trend for the central actors like other networks. The reason may be understandable from the communication network structure of figure 7.4.8.4-1. Three different clusters are clearly identifiable. The biggest one is with Muslims where ID39, ID27, ID37, ID28 and ID35 are central actors. Between two other clusters, one is of Rabi Das (RD) and another is of Chouhan community, both are well-established non-Bengali Hindu communities. Among them they have their own central actors like ID19 in Chouhan community, and ID21 in Rabi Das community. So, the central actors in this mahallah perhaps were selected more on a community basis rather than by some unique characteristics.

7.5 Discussion

From the results obtained and the figures presented on various *centrality* measures (*in-degree*, *out-degree*, *betweenness*, and *power*), cliques-subgroups and network structures with different matrices (“strength”, “approval”, and “contact”) in section 7.4, it was found that:

- i. Similar actors with little or sometimes no variation were the central actors in all the centrality measures. More specifically, the *in-degree* central actors (popular/prestigious actors) and the *betweenness* central actors (liaisons/bridges) were very similar, whereas *out-degree* central actors (influential actors) were found to be more similar to *power* central actors. This means that, in these surveyed areas, prestigious actors were also in positions of liaison among disjointed actors or cliques, whereas influential actors having control on many contacts were mostly also the actors who were powerful in that the actors in their surroundings were weakly tied.
- ii. Irrespective of centrality measures, very strong similarity was found between the actors of ‘strength’ matrix and ‘approval’ matrix, and this similarity was more than that with the ‘contact’ matrix. This reads, that the central actors with more frequencies of contacts were the influential actors irrespective of centrality measures. Very strong similarity was found among the actors of

‘strength’ matrix and ‘approval’ matrix, and this similarity was more than that with the ‘contact’ matrix. Thus, the central actors with greater frequencies of contact were the actors who approved of family planning, rather than the actors who were central in that they just had links with other actors whatever the contact frequency.

- iii. Variations in the pattern of communications were not attributable to topographical features of the landscape of the villiage. In none of the villages studied was there any evidence that physical geographical features influenced the form of the social networks.

7.5.1 Descriptive Statistics

From the descriptive statistics, the standard deviations for the *in-degree* centrality of the “strength” matrices and the “approval” matrices were higher than that of the means (exceptions are: Mohugaon, Brahmin Shasan and Jobra for the “strength” matrix and Brahmin Shasan for the “approval” matrix). This means that there was large diversity among the actors for centrality positions. In other words, only a few actors were at the centrality positions compared to other actors of the network. This diversity was also evident among the actors who approve of family planning. Exceptions were recorded in Mohugaon, Brahmin Shasan and Jobra for the “strength” matrix. Mohugaon was a Hindu village where centrality was formed on a caste and creed basis (for details, see sections 7.4.5.4 and 7.4.5.5 in this chapter), thus central actors represented the local centrality rather than overall network centrality. Brahmin Shasan and Jobra were both ‘conservative’ areas where women had less freedom of travelling and less opportunity of keeping contacts throughout the network. Thus these two areas also represented more the locally central actors than the network central actors. For the “approval” matrix, only in Brahmin Shasan was the standard deviation less than the mean, so, a large diversity is evident among the actors in all areas except Brahmin Shasan. This means that, as regards approving family planning, only a few actors are at central positions compared to other networks members. Interestingly, for the ‘contact’ matrix all the standard deviations are less than the means, which means that, if the strength of relationships is not measured, then the diversity among the central actors is less.

For *out-degree* centrality, in both the “strength” and “approval” matrices, the standard deviations are far less than the means throughout the areas. Thus, the diversity among actors as regards the claim of having contacts with others is less than the mean

network-tie, which means that more actors in the network claim to have contacts with others than other network members mention them.

For *betweenness* centrality, in all the three matrices, the standard deviations are much higher than that of the network means depicting that only a few actors are at the central liaison positions in the networks and only a few actors are at the liaison positions among those who approve of family planning.

For *Bonacich Power Index*, like *out-degree* centrality, the standard deviations are much less than the mean power, which means that centrality among *power* actors is more local than central in all the surveyed areas. Also the *powerful* actors who approve of family planning are more local than central.

From the clique-by-clique overlaps and actor-by-clique overlaps, it was found that clique and sub-group patterns were mainly local than central though some central actors are overlapping through various cliques. These local clique patterns are, when observed with the network data, mainly comprised of the women of same *bari* or *para* and often these are the *ja-network*, 63.75 per cent of the mentioned ties were recorded as *ja*. For Hindu women, cliques are made up of women of the same caste (see figure 7.4.5.5-1).

With some exceptions (in Balai Nagar, Jobra and Akkelpur on some points), the central actors are a little more mature in age, both their education rate and level are a little higher, husbands are involved more in non-agricultural occupations, child-death is lower, female autonomy score is higher and family planning use is almost 100 per cent among central actors. There no major differences in housing score and information score.

To understand the influence of actors' centrality and their structural positions on fertility behaviour, a set of sub-hypotheses (developed in chapter 3) were tested in this chapter and these are discussed below.

7.5.2 Testing Sub-hypotheses

7.5.2.1 Sub-hypothesis 1 (isolates practise contraceptives less than non-isolates) and sub-hypothesis 7 (central actors are more likely to use contraception than the women who are less connected).

In almost all the networks (except Jobra and Akkelpur), central actors practise family planning whereas the actors with isolate and pendant position are less likely to practise family planning. In the Balai Nagar network, among the 6 isolates, only one (ID56) practises family planning and among the 17 pendants, only 4 practises family planning (see figure 7.4.1.4-1). In the Paygram network, none among the 6 isolates practises family planning and among 11 pendants, only 2 practise family planning (see figure 7.4.2.4-1). In the Kamarpara network (figure 7.4.3.4-1), none of the 15 isolates practise family planning and, among 14 pendants, only two practise family planning. Among the 14 isolates in the Royer Kathi network, none practise family planning though 7 among the 15 pendants practise family planning (see figure 7.4.4.4-1). Among these 7 family planning practicing pendants, all are connected with the central actors. For example, pendants ID17 and ID45 are associated with the central actor ID18, pendant ID90 is connected with the central actor ID32, ID50 is related to central actor ID48, ID31 is associated with central actor ID25 and ID92 is connected with ID91 who is a member of a clique. In the Mohugaon network (see figure 7.4.5.4-1), none of the 8 isolates and 6 pendants practise family planning. In the Brahmin Shasan network, none of the 5 isolates and 4 pendants practise family planning (see figure 7.4.6.4-1). Among the 4 isolates and 5 pendants in the Jobra network, only one pendant (ID66) practise family planning. Thus sub-hypotheses 1 and 7 are accepted that isolates practise contraceptives less than non-isolates and central actors practise family planning more than both isolates and pendants. Also from the central actors profiles (see tables 7.4.1.6-1, 7.4.2.6-1, 7.4.3.6-1, 7.4.4.6-1, 7.4.5.6-1, 7.4.6.6-1, 7.4.7.6-1 and 7.4.8.6-1), family planning practice rate is 100 per cent among the central actors in the surveyed areas except in Jobra where the practice rate is 79 per cent among the central actors (much more than the network average of 36 per cent). In Akkelpur *mahallh*, the contraceptive prevalence rate is 100 per cent regardless of actor centrality positions.

7.5.2.2 Sub-hypothesis 5 (actors who are members of a clique are more likely to use contraception than the actors who are not members of any clique); sub-hypothesis 6 (members of more than one clique use contraception more than the members of isolated cliques); and sub-hypothesis 2 (an individual in a larger personal networks use more contraception than those who are in a smaller personal network).

From the clique structures it was found that actors who were the members of any clique practised family planning more than the actors who were not in any clique, and members of overlapping cliques practised family planning more than the actors who

were in only one clique. In the Balai Nagar and Royer Kathi networks, all the actors in cliques practise family planning (see figures 7.4.1.5-1 and 7.4.4.5-1). Among 197 actors in the Paygram network, only 4 clique members do not practise family planning. 3 of these (ID15, ID101 and ID162) are members of only one clique (see figure 7.4.2.5-1). In the Kamarpara network only one clique member does not practise family planning (see figure 7.4.3.5-1). In the Mohugaon network only 3 clique members do not practise family planning and in the Brahmin Shasan network 6 clique members do not practise family planning (see figures 7.4.5.5-1 and 7.4.6.5-1 respectively). In both the cases they are the members of only one clique. Jobra is an exception as the members within cliques practise family planning more than the non-clique actors and also many of the clique members who do not practise family planning share only one clique (see figure 7.4.7.5-1). Thus sub-hypotheses 5 and 6 are accepted and this result combined with the accepted sub-hypothesis 7 also proves the sub-hypothesis 2 that an individual with larger personal network uses contraception more than those with smaller networks.

7.5.2.3 Sub-hypothesis 3 (contraception use is higher among individuals if a larger portion of her personal network consists of individuals who also use contraception).

From both the clique analyses (see figures 7.4.1.5-1, 7.4.2.5-1, 7.4.3.5-1, 7.4.4.5-1, 7.4.5.5-1, 7.4.6.5-1 and 7.4.7.5-1) and the full network analyses (see figures 7.4.1.4-1, 7.4.2.4-1, 7.4.3.4-1, 7.4.4.4-1, 7.4.5.4-1, 7.4.6.4-1 and 7.4.7.4-1) throughout the areas, it was clear that pendants practised contraception more than isolates, clique members practised contraception more than pendants and members of more than one clique practised contraception more than the actors who were in one clique. It was also found that all the overlapping clique members (with a negligible exception) practised family planning. In other words, actors who practised family planning were in a clique relation or in a personal network. Thus sub-hypothesis 3 is proved that contraceptive use is higher among individuals if a larger portion of her personal network consists of individuals who also use contraceptive.

7.5.2.4 Sub-hypothesis 4 (contraception use is higher among individuals if a larger portion of her personal network consists of individuals who approve of family planning).

As discussed earlier in this section, irrespective of centrality measures very strong similarity was found among the central actors of the “strength” matrix and the

“approval” matrix. Also it was demonstrated that most of the central actors practise family planning. These central actors who practise family planning are also the actors who approve of family planning. From the clique structure analysis it was again found that these central actors who approve of family planning are forming cliques and the members who are in clique(s) practise family planning more than who are not in clique(s). Thus it can be observed that actors who are practising family planning are in the personal network of actors who approve of family planning. This supports the sub-hypothesis 3 that contraceptive use is higher among the individuals if a larger portion of her personal network consists of individuals who approve of family planning.

7.5.2.5 Sub-hypothesis 8 (central actor’s fertility behaviour has a significant influence on contraceptive behaviour of other women of the network).

Both through the analyses of full network structures and clique structures in the surveyed areas (except Jobra and Akkelpur), almost all the central actors practised family planning and the actors connected with them also practised family planning, whereas the isolates or pendants who were not connected with these central actors practised less. Again the central actors formed overlapping cliques (i.e. common in several cliques), interestingly almost all the members of these cliques practised family planning even if they were not the very central. Thus the influence of central actors’ family planning behaviour on other actors can be accepted. Jobra was found to be the exception where many of the central actors did not practise family planning but the impact of it is very clear in the figures 7.4.7.4-1 and 7.4.7.5-1. Actors connected with these non-practising central actors did not practise family planning either, which strengthens the claim of sub-hypothesis 8 that the fertility behaviour of the central actors has significant influence on contraceptive behaviour of other women of the network.

Through using network analysis it is tentatively proved that actors’ centrality positions (i.e. connectedness), their clique structures, perception of family planning and family planning behaviour of personal networks have significant influence on women’s fertility behaviour, though there might be the bias of other socio-economic and cultural variables mixed in with this particular behaviour. To assess the impact of these various network centrality measures on fertility behaviour while controlling for other socio-economic and cultural variables, new variables were created from these *in-degree*, *out-degree*, *betweenness*, and *power* centrality measures from the three matrices. These

created variables (see section 8.1 of chapter 8) will be used to determine the properties of the network impact on the total number of children and family planning use. This will be done by extending the OLS regression and logistic regression models developed in chapter 6 and these will then be used in the final path model. Doing this will allow hypothesis 5 to be tested and this is the subject of chapter 8.

Chapter 8

Modelling Network Variables

Introduction

The aim of this chapter is to analyse the network variables created in chapter 7 to measure the impact of network properties on fertility behaviour and address the hypothesis 5 that being interconnected with more actors in the network will increase family planning use. To this end the created sociometric variables are analysed in this chapter to update the binary and logistic regression, and path models of chapter 6. Before adding the network variables to the regression and path models, several tests were conducted using these variables and are also discussed in this chapter. This chapter is organised in *five* sections:

Section 1: brief descriptions of social network variables created;

Section 2: measuring the association between sociometric variables in the study areas;

Section 3: measuring variation in number of children, family planning use and method used with these variables;

Section 4: updating models;

Section 5: discussion.

8.1 Social Network Variables Created

As discussed in chapter 7, three types of matrix were formed using the sociometric data: 'strength' matrix, 'approval' matrix, and 'contact' matrix. The 'strength' matrix was formed using the strength score among actors in the network. The 'approval' matrix was formed using the family planning approval score among the network members and the 'contact' matrix was formed using non-valued contacts among the network members. Both the 'strength' matrix and the 'approval' matrix are valued asymmetric matrices, whereas the 'contact' matrix is a non-valued matrix that was symmetrised when analysed.

Three types of centrality measures (*degree* centrality, *betweenness* centrality and *Bonacich Power Index*) led to the creation of 11 new sociometric variables. These variables are:

indegree centrality-‘strength’ matrix (indc_strn)
indegree centrality-‘approval’ matrix (indc_appr)
degree centrality-‘contact’ matrix (dc_cont)
outdegree centrality- ‘strength’ matrix (outdc_strn)
outdegree centrality- ‘approval’ matrix (outdc_appr)
betweenness centrality- ‘strength’ matrix (bc_strn)
betweenness centrality-‘approval’ matrix (bc_appr)
betweenness centrality-contact matrix (bc_cont)
Bonacich Power Index- ‘strength’ matrix (bpi_strn)
Bonacich Power Index- ‘approval’ matrix (bpi_appr)
Bonacich Power Index- ‘approval’ matrix (bpi_cont)

A brief description of these created variables are as follows:

In-degree Centrality-strength matrix: This is a measure of actor centrality from the asymmetric ‘strength’ matrix, which measures the nominations each actor got from their fellow actors of the network. This is a popularity index of the actors in the ‘strength’ matrix denoted by “indc_strn”.

In-degree Centrality-approval matrix: This is the centrality measure using the asymmetric ‘approval’ matrix. It is an index of nominations each actor got from their fellow actors of the network built upon the ‘approval’ matrix. It is the popularity index of the actors in the ‘approval’ matrix denoted by “indc_appr”.

Out-degree Centrality-strength matrix: This is the variable created from the asymmetric ‘strength’ matrix that represents the number of links mentioned by each actor in the network. The index depicts how influential the actors are in the network and is denoted by “outdc_strn”.

Out-degree Centrality-approval matrix: This variable is created from the asymmetric ‘approval’ matrix that represents the number of nominations each actor in the network gives to other network members. It is an index of how influential actors are in the network and is formed from the ‘approval’ matrix, and is denoted by “outdc_appr”.

Degree Centrality-contact matrix: This variable, denoted as “dc_cont”, is created from the ‘contact’ matrix that represents the nominations each actor got from her network members; the strength of the relationships is omitted here.

Betweenness Centrality-strength matrix: This variable is created from the ‘strength’ matrix and represents the liaisons or information controlling positions of the actors in the network. This is denoted by “bc_strn”.

Betweenness Centrality-approval matrix: This is the variable created from the ‘approval’ matrix that represents the betweenness position. It is the information controlling position of each actor in the network and is denoted by “bc_appr”.

Betweenness Centrality-contact matrix: This is the variable created from the ‘contact’ matrix that represents the betweenness position of actors in the ‘contact’ matrix, and is denoted by “bc_cont”.

Bonacich Power Index-strength matrix: This variable is created from the asymmetric ‘strength’ matrix that represents the power of the actors in the network and is denoted here by “bpi_strn”. Bonacich power is not a measure of how connected an actor is, rather the fewer the connections of the actors in her neighbourhood, the more powerful is that actor.

Bonacich Power Index-approval matrix: This variable is created from the asymmetric ‘approval’ matrix that represents the power of the actors in the family planning approval network and is denoted by “bpi_appr”.

Bonacich Power Index-contact matrix: This variable represents the power of actors in the symmetric ‘contact’ matrix and is denoted by “bpi_cont”.

8.2 Association Between Sociometric Variables

The aim of creating these sociometric variables is to use them in the statistical models of chapter 6 to update those models. While comparing the central actors of different centrality measures in chapter 7, it was found that with few exceptions there were overall similarities among the central actors irrespective of centrality measures and data matrices. Variables of similar effects often disturb the analysis (Krzanowaski 1998). So, to identify similar variables a correlation test was made using all the

sociometric variables in each village. Many of the variables were strongly correlated as can be seen from the matrix scatter plots in figure 8.2.1.



Figure 8. 2. 1: Correlation Graphs of Sociometric Variables in each of the Study Areas

All the villages displayed similar correlation structures between the sociometric indices. So, rather than present here all the villages, the detailed correlation pattern among the indices in village Jobra is presented below as an example.

Jobra

Displayed in table 8.2-1 are the associations among the sociometric variables in the Jobra network, and this was similar to the findings of all the villages, with very few exceptions (for example in Balai Nagar; see figure 8.2.1).

The variables `indc_strn`, `indc_appr`, `dc_cont`, `bc_strn`, `bc_appr`, `bc_cont`, and `bpi_cont` are all strongly correlated with each other. Also, `outdc_strn` and `outdc_appr` were found to have a very strong association with the Bonacich Power Index of the ‘strength’ (`bpi_strn`) and the ‘approval’ matrices (`bpi_appr`).

Table 8.2-1: Correlation Measures among Sociometric Variables in Jobra

Correlations												
		Indc_strm	Indc_appr	DC_cont	Outdc_str n	Outdc_appr	BC_strm	BC_appr	BC_cont	BPI_strm	BPI_appr	BPI_cont
INDC_strm	Pearson Correlat	1	.875*	.860*	.280*	.376*	.749*	.756*	.722*	.280*	.376*	.860*
	Sig. (2-tailed)	.	.000	.000	.005	.000	.000	.000	.000	.005	.000	.000
	N	97	97	97	97	97	97	97	97	97	97	97
Indc_appr	Pearson Correlat	.875*	1	.812*	.227*	.525*	.731*	.731*	.613*	.227*	.525*	.812*
	Sig. (2-tailed)	.000	.	.000	.025	.000	.000	.000	.000	.025	.000	.000
	N	97	97	97	97	97	97	97	97	97	97	97
DC_cont	Pearson Correlat	.860*	.812*	1	.538*	.570*	.816*	.827*	.837*	.538*	.570*	1.000*
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.000	.000	.
	N	97	97	97	97	97	97	97	97	97	97	97
Outdc_strm	Pearson Correlat	.280*	.227*	.538*	1	.610*	.343*	.336*	.343*	1.000*	.610*	.538*
	Sig. (2-tailed)	.005	.025	.000	.	.000	.001	.001	.001	.	.000	.000
	N	97	97	97	97	97	97	97	97	97	97	97
Outdc_appr	Pearson Correlat	.376*	.525*	.570*	.610*	1	.480*	.459*	.320*	.610*	1.000*	.570*
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.001	.000	.	.000
	N	97	97	97	97	97	97	97	97	97	97	97
BC_strm	Pearson Correlat	.749*	.731*	.816*	.343*	.480*	1	.982*	.828*	.343*	.480*	.816*
	Sig. (2-tailed)	.000	.000	.000	.001	.000	.	.000	.000	.001	.000	.000
	N	97	97	97	97	97	97	97	97	97	97	97
BC_appr	Pearson Correlat	.756*	.731*	.827*	.336*	.459*	.982*	1	.868*	.336*	.459*	.827*
	Sig. (2-tailed)	.000	.000	.000	.001	.000	.000	.	.000	.001	.000	.000
	N	97	97	97	97	97	97	97	97	97	97	97
BC_CONT	Pearson Correlat	.722*	.613*	.837*	.343*	.320*	.828*	.868*	1	.343*	.320*	.837*
	Sig. (2-tailed)	.000	.000	.000	.001	.001	.000	.000	.	.001	.001	.000
	N	97	97	97	97	97	97	97	97	97	97	97
BPI_strm	Pearson Correlat	.280*	.227*	.538*	1.000*	.610*	.343*	.336*	.343*	1	.610*	.538*
	Sig. (2-tailed)	.005	.025	.000	.	.000	.001	.001	.001	.	.000	.000
	N	97	97	97	97	97	97	97	97	97	97	97
BPI_appr	Pearson Correlat	.376*	.525*	.570*	.610*	1.000*	.480*	.459*	.320*	.610*	1	.570*
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.001	.000	.	.000
	N	97	97	97	97	97	97	97	97	97	97	97
BPI_cont	Pearson Correlat	.860*	.812*	1.000*	.538*	.570*	.816*	.827*	.837*	.538*	.570*	1
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.000	.000	.
	N	97	97	97	97	97	97	97	97	97	97	97

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Generally, the association pattern among the variables is very similar irrespective of study area. The *in-degree* centrality and the *betweenness* centrality are strongly associated, whereas the *out-degree* centrality and the *Bonacich Power Index* for the ‘strength’ and the ‘approval’ matrices are strongly associated. The Bonacich Power Index of the ‘contact’ matrix is sometimes associated with the *in-degree* centrality.

But to understand the association among these variables as a whole rather than per area, another correlation analysis was run using *indc_strn*, *dc_cont*, *outdc_strn*, *bc_strn* and *bpi_strn*, table 8.2-2. Here, as *indc_strn* and *indc_appr* were very closely associated and so were *outdc_strn* and *outdc_appr*, *bc_strn* and *bc_appr*, and *bpi_strn* and *bpi_appr*, only one variable from each pair has been selected and that is the variable with strength matrix from each pair. Thus all the centrality measures presented in the table 8.2-2 are in the strength matrix.

Table 8.2-2: Overall Correlation Measure Among Selected Sociometric Variables

Correlations						
		ind_strn	dc_cont	out_strn	bc_strn	bpi_strn
ind_strn	Pearson Correlation	1	.428**	.314**	.597**	.309**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	724	724	724	724	724
dc_cont	Pearson Correlation	.428**	1	.291**	.647**	.281**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	724	724	724	724	724
out_strn	Pearson Correlation	.314**	.291**	1	.347**	.980**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	724	724	724	724	724
bc_strn	Pearson Correlation	.597**	.647**	.347**	1	.347**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	724	724	724	724	724
bpi_strn	Pearson Correlation	.309**	.281**	.980**	.347**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	724	724	724	724	724

** . Correlation is significant at the 0.01 level (2-tailed).

Here, as presented in table 8.2-2, a very strong association was found among *in-degree* centrality, *degree* centrality and *betweenness* centrality whereas *out-degree* centrality and *Bonacich Power Index* were found to be strongly associated with each other. Thus from the eleven sociometric variables only two variables were selected to measure the influence of the network variables on fertility behaviour, one from each group: *indc_strn* and *outdc_strn*. These were chosen as being representative of their group and, between them, cover the variation of virtually all the variables as was found in Jobra.

8.3. Sociometric Variables and Fertility Behaviour

The association of the selected sociometric variables with the square root of total number of children (SQR_TCH), and family planning use (FP_use), are tested using linear and logistic regression analysis, respectively, before using these variables to update the models in chapter-6.

8.3.1. SQR_TCH

The coefficients of the linear regression model are presented in table 8.3.1-1, where SQR_TCH is the dependent variable and *in-degree* centrality and *out-degree* centrality are the independent variables. The explanatory power is weak; however, there is an indication that *in-degree* centrality, i.e. the popularity of the actor in the network, is significantly associated with the total number of children. *Out-degree* centrality was found to have no significant association with the total number of children.

Table 8.3.1-1: Variation in SQR_TCH with Sociometric Variables

Variables	Unstandardised		Standardised		t	Sig
	Coefficients		Coefficients			
	B	Std. Error	Beta			
(Constant)	1.501	.034			44.724	.000
Ind_strn	.0004	.000	.071		1.811	.070
Out_strn	.0004	.000	.037		.951	.342

Adjusted R² = .005

8.3.2. FP Use

Using logistic regression analysis, variation in FP use with sociometric variables was measured.

Table 8.3.2-1: Variation in FP Use with Sociometric Variables

Variables	B	SE	Wald	df	Sig	Exp(B)
Indc_strn	.007	.002	13.945	1	.000	1.007
Outdc_strn	.037	.003	131.254	1	.000	1.038
Constant	-1.518	.190	63.731	1	.000	0.219

Percentage of ‘no’ correct = 64.4, Percentage of ‘yes’ correct = 91.4,
Overall percentage correct = 83.1

From the logistic regression analysis with FP_use as the dependent variable and the sociometric variables as the independent variables, it was found that both *in-degree*

centrality and *out-degree* centrality have significant associations with FP use; see table 8.3.2-1. Association with both the variables is positive, which means that the higher the *in-degree* centrality and *out-degree* centrality scores, the higher is the FP practice. Thus, more popular actors, as well as influential actors who have many contacts, practised family planning more.

8.4 Updated Models

In order to measure the influence of the sociometric variables on fertility behaviour while controlling for other socio-economic-cultural variables, these created variables were added in to the regression, logistic regression and path models of chapter 6 to update them.

8.4.1 Linear Regression: SQR_TCH

The sociometric variables were added to both the entry wise and the stepwise linear regression models of chapter 6 to get the final regression model for SQR_TCH.

Entry 5 in entry wise regression analysis: At this stage all the communication variables were found to be insignificant when the two sociometric variables, the *in-degree* centrality of the strength matrix (*indc_strn*) and the *out-degree* centrality of the strength matrix (*outdc_strn*), were entered.

From the final table for entry wise regression table for SQR_TCH, all the variables in table 6.3.1-2 in chapter 6 were found to be significant in explaining the variation in the total number of children that a women had. The only exception is that here no communication variable was found to be significant, and, between the two sociometric variables entered, only *out-degree* centrality was found to be significant in explaining the total number of children. The Adjusted R^2 was slightly improved to 55 per cent. The updated entry wise regression model for SQR_TCH is presented in Table 8.4.1-1.

Table 8.4.1-1: Regression Model for SQR_TCH and Other Explanatory Variables

Explanatory Variables	Demographic Variables	Demographic + Health Variables	Demographic + Health + Socio-economic-cultural	Demographic+Health+ Socio-economic+ Communication	Demographic+Health+ Socio-economic+ communication+ Social Network										
	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig						
(Constant)	1.007	0.100	0.000	0.711	0.116	0.000	0.701	0.116	0.000	0.729	0.116	0.000	0.629	0.112	0.000
<i>Demographic Variables</i>															
w_age	.033	.002	.000	.033	.002	.000	.033	.002	.000	.035	.002	.000	.036	.002	.000
a_fchib	-.041	.004	.000	-.035	.004	.000	-.032	.004	.000	-.032	.004	.000	-.033	.004	.000
f-mem	.045	.005	.000	.046	.005	.000	.049	.005	.000	.051	.005	.000	.049	.005	.000
d_mchi	-.095	.025	.000	-.093	.025	.000	-.094	.024	.000	-.100	.024	.000	-.098	.023	.000
d_fchi	-.068	.038	.069	-.059	.037	.109	-.058	.035	.101						
s_fchib	.075	.026	.004	.066	.024	.006	.055	.023	.018	.070	.023	.002	.066	.022	.003
mchid	.108	.032	.001	.105	.033	.001	.097	.031	.002	.089	.032	.006	.096	.031	.002
fchid	.042	.026	.105												
mfchi_bal	.003	.009	.703												
<i>Health Variables</i>															
DELHP				.033	.042	.434									
DELREL				.063	.054	.243									
DELUNQ				.094	.027	.001	.023	.029	.425						
Pl_gbrth				.157	.051	.002	.126	.051	.013	.134	.049	.006	.137	.047	.004

	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig
<i>Socio-economic-cultural Variables</i>									
Inc_source	.007	.027	.797						
edu_score	-.025	.014	.071	-.022	.014	.114			
WJOB	.053	.047	.259						
fmlabrd_score	.007	.012	.565						
housing_score	-.054	.015	.000	-.050	.015	.001	-.045	.014	.002
femauto_score	-.038	.014	.005	-.036	.014	.011	-.039	.013	.003
religion	-.105	.029	.000	-.099	.028	.000	-.088	.028	.001
equip_score	-.026	.008	.002	-.022	.009	.017	-.034	.008	.000
mco	-.003	.025	.915						
land property	.037	.020	.068	.036	.020	.070	.038	.019	.039
food consumption	.038	.015	.011	.035	.015	.025	.031	.015	.035
<i>Communication Variables</i>									
information_score				-.007	.005	.166			
off_fpinf				-.011	.030	.704			
fr_fpinf				.009	.028	.739			
rt_fpinf				.014	.038	.703			
display				.016	.012	.927			
interpersonal				.007	.014	.618			
mass media				.011	.013	.415			
husband				-.002	.003	.590			
FWA				-.005	.003	.191			
fp_disfreq				-.003	.009	.695			

<i>Social Network Variables</i>	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig	Co-eff	SE	Sig
ind_strength										-.0001	.000	.383
outdc_strength										.0009	.002	.003

Dependent Variable = SQR_TCH, N=723
Demographic Variables: Adjusted R² = 48.8%
Demographic+ Health Variables: Adjusted R² = 50.2%
Demographic+Health+Socio-economi-cultural Variables: Adjusted R² = 54.1%
Demographic+Health+Socio-economi-cultural+communication Variables: Adjusted R² = 53.8%
Demographic+Health+Socio-economi-cultural+communication+sociometric Variables: Adjusted R² = 54.5%

As in chapter 6, all the explanatory variables in the five categories (adding the sociometric variable category to the previous four categories) were entered into a stepwise regression procedure, relaxing the entry criterion of using probability of F at 0.08 and removal at 0.10 level, and this gave the final model for regression analysis, which is presented in table 8.4.1-2.

Table 8.4.1-2: Step-wise Updated Regression Model for SQR_TCH

Explanatory Variables	Unstandardised Co-efficients	Standard Error	Standardised Coefficients	Significance
(Constant)	0.746	0.111		0.000
<i>Demographic Variables:</i>				
Wife's age	0.035	0.002	0.502	0.000
Age of first child born	-0.033	0.002	-0.208	0.000
Family members	0.051	0.005	0.259	0.000
Demand for male children	-0.087	0.023	-0.112	0.000
Male child died	0.093	0.032	0.077	0.004
Sex of first child born	0.074	0.023	0.086	0.001
<i>Health Variables:</i>				
Place of giving birth	0.148	0.048	0.079	0.002
<i>Socio-economic-cultural Variables:</i>				
Equipment-score	-0.039	0.007	-0.154	0.000
Religion	-0.099	0.028	-0.096	0.000
<i>Communication Variables:</i>				
FWA	-0.007	0.003	-0.086	0.010
<i>Sociometric Variables:</i>				
Out-degree centrality - strength	0.001	0.000	0.090	0.001

Dependent Variable = SQR_TCH

Adjusted R² = 54.0%

From the up-dated step wise final regression model for SQR_TCH it was found that five demographic variables are common to both the step-wise models in chapter 6 and chapter 8: wife's age, age of first child born, number of family members, demand for male children and male children died. Instead of 'female children died' which was significant in the chapter 6 model, 'sex of first child born' was found to be significant

in the updated model. The health variable 'place of giving birth' was found to be significant in both models. Among the socio-economic-cultural variables, 'equipment score' and 'religion' were found to be significant in both models. In the earlier model two communication variables were found to be significant: 'FWA' and 'Information score', but in the updated model only 'FWA' is found to be significant. Between the two sociometric variables, only '*out-degree* centrality' was found to be significant in explaining the total number of children. The adjusted R^2 for this final model is 54 per cent.

8.4.2. Logistic Regression Analysis: FP Use

As in chapter 6, logistic regression analysis was run in two ways: entry wise and using the Wald Forward Selection method. First the sociometric variables were added to the entry wise logistic regression model in chapter-6, and then all the explanatory variables including sociometric variables were again analysed using the Wald Forward Selection method.

Entry 5 in entry wise logistic regression analysis: After removing the non-significant variables 'unqualified delivery assistants (delunq)', 'education score', 'equipment score', 'micro-credit organisation affiliation', 'influencing factor1-display', 'influencing factor2-interpersonal' and 'information score', the sociometric variables '*in-degree* centrality' and '*out-degree* centrality' were entered into the equation at this stage. All the variables entered at this entry were found to be significant in explaining the use of family planning. At this level, the percentage of "no"s correct was 77, the percentage of "yes"s correct was 93.3 and the overall percentage correct was 88.2. Table 8.4.2-1 shows the updated logistic regression model to explain family planning use.

Table 8.4.2-1: Up-dated Logistic Regression Model for FP Use

Explanatory Variables	Demographic Variables				Demographic + Health Variables				Demographic + Health + Socio-economic-cultural				Demographic+Health+ Socio-economic+ Communication				Demographic+Health+ Socio-economic+ communication+ Social Network			
	B	SE	Sig	Exp	B	SE	Sig	Exp	B	SE	Sig	Exp	B	SE	Sig	Exp	B	SE	Sig	Exp
Constant	1.28	0.671	0.057	3.596	1.16	0.334	0.001	3.184	1.659	0.407	0.000	5.257	0.141	0.528	0.790	1.151	-2.9	.57	.000	.056
				(B)					(B)					(B)					(B)	
<i>Demographic Variables</i>																				
W_AGE	-0.01	0.015	0.346	0.986																
AGE_FCH	-0.01	0.028	0.727	0.990																
F_MEM	0.029	0.036	0.415	1.030																
D_MCHI	-0.43	0.162	0.007	0.648	-.35	0.148	0.018	0.706	-0.25	0.159	0.120	0.781	-0.65	0.293	0.026	0.521	-.90	.392	.021	.406
D_FCHI	-0.49	0.248	0.046	0.609	-.53	0.230	0.022	0.590	-0.55	0.237	0.020	0.576	-0.65	0.293	0.026	0.521	-.90	.392	.021	.406
S_FCHIB	0.18	0.179	0.310	1.199																
MCHID	-0.64	0.203	0.002	0.526	-.60	0.203	0.003	0.547	-0.69	0.221	0.002	0.499	-0.75	0.261	0.004	0.473	-73	.312	.020	.483
FCHID	0.014	0.166	0.934	1.014																
MFC_BAL	0.021	0.062	0.731	1.021																
<i>Health Variables</i>																				
DELHP					.153	0.284	0.592	1.165												
DELREL					-.70	0.340	0.038	0.494	-0.56	0.361	0.121	0.572								
DELUNQ					-.38	0.190	0.046	0.685	-0.40	0.213	0.060	0.670	-.197	.246	.422	.821				
PLGBRTH					.239	.333	.472	1.270												
<i>Socio-economic-cultural Variables</i>																				
INCS									-0.37	0.199	0.063	0.691	-.194	.234	.407	.824				
EDU_SCO									0.07	0.100	0.461	1.076								
WJOB									-0.08	0.339	0.799	0.917								
FMLAB SC									-0.37	0.086	0.000	0.690	-.189	.104	.068	.827	-.56	.128	.000	.571

	B	SE	Sig	Exp	B	SE	Sig	Exp	B	SE	Sig	Exp	B	SE	Sig	Exp
H_SCO				(B)				(B)								(B)
FAUTO_SC					0.297	0.118	0.012	1.345	.227	.135	.093	1.25	.386	.155	.013	1.471
RELIGION					0.269	0.100	0.007	1.309	.221	.121	.067	1.24	.388	.149	.009	1.475
EQUIP_SC					-0.51	0.212	0.016	0.601	-.467	.248	.059	.627	.814	.313	.009	2.257
MCO					0.180	0.064	0.005	1.198	.097	.079	.223	1.102				
LAND_PRO					0.518	0.190	0.006	1.679	.354	.229	.122	1.424				
FOODCONS					-0.01	0.148	0.933	0.988								
					-0.23	0.115	0.044	0.793	-.307	.143	.031	.736	-.33	.170	.051	.718
Communication Variables																
Infl11-display									0.451	0.619	0.466	1.570				
Influf2-interp									0.250	0.152	0.100	1.284				
Influf3- mass									0.484	0.145	0.001	1.622	.499	.152	.001	1.647
Inf_score									0.041	0.045	0.359	1.042				
F_DFPW									0.227	0.074	0.002	1.254	.198	.086	.021	1.219
Husband									0.128	0.026	0.000	1.136	.200	.032	.000	1.222
FWA									0.187	0.028	0.000	1.205	.173	.033	.000	1.189
Social Network Variables																
Indc_strength													.010	.003	.000	1.010
Outdc_strength													.046	.005	.000	1.047

Demographic Variables: % of 'No' correct=7.7%, % of 'Yes' correct= 96.6%, Overall percentage correct= 69.5%

Demographic+ Health Variables: % of 'No' correct=12.2%, % of 'Yes' correct= 96.4, Overall percentage correct= 70.6%

Demographic+ Health+ Socio-economic-cultural Variables: % of 'No' correct=29.5%, % of 'Yes' correct= 92.2%, Overall percentage correct= 72.8%

Demographic+ Health+ Socio-economic-cultural +Communication Variables: % of 'No' correct= 69.5%, % of 'Yes' correct= 90.9, Overall percentage correct= 84.3%

Demographic+ Health+ Socio-economic-cultural +Communication + Sociometric Variables: % of 'No' correct= 77%, % of 'Yes' correct= 93.3, Overall percentage correct= 88.2%

From the entry-wise final logistic regression table, only two demographic variables were found to be significant: demand for male children and death of male children. No health variable was found to be significant. Five socio-economic-cultural variables were found to have significant association with FP use: housing score, female autonomy score, religion (positively associated), family members live abroad score and food consumption (negatively associated). Four communication variables were found to be highly significant: exposure to mass media, frequency of discussing with family planning experts, husbands and FWA. All these four variables were positively associated. Finally both *in-degree* centrality and *out-degree* centrality of sociometric variables were found to be positively significant in explaining the use of family planning. Using the Wald Forward Selection method, the updated model is presented in table 8.4.2-3.

Table 8.4.2-3: Updated Wald Forward Selection Method Logistic Regression Model for FP Use

Explanatory Variables and Category	B	S.E.	Significance	Exp (B)
Constant	-4.83	0.62	0.000	0.007
<i>Demographic Variables:</i>				
Demand for Male Child	-0.81	0.24	0.000	0.44
Sex of First Child Born	-0.52	0.25	0.038	1.68
<i>Socio-economic-cultural Variables:</i>				
Family Members Live Abroad Score	-0.59	0.13	0.000	0.55
Religion	0.63	0.32	0.049	1.88
Equipment Score	0.23	0.08	0.004	1.26
<i>Communication Variables:</i>				
INFLF2_interpersonal	0.49	0.15	0.002	1.63
INFLF3-mass media	0.50	0.16	0.002	1.65
Husband	0.16	0.03	0.000	1.17
FWA	0.18	0.03	0.000	1.20
F_DFPW	0.22	0.09	0.013	1.25
<i>Sociometric Variables:</i>				
Indc_strength	0.01	0.00	0.000	1.01
Outdc_strength	0.05	0.01	0.000	1.05

Percent of “no” correct = 76.1% percent of “yes” correct = 93.4% and the overall percentage correct = 88%

This model is quite similar to the entry wise logistic regression model. The differences noticed are: in the demographic variables the sex of first child born takes the place of male child death; in the socio-economic-cultural variables, equipment score replaces both female autonomy score and food consumption and has a positive influence on the use of family planning, and, amongst the communication variables, interpersonal communication is added to the model and appears to promote the adoption of family planning. Other wise the effects of the variables is similar to the entry wise model.

This updated Wald Forward Selection model is very similar to the previous Wald Forward Selection logistic regression model in chapter 6 with a few differences: ‘death of male children’ in demographic variables and ‘delivery assistant-relatives’ in health variables were found to be insignificant. Three socio-economic-cultural variables came to be significant, which were not significant in the previous model. All the communication variables that were found to be significant were the same as the previous model. With the addition of the network variables *in-degree* centrality and *out-degree* centrality, the overall percentage correct increased from 83.86 per cent to 88 per cent with the percentages of ‘no’ correct 76.1 and percentage of ‘yes’ correct 93.4.

From the updated models, it is clear that demographic and socio-economic-cultural variables help to explain the total number of children whereas communication and to a lesser extent sociometric variables are more significant in explaining the use of family planning. To determine the direct and in-direct influence of these variables, path analysis was again run using Amos-6.

8.4.3 Updated Path Model

Sets of explanatory variables obtained from the stepwise regression analysis for the square root of the total number of children and the Wald Forward Selection method for FP Use were used to update the path model in chapter 6. The updated path model is presented in figure 8.4.3-1.

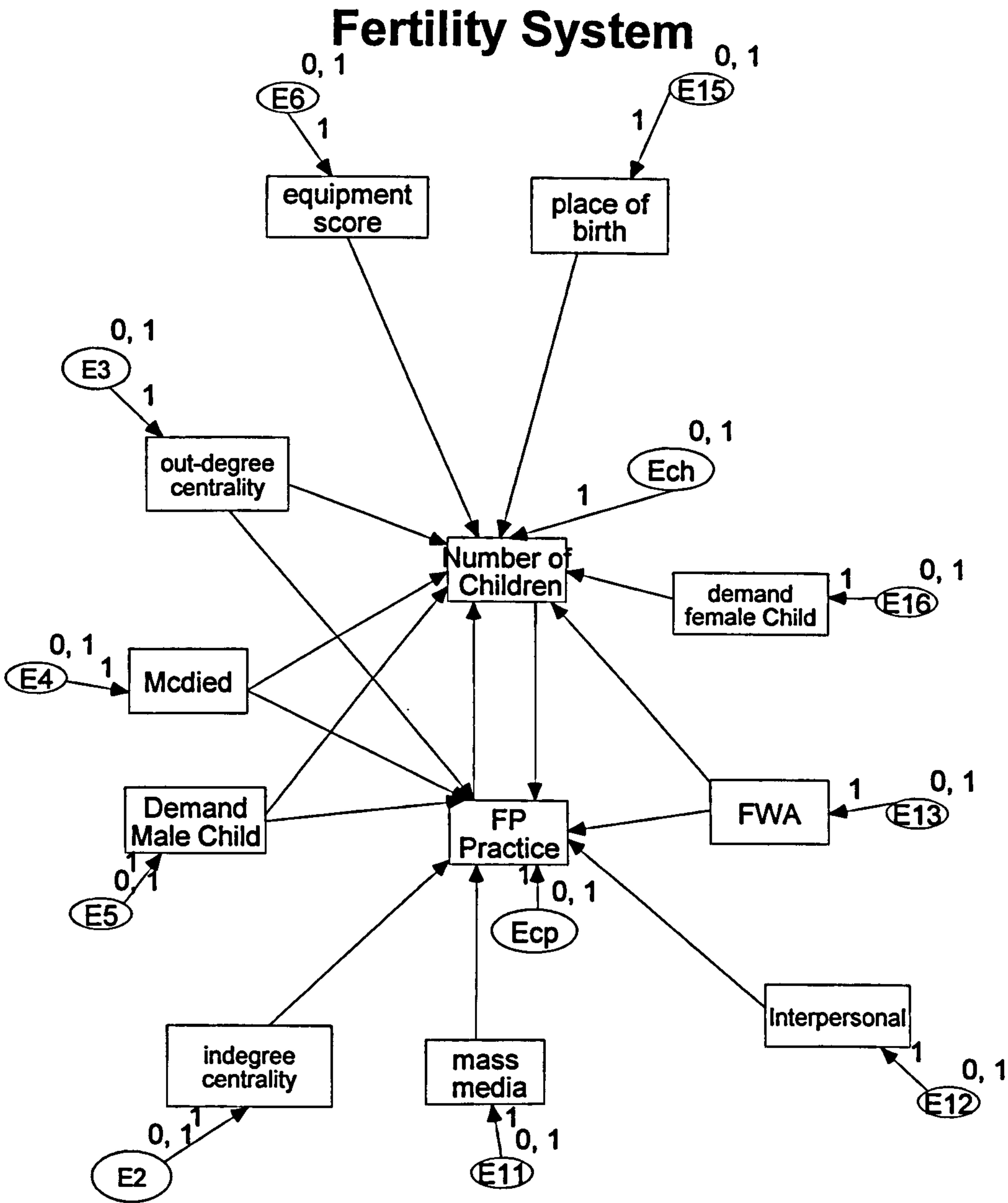


Figure 8.4.3-1: Updated Path model

The estimates of the coefficients of the model are presented in table 8.4.3-1 below.

Table 8.4.3-1: Regression Weights: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	PLabel
SQR_TCH<---D_MCHI	-.079	.038	-2.099	.036
FP_MP <---D_MCHI	-.693	.041	-16.708	***
SQR_TCH<---MCDIED	.371	.037	9.933	***
SQR_TCH<---D_FCHI	-.036	.037	-.979	.327
FP_MP <---MCDIED	.509	.041	12.517	***
FP_MP <---INFLF3	.051	.037	1.364	.173
FP_MP <---INFL_F11	.014	.037	.376	.707
FP_MP <---INFLF_2	.072	.037	1.926	.054
SQR_TCH<---EQUIP_SC	-.114	.037	-3.045	.002
SQR_TCH<---PLGBRTH	.274	.038	7.256	***
SQR_TCH<---INFL_F11	-.101	.037	-2.697	.007
SQR_TCH<---OUTDC_IN	-.013	.037	-.352	.725
FP_MP <---OUTDC_IN	.007	.037	.180	.857
FP_MP <---IND_INT	.002	.037	.048	.962
SQR_TCH<---FP_MP	2.627	.077	33.973	***
FP_MP <---SQR_TCH	-2.210	.066	-33.599	***

Intercepts: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	PLabel
MCDIED	.134	.037	3.604	***
EQUIP_SC	2.660	.037	71.340	***
INFL_F11	4.314	.037	116.021	***
D_MCHI	.329	.037	8.842	***
D_FCHI	.131	.037	3.529	***
INFLF3	.000	.037	.000	1.000
PLGBRTH	.927	.037	24.928	***
INFLF_2	.000	.037	-.009	.993
OUTDC_IN	61.804	.037	1662.346	***
IND_INT	61.804	.037	1662.347	***
SQR_TCH	1.010	2.306	.438	.662
FP_MP	3.711	3.256	1.140	.254

The total and direct and indirect effects are listed in table 8.4.3-2:

Table 8.4.3-2: Total, Direct and Indirect Effects of the Variables

Total Effects (Group number 1 - Default model)

	IND St	OUTDC St	PLGBRTH	INFLF 2	EQUIP SC	INFLF3	INFL F11	D FCHI	MCDIED
SQR_TCH	.001	.001	.040	.028	-.017	.020	-.009	-.005	.251
FP_MP	.000	.005	-.089	.011	.037	.007	.035	.012	-.046

D MCHI	SQR TCH	FP MP
-.279	-.853	.386
-.076	-.325	-.853

Direct Effects (Group number 1 - Default model)

	IND St	OUTDC St	PLGBRTH	INFLF 2	EQUIP SC	INFLF3	INFL F11	D FCHI	MCDIED
SQR_TCH	.000	-.013	.274	.000	-.114	.000	-.101	-.036	.371
FP_MP	.002	.007	.000	.072	.000	.051	.014	.000	.509

D MCHI	SQR TCH	FP MP
-.079	.000	2.627
-.693	-2.210	.000

Indirect Effects (Group number 1 - Default model)

	IND St	OUTDC St	PLGBRTH	INFLF 2	EQUIP SC	INFLF3	INFL F11	D FCHI	MCDIED
SQR_TCH	.001	.014	-.234	.028	.097	.020	.091	.031	-.120
FP_MP	-.002	-.001	-.089	-.061	.037	-.043	.021	.012	-.555

D MCHI	SQR TCH	FP MP
-.200	-.853	-2.241
.617	1.886	-.853

From both the path diagram in figure 8.4.3-1 and the model table 8.4.3-1, it was found that the demand for male and female children, death of male child, place of giving birth, equipment score, land property, housing score, food consumption, female autonomy score, FWA, out-degree centrality and family planning use were directly associated in explaining the variation of the total number of children. Whereas for family planning use, the direct influencing factors were: influencing factor2-interpersonal, influencing factor3-mass media, FWA, in-degree centrality, out-degree centrality, demand for male children, death of male children, religion and the total number of children. Thus demographic, socio-economic-cultural factors were more directly associated with the number of total children whereas communication variables were more directly associated with the variance of family planning use.

8.5 Discussion

In this chapter the sociometric variables created from various centrality measures in chapter 7 were added to the regression, logistic regression and path models of chapter 6. Strong association was found between communication variables and both the total number of children and family planning practice, and also the network measures of interconnectedness were found to be significant. Through path modelling it was found that communication and sociometric variables were directly associated with explaining the use of family planning, whereas demographic-socio-economic and cultural variables were directly associated with the total number of children as was found in chapter 6. Also family planning practice was directly associated with explaining the total number of children, as in chapter 6.

8.5.1 Testing the Influence of Network Variables

The essence of the sub-hypotheses that were tested in chapter 7 was that the actors' various centrality positions (i.e. the pattern of connectedness with other actors) in the network have a significant influence on their fertility behaviour, mainly on contraception practice.

From the up-dated logistic regression model (using Wald Forward Selection) for FP use, both the *in-degree* and *out-degree* centrality were found to be significant (see table 8.4.2-2). Both the variables were found to be positively associated, which reads that the more the actors are connected the more they use contraception. Whereas from the updated stepwise regression model for SQR_TCH (see table 8.4.1-2), only *out-degree* centrality was found to be significant for explaining the total number of children an actor is likely to have. But through the updated path model (see figure 8.4.3-1) and the updated table depicting the total, direct and indirect effects of the variables used in final path model (see table 8.4.3-2), it is clear that FP use has a significant direct effect on the total number of children. That way *in-degree* centrality indirectly influences women's likelihood of having a certain total number of children and *out-degree* centrality influences it directly. Thus the *in-degree* and *out-degree* centrality significantly influence both the family planning use and total number of children. The addition of these two network variables increased the overall percentage correct from 83.86 per cent in the previous Wald Forward Selection model for FP use in chapter 6 (see table 6.2.2-2) to 88 per cent in the updated logistic regression model

(using Wald Forward Selection method) in chapter 8. This then is the evidence of the importance of sociometric variables in the adoption of family planning.

Again, as the central actors and the actors related with them were proved to be the actors who were the members of cliques and overlapping cliques, and also the actors who practised family planning (see section 7.5.2 in chapter 7), the significant association of *in-degree* and *out-degree* centrality variables in explaining the FP use further confirms hypothesis 5 and the sub-hypotheses 6, 7 and 8 in that central actors practise family planning more, and the central actors' fertility behaviour has a significant influence on the contraceptive behaviour of the other women in the network.

The thesis is concluded in the next chapter. The chapter begins with a review of the findings, and then possible limitations and an assessment of the contribution to knowledge are presented. Finally, recommendations are made for both policy makers and those who may engage in further research in this area.

Chapter 9

Conclusion

The influence of communication on the fertility behaviour of a sample of women in rural Bangladesh has been investigated in this research. Other socio-economic-cultural and demographic variables were also accounted for in the regression models. Emphasis has been given to understanding the degree of influence that various communication processes (i.e. mass, interpersonal and network approaches) have in this particular behaviour. These have been analysed and discussed in chapters 6, 7 and 8 in the light of proposed hypotheses and sub-hypotheses developed in chapters 1 and 3. The aim of this concluding chapter is to summarise the findings of this research in relation to the stated hypotheses and to compare to the existing literature. In addition, the contribution of this research to knowledge, its relevance in Bangladesh, and some policy recommendations will be stated. The limitations of this research and suggestions for future research will also be discussed. The chapter is organised in *four* broad sections:

Section 1: Findings of the research;

Section 2: Limitations of the Study;

Section 3: Contribution of this Research;

Section 4: Recommendations;

9.1 Findings of the Research

The ‘fertility behaviour’ of the women was analysed in terms of the total number of children they had and their family planning use. Therefore, two statistical models were generated using the data collected by interviewing women in seven rural villages and one small town area of Bangladesh (see chapter 5 for details on data collection). One model aims to understand the factors that explain the total number of children and the other model aims to understand the factors which explain the family planning use of the interviewed women (for details on model development, see section 5.9 in chapter 5).

Two types of method were used for building both the models. One set was constructed using entry wise and stepwise regression models to explain the square root of the number of children (SQR_TCH). The other set was entry wise and Wald Forward Selection method logistic regression models to explain family planning (FP) use,

(reasons are discussed in section 5.9). Altogether 36 demographic, health, socio-economic-cultural, communication and social network variables (see appendix 2 for the full list of variables) were used in the entry wise and step wise regression models for the SQR_TCH, whereas 33 variables were used in both of the logistic regression models for FP use. Three communication variables depicting family planning information sources (i.e. off_fpinf, fr_fpinf, and rt_fpinf) were dropped in the logistic regression models for explaining the FP use. It is considered that women who practise family planning will be exposed to family planning information sources more than non-practising women. Except for these three family planning information sources, the other variables were similar in the regression and the logistic regression models. Some of these variables were created variables, using factor analysis or other methods as detailed in section 5.9 of chapter 5.

As entry wise and stepwise regression models gave similar type of results for explaining SQR_TCH and so did entry wise and Wald Forward Selection method logistic regression models for explaining FP use, the step wise/Wald forward selection models are forwarded as the final models. Though entry wise models allow for observing the evolution of the model and is a recommended procedure to develop a model, there might be a danger of dropping variables at some stages, which, as a result of interaction with other variables, would later be significant (see section 5.9 in chapter 5). Path models were also developed using the same set of variables to measure the interactive influences (total, direct and indirect) of all the dependent and independent variables on the fertility behaviour as a whole (for details see section 6.3 in chapter 6 and section 8.4.3 in chapter 8).

The hypotheses (see appendix-3) of this research are tentatively proved in chapter 6 (see section 6.4.3 in chapter 6). The sub-hypotheses are proved in chapter 7 (see section 7.5.2 in chapter 7), and the influence of the network properties on fertility behaviour while controlling for other socio-economic variables is established in chapter 8 (see section 8.5.1). Now, using the final stepwise regression model (see table 8.4.1-2), final Wald Forward Selection Logistic regression model (see table 8.4.2-2) and the final path model (see figure 8.4.3-1 and table 8.4.3-2), the findings of this research are discussed in relation to the hypotheses and existing literature.

For the SQR_TCH (see table 8.4.1-2), among the 36 variables only 11 were found to be significant, six of which are demographic. The demographic variables, which were shown to be significant were: wife's age, age of first child born, family members, demand for male children, death of male child and sex of first child born. Whereas demand for female children, death of female child and male-female child balance were found to be insignificant. Thus the female child is not significant for explaining the number of children women have. Besides these demographic variables, one health variable, two socio-economic-cultural variables, one communication variable and one sociometric variable were found to be significant.

Among the four health variables used, only one proved to be significant, the place of giving birth. The type of delivery assistance (del_hp, del_rel, del_unq) was not found to be significant. The reason for this may be that the delivery assistance women get (irrespective of socio-economic conditions) is mainly from unqualified health professionals, 96 per cent of which (unqualified health professionals) is comprised of village *dai*-es.

Among the 11 socio-economic-cultural variables, only two were found to be significant: equipment score and religion. Interestingly, economic variables like income source, housing score, land property and food consumption, and socio-economic and women status variables like education score, women's job, family members living abroad score, female autonomy score, women's micro-credit organisation affiliation were not found to be significant in explaining the number of children women have.

Only one out of the 10 communication variables used in this model was found to be significant, FWA. In the previous model in chapter 6, i.e. before adding sociometric variables, information score was found to be significant, but the addition of the two sociometric variables removed the information score from the model. Information score, sources of family planning information sources (off_fpinf, fr_fpinf, rt_fp_inf), family planning influencing sources (inflf1_display, influf2_interpersonal, inflf3_mass media), husband, and frequency of discussing with family planning workers were all found to be insignificant.

So, from this final model for explaining the likelihood of the total number of children a woman has, the dominant influencing factors are demographic variables. Among the

six significant demographic variables, three variables (demand for male child, death of male child and sex of first child born) are associated with son preference and two are associated with women's age and age of first child born. This dominance of son preference, and women's age/first childbearing age dwarfs the significance of the lone economic variable and the two communication variables, which were found significant in this model. However, in spite of the clear dominance of demographic variables, the communication variable FWA and sociometric variable *out-degree* centrality still have a significant influence.

For FP use (see table 8.4.2-2), among the 33 variables used for developing this model, only 12 were found to be significant. Seven out of these 12 explanatory variables are communication and sociometric variables: interpersonal communication, mass media, husband, FWA, frequency of discussing with FP workers, *in-degree* centrality and *out-degree* centrality. In addition, two demographic variables, both of which are associated with son preference (demand for male child and sex of first child), and three socio-economic-cultural variables (religion, equipment score and family members live abroad score) are found to be significant. Like the regression model for explaining the SQR_TCH, here also the only significant economic variable is equipment score. Thus, in this model, communication variables dominate over demographic and other socio-economic variables. Hence socio-economic factors are dominated either by demographic variables (in the final regression model) or by communication variables (in the final logistic regression model). As a single variable, religion is the most significant for explaining FP use and is common to both the models. The final path model (see figure 8.4.3-1 and table 8.4.3-2) represents a synchronised model of all the dependent and independent variables of the fertility system as a whole. In this model FP use directly influences the total number of children, and FP use is mainly explained by the communication variables, whereas most of the demographic variables directly influence the total number of children. Except for religion, socio-economic-cultural variables were not significant in explaining fertility behaviour, which confirms the findings in chapter 6. Presented in table 9.1-1 are the end findings of this research depicting the positive and negative effects on the total number of children and family planning use (communication variables are displayed in bold text).

9.1-1: Significant Variables with Positive-Negative Association in Final Regression Model for SQR_TCH and in Logistic Regression Model for FP_Use

Regression Model for SQR_TCH	Logistic Regression for FP_Use
Variables with Positive Association	Variables with Positive Association
Wife's Age Number of Family Members Male Child Died Sex of First Child Born Place of Giving Birth Out-degree centrality	Religion Equipment Score Influencing Factor2- Interpersonal Comm. Influencing Factor3- Mass Media Husband FWA Frequency of Discussion with FP Workers In-degree Centrality Out-degree Centrality
Variables with Negative Association	Variables with Negative Association
Age of First Child Born Demand for male Child Religion Equipment Score FWA	Demand for Male Child Sex of First Child Born Family Members Live Abroad Score

9.1.1 Findings in Relation to Research Hypotheses

From the above findings, communication and sociometric variables are significant in explaining both the total number of children and family planning use. The communication variable FWA and the sociometric variable *out-degree* centrality were found to be significant in explaining the total number of children, whereas practice of family planning was mainly influenced by communication and sociometric variables. The practice of family planning and the total number of children were found to interact in the final path model, in particular FP use had a strong and direct negative impact on the total number of children (see figure 8.4.3-1 and table 8.4.3-2). Thus the prime hypothesis of this research is accepted that communication has a significant impact on fertility behaviour of the women interviewed.

Though the communication variable FWA and the sociometric variable *out-degree* centrality were found to be significant with a limited effect when compared to demographic variables in explaining total number of children, communication and sociometric variables were found to be the main explanatory factors for family planning use. All the odd ratios of communication and sociometric variables were

strong and greater than unity in explaining family planning use. Family planning use was proved to be influencing women's small family size norm directly, which is evident from the inter-linkage among the variables in the fertility system as a whole in the final path model (see figure 8.4.3-1 and table 8.4.3-2). Thus hypothesis two is accepted that communication variables have greater influence than demographic variables in fertility behaviour.

Only two socio-economic-cultural variables were found significant for explaining the small family size: equipment score and religion; and for explaining the family planning use another variable was added, i.e. family members live abroad score. Among these three variables the only economic variable was equipment score. Family members live abroad score was significant in explaining family planning use but not for explaining the total number of children and for this research, this variable is negatively associated with family planning use. Perhaps women practise family planning less simply because their husbands are absent. The only cultural variable found to be strongly associated was religion. But communication and sociometric variables dominate the explanation of family planning use, which ultimately influenced the total number of children. Thus the economic explanation of family planning use was not substantiated in the present research. Though the strongest odd-ratio was found with religion, the combined odd-ratio of communication and sociometric variables were much greater than socio-economic-cultural variables. Therefore hypothesis three is accepted that communication has greater influence than socio-economic-cultural variables on fertility behaviour.

Both the communication variables that were found to be significant for explaining the total number of children were interpersonal communication: FWA and *out-degree* centrality. For explaining the FP use, six out of the seven significant communication variables were interpersonal: interpersonal communication, husband, FWA, frequency of discussion with family planning workers, *in-degree* centrality and *out-degree* centrality. Though mass media had the strongest influence (the strongest odd-ratio) as a single variable, the combined influence of six interpersonal variables was much greater than the mass media. Also from descriptive statistics, the main source of information of these women was interpersonal, i.e. friends and relatives (see table 6.1.2.6-1); the family planning information source was dominantly interpersonal, i.e. FWA, friends, relatives and GHW (see table 6.1.4-2), and the factors that influenced

them most in FP decision making were interpersonal: FWA, husband and relatives. Finally, significance of women's *in-degree* centrality and *out-degree* centrality, i.e. their network connection further enhanced the impact of interpersonal communication over mass communication. Thus hypothesis four is accepted that interpersonal communication played a greater role than mass media on fertility behaviour. Hypothesis five is also proved that women's social interactions influence their fertility decision.

Using communication network analysis, the web of interpersonal communication these women were tied with, and the impact of those network relations on fertility behaviour, was revealed further. It was found that: isolates used contraceptive less than the non-isolates; central actors used family planning more than those who were less connected; members of a clique practised family planning more than isolates or pendants (person with one connection); members of multiple cliques practised family planning more than those who were members of one clique; and finally the fertility behaviour of an actor's personal network and the fertility behaviour of the central actors influenced her family planning behaviour (for details see section 7.5.2 in chapter 7). This influence of connectedness was found to be statistically significant in the regression, logistic regression and path models in chapter 8. Hence, hypothesis 5 is accepted. Thus in this research the influence of communication on the fertility behaviour of the women in rural Bangladesh is proved with reference to the degree of influence, and depicts the type of communication that most explains this process, which is interpersonal communication and social connectedness.

9.1.2 Findings in Comparison with Existing Literature

As with the dominant theoretical approach to explain fertility behaviour, the existing literature on the fertility behaviour of Bangladesh also accentuates socio-economic and demographic development indices including women's status. In the present research, rather than finding family planning use and desire for a small family as the outcome of advanced socio-economic-cultural condition, the aspiration of attaining a better livelihood was found to be the core reason for family planning practice and a desire for a small family. This is in opposition to the economic deterministic explanations or explanations such as the old age risk theory of Cain. In the present research, almost 73 percent of the interviewed women wanted to limit family size for purely economic reasons and just over 25 per cent wanted to avoid probable hazards of nurturing many

children, which was also related with economic causes. Less than two per cent mentioned other causes like health reasons, philosophical reasons, and social commitment. This ideational shift for a small family norm for attaining a better livelihood was diffused through various communication channels and the practice of family planning use was directly influenced by communication: mass media, interpersonal communication and connectedness within the immediate social network. Thus a significant difference is observed at the basic theoretical point compared to the dominant literature. A comparison of findings with existing literature follows:

Most of the demographic variables found significant in the present research are similar to the existing literature. For example, Islam and Khan 1995, and Khan 1996 point to the respondent's *current age*; the works of Amin and Mariam 1987, Rahman and Da Vanzo 1993, and Barkat *et al* 1997 point to the association among strong *son preference*, *off-spring configuration* and women's fertility behaviour – these are similar in the present research. The works of Cain 1977 and 1981, Khuda *et al* 1990, Barkat *et al* 1997, Rahman and Da Vanzo 2002 found positive association between *reduced child mortality* and contraceptive use. However, in the present research *male child mortality* was found to be associated with the number of total children: death of female child had no significant impact on fertility behaviour.

The most significant difference between the findings of this research and the existing literature is observed in socio-economic-cultural variables. Though *education of women* (Rahman and Da Vanzo 2002; Barkat *et al* 1997; Khuda and Howlader 1990) and *education score* (Sohail 1997) were found to have positive influence on contraception, the present research found no such significant association. Works of Khuda *et al* 2001; Caldwell *et al* 1999; Sabir and Bhadra 1991 found a positive relation between women's *labour force participation* and contraception. Hossain and Phillips 1996, and Khuda *et al* 2001 emphasised women's mobility as a determinant of fertility transition. Neither the *labour force participation* nor the *women's mobility* was found significant in explaining family planning use in this present research. The works of Kabeer 1998, Barkat *et al* 1997 and Schuler *et al* 1997 found positive association between membership in any *micro-credit organisation* and contraceptive use. In the present research no significant association was found. Though positive association was found between *socio-economic conditions* and contraceptive use in much of the previous research, among the 11 socio-economic variables only *equipment score* was

found to be positively associated with contraceptive use. This confirms the finding of Ahmed (1984). Thus existing economic deterministic explanations of women's fertility behaviour were shown to be insignificant in this research. But the cultural variable *religion* was found to be significant in explaining both the total number of children and contraceptive use and is hugely supported by the existing literature (for example, see the works of Khuda *et al* 2001; Amin *et al* 1995; Islam and Mahmud 1995). A new variable was used and found significant, the *family members live abroad score*.

Rather than the socio-economic-cultural variables, the findings of the present research confirm the importance of communication variables, in a more precise way indicating the degree of influence, which were previously found significant but mostly in a sporadic way. These variables are: *mass media communication* (Khuda *et al* 2001; Mitra *et al* 1996; Khan and Rahman 1997); *social interaction* (Marten 2002); *interpersonal communication* (Kincaid 1993); *FWA* (Khuda *et al* 2001; Barkat *et al* 1997; Arends-Kuenning 1997; Kamal and Slogett 1994; Ullah and Chakrabarty 1993); *husband* (Kincaid 2001). The research also demonstrates the significance of some new interpersonal communication variables such as *frequency of discussion with family planning workers, in-degree centrality and out-degree centrality*. Thus communication variables, mainly interpersonal and sociometric, explain more the variation of family planning use than socio-economic variables, which were previously argued to be significant.

9.2 Limitations of the Study

There are three main limitations in this research, which are related to the sampling, data wasted in network analysis, and the use of a partial network.

9.2.1 Conduct of the Sampling: Regarding the sample there are four weaknesses, which are:

- i. Data were collected from seven villages of six administrative divisions of Bangladesh and a small town *mahallah*. One village per division was purposively selected to represent the unique characteristics of concerned division. Clearly the result would be more representative if data from more villages could be collected.

- ii. Only women were interviewed in this research, husbands were not included. Throughout the analysis it was found that husbands were the main determinants whether the women used family planning method(s) and, if they used contraception, what type of methods would be used. Thus the most influential portion of fertility decision makers in Bangladesh is missing. But as women reflect their husband's attitude (see section 5.1 in chapter 5 for a detailed discussion) towards family planning behaviour husband's views are indirectly represented in this research. However, husbands' direct views could provide a further insight in explaining fertility behaviour in rural Bangladesh.
- iii. While collecting network data, it was found that the nominations women gave to other actors sometimes depended on who were present around the interviewee at the time of the interview. As most of the women cannot read and write they could not complete the questionnaire themselves. When the interviews were conducted, it normally happened that other women of the *bari* were also present. So there might be some bias regarding the links women nominated. But this bias might be only on ranking of the preference as the women nominated mainly within relatives of the same *bari* (particularly *ja-s*). To avoid this probable bias, tie-strength was measured on the frequency of the communication among the concerned actors rather than their reported rank (see section 7.2 in chapter 7).
- iv. The absence of vital data registration was another limitation of data collection. In many cases it was found that village women did not even have the concept of numbers. So the data on women's age, husband's age, age at marriage, age of first child born, age of last child born should be considered as approximate data rather than exact.

9.2.2 Data Wasted in Network Analysis: Data were collected from one woman of reproductive age per household who was married and had at least one child at the time of interview. This data collection procedure was used mainly for collecting sociometric data. The analysis was made on data matrices based on the links, which satisfied this selection criterion. It was found that in many cases women mentioned some elderly lady's name(s) as the person with whom they talked most and also who encouraged their fertility behaviour. These ties were dropped in the data matrix because they were

not of reproductive age. In total 18 per cent of the mentioned ties were dropped (see table 7.1-1). Analysis including these ties may give a different network structure.

9.2.3 Partial Network: The network analysis presented in this thesis is a partial one in that women interviewed were asked to mention at the most five ties. In reality, women may have more than five ties. Also some women mentioned some of their special ties who lived in adjacent villages and with whom they discussed family planning. But for boundary specification reasons, those ties were not included in the analysis. Most importantly almost all the women mentioned their husbands as the person with whom they discussed most on any topic and their husband's decisions were their decisions. In the network analysis husbands were excluded. Thus the network presented here is only a partial network.

Despite these limitations, this research has some unique contributions, which are discussed in section 9.3.

9.3 Contribution of this Research

The contribution of this research is discussed in this section from two aspects: first, the contribution in the research field of Bangladesh; and then the contribution to knowledge.

9.3.1 Contribution for Bangladesh: Several communication aspects like *FWA* visits (Janowitz *et al* 1999; Kamal *et al* 1996; Rob *et al* 1992), *community resource* (Saha 1994), *female community workers* (Rob *et al* 1992) were perceived as contributing factors in explaining the success of the family planning programme in Bangladesh. Works of Kincaid (1993, 2000) on *Jggasa* project, i.e. community networking and Marten (2002) on the influence of *social interaction*, further cast light on the role of social interaction and social learning in fertility behaviour. But the present research is different in that it has revealed the role of both mass media and interpersonal communication with reference to fertility reductions amongst the rural women of Bangladesh, and how the communication network acts to facilitate this reduction. This research points out that the general source of information of rural women is interpersonal communication, that the source of family planning information is interpersonal and that the factors that influenced them most with regard to their family planning behaviour were interpersonal in nature. Using network analysis and clique

structures for 724 women, it further revealed that the degree of actors' interconnectedness with their network, and the fertility behaviour of those network members, influences the likelihood of practising family planning. This type of statistical and social network modelling is carried out for the first time in Bangladesh. In this sense this work has a pioneering contribution.

The research has a number of novel applications in Bangladesh relating to the use of full network approach. In the *Jiggasa* project (Kincaid 1993, 2000), the analysis was done only with ego-centred network data, which were collected using snowball sampling. According to Hannemann (2001: 9), "ego-centric methods really focus on the individual, rather than on the network as a whole." So the various actors positions in the network (including isolates) and their impact on fertility behaviour, is not assessable from this analysis. Also the limitations of the snowball technique of data collection are, as Hannemann (2001:8) observed: "Where does the snowball start rolling? If we start in the wrong place or places, we may miss whole sub-sets of actors who are connected...but not attached to our starting point". Marten (2002) used ethnographic interviews of only 40 women from one area of the country, i.e. Chittagong division to explore the influence of social learning and social interaction on fertility behaviour. Compared to these works, the analysis of various centrality measures using full networks, studying clique patterns and the actor positions (including isolates and pendants) in the whole network, assessing the influence of actor positions, combined with statistical modelling gives greater insight in to the fertility behaviour of the women of rural Bangladesh.

The use of new variables created from various centrality measures like *in-degree* centrality, *out-degree* centrality, *degree* centrality, *betweenness* centrality, Bonacich Power Index in all three matrices (strength matrix, approval matrix and contact matrix) in explaining fertility behaviour, has been used for the first time in Bangladesh.

The data collection procedure of interviewing one woman of reproductive age per household in a village, who was then married and had at least one child, is used for the first time in Bangladesh while collecting social network data.

Collection and analysis of data on the "influencing factors in family planning decision making" (see question number 17 of section 4 in Appendix 1) is undertaken for the first time in Bangladesh.

The comparative analysis of socio-economic-cultural, demographic, communication and sociometric data for a Hindu village versus other villages is also novel for Bangladesh.

In the demographic literature two commonly found factors are: death of children and demand for children. Especially with regard to the demographic literature of Bangladesh, these two factors are common. But it was found through data and statistical modelling in this research that it is not the “death of children” but the “death of male children” and not the “demand for children” but the “demand for male children” that are important in determining the fertility behaviour.

Another important area of the study was the influence of family members who live abroad on fertility behaviour was studied. It is popularly believed in the West that people who work abroad incorporate the norm of small family size into Bangladesh as a part of westernisation. But it was found through research that more than 90 per cent of the women reported not to have any family member who was in abroad. Of those who reported family members living abroad, around 70 per cent of their family members live in Middle Eastern countries. So, there is no practical ground for this hypothesis. In the final logistic regression model, family members living abroad score was found to be negatively associated with the use of family planning. Rather, the western influence may be traced out through donor agency pressure on Bangladesh government and various aide agencies. This can be another topic of research.

For the first time through statistical modelling it was found that, for Bangladesh, rather than socio-economic-cultural and demographic variables, communication variables are more relevant for explaining the use of family planning. Interpersonal communication is more relevant in explaining fertility behaviour than mass media, and the network positions of women play an important role in this behaviour. It was found that the central actors in a network are more likely to use family planning methods.

In this research, also studied were the direct and indirect influences of the factors on both contraceptive use and total number of children using Amos-6. This further showed that the traditional factors are more directly related with total number of children whereas communication variables and network variables are directly related

with family planning use. The total number of children, however, was directly influenced by family planning use.

Thus this research has provided a more comprehensive explanation of family planning behaviour and the family size norm of rural Bangladesh.

9.3.2 Contribution to the Field of Knowledge: This research has made a general contribution to knowledge in that the fertility transition of Bangladesh is a puzzle amongst demographic researchers and policy makers throughout the world. The findings of this research cast new light on this process and help to explain the success of the family planning programme of Bangladesh government “in a challenging environment”(Cleland *et al* 1994).

The findings with regards to women’s information source, family planning information source and the source of influence in fertility decision-making are a contribution to demographic research.

Although various centrality measures are common in network analysis literature, creating variables from those centrality measures and adding those variables in statistical models for determining fertility behaviour is novel.

The various centrality and clique patterns were measured using three different matrices, and determining their difference(s) cast further light on the analysis of the network. For example, while explaining the total number of children, *out-degree* centrality was found to be positively associated. Whereas, though not found significant, the co-efficient for the *in-degree* centrality was negatively associated. The interpretation of this is that the actors who are nominated by others (prestigious actors) have fewer children than the actors who claim to have contacts with others. This points to the notion that it is not the central position but the type of central position that is more important to explain the fertility behaviour.

The whole procedure of capturing the macro (socio-economic-cultural, demographic, decisional, communication) and micro variables (in-degree centrality, out-degree centrality, Bonacich Power Index) and their interlinkages to each other, as well as to the family planning use and the number of children, using structural equation model is a further contribution to the field of demographic research.

Re-interpreting factors from “death of children” to the “death of male children” and “demand for children” to “demand for male children” may strengthen the claim of gender perspective in the fertility behaviour of countries like Bangladesh where strong patriarchy is still prevailing. This has not been explored to any great amount before.

Bangladesh is a country where TFR declined bypassing the prescription of “development is the best cure” or not applying coercion, as was the case in China. Ideation change, popularisation of the two-child family norm, the supply of contraceptive advice and contraceptive devices to the door-step, and discussion amongst peer groups and central actors of the networks, performed through various communication channels, has influenced fertility decision making. This has been revealed through this research.

9.4 Recommendations

Two types of recommendation are made from this research: policy recommendation for Bangladesh and recommendations for further research.

9.4.1 Policy Recommendations

i) It was found in this research that FWAs played a vital role in both making the family planning issue a household word and providing devices at the doorstep of the women who cannot leave the boundary of their home. All the women who were interviewed mentioned FWAs as the source of family planning information and the source of influence in practicing family planning. They also reported that FWAs used to provide them with the contraceptive devices but this was no longer provided. As these FWAs and health workers are also women of the same village or the neighbouring village, women still meet FWAs informally and get advice. But FWAs do not supply the contraceptives any more, so the village women have to go to the *Thana* health complex/community clinics to collect these devices, which is not convenient. There may well be a relation between the levelling of TFR from 1996 to date and the withdrawal of FWAs from home delivery service. Through this research it was also revealed that the communication pattern of the village women is still limited to their *bari* boundary within *ja*-network. So, from this research it is strongly recommended that the FWA visits are re-established to allow women access to contraceptive advice and devices.

- ii) Husbands were reported to be the main person in deciding the family planning practice, type of method practised and even whether the women can let the FWAs come home and meet them. So, not only women, but also men should be included in the IEC programmes for motivation. Couple communication should be given greater emphasis.
- iii) The per cent of husband's using family planning methods was found to be very low in this research. So, it is recommended that a policy be formulated to encourage greater use of male contraception. At the time of interview (July 2002 to January 2003), no male method was advertised on the radio or television. There should be a media campaign to change the view of whole family planning only for women.
- iv) Demand for male child, death of male child and sex of first child born all were negatively associated with family planning use. So, more motivational programmes should be developed to create a positive outlook for the female child.
- v) It was found that Muslims practised family planning less than the Hindus did. Perhaps Muslim religious leaders need to be involved in family planning programme campaigns. Khuda *et al* 2001 mentioned that the Information, Education and Motivation Unit of the Directorate of Family Planning has regularly been paying *imams* the lecture fees for making statements in favour of family planning at the Friday mosque. The impact of *imam* lectures at Friday mosque needs to be investigated and, if found positive, it can be included in the policy.
- vi) The significance of both *in-degree* and *out-degree* central actors in family planning use reveals that women need more exposure outside their home. Meeting in the home-yard (*Uthan Boithak*) prescribed by the *Jiggasa* project (Kincaid 2000) can be strengthened to mobilise women.
- vii) Many of the interviewed women mentioned other elderly women's influence (especially mother-in-law's) on their mundane decision-making but they do not discuss family planning with them. Elderly women including mother-in-laws should be included in the motivational programmes.
- viii) The vital registration procedure should be improved by the Government to obtain realistic data.

Finally, if the BDHS incorporates the collection of communication and social network data, it will benefit researchers.

9.4.2 Further Research Recommendation

- i) To understand the degree of influence that communication processes have on the fertility behaviour of women in Bangladesh, further research can be done on a broader scale with a greater sample size from more sample areas.
- ii) Further research can be done including husbands as target population along with wives.
- iii) In situations such as Bangladesh where women can not read or write and where there is hardly any privacy of women to talk with other people, how they can talk about their relational ties without bias, stimulates a further research topic for social network analysts.
- iv) Further analysis can be carried out to incorporate the ties mentioned outside the network.
- v) How important elderly ladies really are in the home in influencing women's decision making process and how they can be incorporated in the process of family planning motivation programmes can be another topic of research.

From this research the role of communication in influencing the fertility behaviour of the women in rural Bangladesh has been identified and the importance of interpersonal communication and social interaction through network connections has been proved. To reduce fertility from its persistent level of 3.3 children per family, which has held constant since 1996, cognisance should be taken of the findings of this thesis. Doing this will hopefully allow the realisation of the aspirations of women in rural Bangladesh to attain socio-economic improvement, and for Bangladesh as a whole to avert the threat of over-population.

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APPENDIX 1

Hypotheses

Key Hypotheses

Hypothesis 1: Communication has a significant impact on the number of children a woman has via the decision to use contraception;

Hypothesis 2: Communication has more impact than demographic variables on fertility behaviour;

Hypothesis 3: The influence of communication on fertility behaviour is greater than that of socio-economic variables;

Hypothesis 4: Interpersonal communication played a greater role than mass media in contraceptive decision-making;

Hypothesis 5: Social connectedness of women is an important influence on fertility behaviour.

These hypotheses are supported by sets of sub hypotheses, which are elaborated on when these hypotheses are tested.

Sub Hypotheses

1. isolates use less contraceptives than non-isolates.
2. individuals with larger personal networks use more contraception than those who are with smaller personal networks;
3. contraception use is higher among individuals if a larger portion of her personal network consists of individuals who also use contraception; and
4. contraception use is higher among individuals if a larger portion of her personal network consists of individuals who approve of family planning.
5. actors who are members of a clique are more likely to use contraception than the actors who are not members of any clique;
6. members of more than one clique use contraception more than the members of isolated cliques;
7. central actors/opinion leaders are more likely to use contraception than the women who are less connected;
8. central actor's fertility behaviour has a significant influence on the contraceptive behaviour of other women of the network .
9. family planning workers have significant influence on contraceptive practice of rural Bangladesh.

APPENDIX 2

Posters

আপনি জানেন কি ?
বাংলাদেশের
বর্তমান জনসংখ্যা
প্রায় সাড়ে ১৩ কোটি



আগামী ২০২০ সালে জনসংখ্যা হবে প্রায় ১৮ কোটি

সময়ের প্রয়োজন
সঠিকভাবে জন্মনিয়ন্ত্রণ



আই ই এম ইউনিট, পরিবার পরিকল্পনা অধিদপ্তর, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

মেয়ে হোক ছেলে হোক দু'টি সন্তানই যথেষ্ট



সন্তান সংখ্যা সীমিত রাখার জন্য পরিবার পরিকল্পনা পদ্ধতি সমূহ

পুরুষদের জন্য স্থায়ী ব্যবস্থা

■ ভ্যাসেকটমি

(কাটা-ছেঁড়াবিহীন অপারেশন)

মহিলাদের জন্য স্থায়ী ব্যবস্থা

■ লাইগেশন

নিরাপদ, ঝামেলামুক্ত এবং পার্শ্ব-প্রতিক্রিয়াহীন উত্তম পদ্ধতি হচ্ছে স্থায়ী ব্যবস্থা

অস্থায়ী ব্যবস্থা

পুরুষ

মহিলা

■ কনডম

■ খাওয়ার বড়ি

মহিলাদের মেয়াদী ব্যবস্থা

■ আই ইউ ডি

■ ইনজেকশন

■ নরপ্ল্যান্ট

আই ইউ ডি উত্তম

পরামর্শ ও সেবার জন্য যোগাযোগ করুন

- নিকটস্থ হাসপাতাল
 - মা ও শিশু কল্যাণ কেন্দ্র
 - ইউনিয়ন স্বাস্থ্য ও পরিবার কল্যাণ কেন্দ্র
 - স্যাটেলাইট ক্লিনিক
- এবং স্থানীয় পরিবার কল্যাণ সহকারী



আই ই এম ইউনিট, পরিবার পরিকল্পনা অধিদপ্তর
স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

APPENDIX 3

Questionnaire

IDENTIFICATION

DIVISION _____

DISTRICT _____

THANA _____

UNION _____

VILLAGE/MOHALLA/BLOCK _____

HOUSEHOLD NUMBER _____

NAME OF HOUSEHOLD HEAD _____

INTRODUCTION AND CONSENT

Hello, my name is _____. I am a research student in a UK University. As a part of my research work, I am now conducting a survey about the health of women and their thinking about family welfare. Your participation in this survey will be very much appreciated. Your information will help me do my research work successfully and help our government to plan health and family planning services more effectively. Whatever information you provide will be kept strictly confidential .

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this survey since your views are important.

At this time, do you want to ask me anything about the survey?
May I begin the interview now?

Signature of the interviewer: _____

Date: _____

Respondent agreed to be interviewed _____

Respondent not agreed to be interviewed _____

SECTION 2: SOCIAL-ECONOMIC
QUESTIONS

1. Have you ever attended school?

YES ☐ NO ☐

2. If “YES”, what is the highest level of your education?

PRIMARY ☐ SECONDARY ☐
COLLEGE ☐ UNIVERSITY ☐
OTHERS ☐

3. What is the highest level of your husband’s education?

PRIMARY ☐ SECONDARY ☐
COLLEGE ☐ UNIVERSITY ☐
OTHERS ☐

4. Can you read and write a letter in any language?

EASILY ☐ WITH DIFF ICULTY ☐
NOT AT ALL ☐

5. What is your occupation?

HOUSEWIFE ☐ SERVICE ☐
ANY INDUSTRY ☐ ☐ AGRICULTURE
OTHER _____
(SPECIFY)

6. Do you belong to any of the following credit organisations? Mention “YES” or “NO”.

GRAMEEN BANK ☐ BRAC ☐
BRDB ☐ MOTHER’S CLUB ☐
ANY OTHER MICRO CREDIT PROGRAMME _____
(SPECIFY)

7. What is your husband’s occupation? Please specify.

8. What type of house do you live in?

OWN☐ RENTED☐

OTHER

(SPECIFY)

9. What is the material of your house?

roof		wall		floor	
Natural Roof BAMBOO/ THATCH		Natural walls JUTE/ BAMBOO/ MUD		Natural floor BAMBOO/ MUD	
Rudimentary roof TIN		Rudimentary wall WOOD		Rudimentary floor WOOD	
Finished roof CEMENT/ CONCRETE/ TILED		Finished walls BRICK/CEMENT/TIN		Finished floor BRICK/CEMENT/TIN	
Other <div>(SPECIFY)</div>		Other <div>(SPECIFY)</div>		Other <div>(SPECIFY)</div>	

10. Do you have access to any land? Please mention amount.

HOMESTEAD LAND

CULTIVABLE LAND

NONE

11. How many members are in your household including yourself?

12. What is the main source of income of your household?

13. In terms of household food consumption, how do you classify your household food consumption:

DEFICIT IN WHOLE YEAR☐ SOMETIMES DEFICIT☐

NEITHER DEFICIT NOR SURPLUS☐ SURPLUS☐

14. Does your family have vulnerable group feeding (VGF) card?

YES☐ NO☐

15. How many male/female members in this household are receiving old age pension/ widow or destitute benefit?

HOW MANY ☐ NONE ☐

16. What is the regular source of your information?

source	frequency*			
	daily	weekly	monthly	never
RADIO				
TELEVISION				
NEWSPAPER/MAGAZINE				
BILL BOARDS				
POSTERS				
RELATIVES				
FRIENDS				
OTHERS (SPECIFY)				

*daily = 3, weekly = 2, monthly =1, never = 0

17. What type of modern equipments does your household possess?

ELECTRICITY

FURNITURE

WATCH/ CLOCK

REFRIGERATOR

TELEPHONE

CAR

☐ TELEVISION

☐ RADIO

☐ BICYCLE

☐ MOTORCYCLE

☐ SEWING MACHINE

☐

☐

☐

☐

☐

☐

☐

18. How many of your family members live abroad?

NUMBER ☐ NONE ☐

19. Where do they live?

CANADA/USA

JAPAN

OTHERS

☐ EUROPE

☐ SINGAPORE

☐

☐ MALAYESIA

(SPECIFY)

AUSTRALIA

☐ MIDDLE EAST

☐

☐

20. Do you have contact with them?

NO	DAILY	WEEKLY	MONTHLY	YEARLY

21. Do they help you financially?

NO	A LITTLE	SOME	REGULARLY	NEVER

22. Can you travel unaccompanied?

YES ☐ NO ☐

23. Degree to which you make a decision about household.

NEVER	OCCASIONALLY	SOMETIMES	OFTEN	ALWAYS

SECTION 3: REPRODUCTIVE
QUESTIONS

1. Have you ever given birth?

YES ☐ NO ☐

2. How many children do you have?

MALE ☐ FEMALE ☐

3. How many more children would you like?

MALE ☐ FEMALE ☐

4. Sex of first child born:

MALE ☐ FEMALE ☐

5. Age of last child born:

6. Have you ever given birth to any child who was born alive but died later?

NO ☐ BOYS ☐ GIRLS ☐

If 'NO', please go to question number 9.

7. Who assisted you with the deliveries?

health professional		relatives		other persons		others (specify)	none
QUALIFIED DOCTOR		PARENTS		TTBA*			
NURSE/MIDWIFE		IN-LAWS		UNTRAINED TTBA			
FAMILY WELFARE VISITORS		BROTHERS-SISTERS		UNQUALIFIE DOCTORS			
				DAI			

* TTBA is the abbreviation of Trained Traditional Birth Attendant

8. If you didn't get assistance with a health-professional, why?

- TOO FAR ☐
- INCONVENIENT SERVICE HOUR ☐
- UNPLEASANT STAFF BEHAVIOUR ☐
- LACK OF PRIVACY ☐
- LACK OF PROVIDER EXPERTISE ☐
- INADEQUATE DRUG SUPPLY ☐
- LONG WAITING TIME SERVICE ☐
- TOO EXPENSIVE ☐
- RELIGIOUS REASONS ☐
- NOT BENEFICIAL/ NEEDED ☐
- NEED FOR SERVICE NOT KNOWN ☐
- UNABLE/NOT PERMITTED TO GO OUT OF HOUSE ☐
- Others _____
(SPECIFY)

9. Who took the decision in selecting delivery place and assistance?

- SELF ☐ HUSBAND ☐ MOTHER – IN- LAW ☐
- FATHER- IN- LAW ☐ PARENTS ☐ RELATIVES ☐
- Others _____
(SPECIFY)

10. Where did you give birth to your children?

home		public sector		ngo sector		private sector		others (specify)
OWN HOME		GOVT. HOSPITAL		STATIC CLINIC		PVT. HOSPITL		
OTHER HOME		THANA HEALTH COMPLEX		SATELLITE CLINIC		CLINIC		
		MCWC*						

*Maternal and Child Welfare Centre

SECTION 4: FAMILY PLANNING
QUESTIONS

1. Have you ever practised any family planning method?

YES ☐ NO ☐

If 'No', please go to question number 12.

2. If "YES" to 1, how long are you practicing contraceptive methods?

3. What method (s) have you used? (Answer may be multiple).

FEMALE STERILISATION ☐ MALE STERILISATION ☐

IMPLANTS/ NORPLANTS ☐ MENSTRUAL REGULATION ☐

PILL ☐ IUD ☐

INJECTIONS ☐

SAFE PERIOD, CALENDER, RHYTHM ☐

LACTATIONAL AMENORRHEA METHOD (LAM) ☐

ANY OTHER METHOD _____(SPECIFY)

4. Where from did you hear about family planning method (s)?

RADIO ☐ TELEVISION ☐

NEWSPAPER ☐ BILL BOARD ☐

VILLAGE THEATRE ☐ CINEMA HALL ☐

FRIENDS ☐ RELATIVES ☐

GOVT. FAMILY
PLANNING WORKER ☐

GOVT. HEALTH
WORKERS ☐

NGO WORKERS ☐

OTHER _____
(SPECIFY)

5. Where do you collect the device?

PUBLIC SECTOR

HOSPITAL/ MEDICAL COLLEGE ☐

FAMILYWELFARE CENTRE ☐

THANA HEALTH COMPLEX ☐

SATELLITE CLINIC/
EPI OUTREACH SITE ☐

MATERNAL CHILD
WELFARE CENTRES ☐

GOVT. FIELD WORKER (FWA) ☐

NGO SECTOR

NGO STATIC CLINIC ☐

NGO SATELLITE CLINIC ☐

NGO DEPOT HOLDER ☐

NGO FIELD WORKER ☐

PRIVATE MEDICAL SECTOR

PRIVATE HOSPITAL/ CLINIC ☐

QUALIFIED DOCTOR ☐

TRADITIONAL DOCTOR ☐

PHARMACY ☐

OTHER PRIVATE SECTOR

SHOP ☐

FRIEND/RELATIVES ☐

OTHER _____
(SPECIFY)

6. Does your husband use any contraception method (s)

YES ☐ NO ☐

7. What method (s) does he use? Please specify.

8. Would you please tell me who decides to use family planning methods?

MAINLY RESPONDENT ☐ MAINLY HUSBAND ☐
JOINT DECISION ☐ OTHERS _____
(SPECIFY)

9. Why have you decided to use family planning methods?

LIMIT FAMILY SIZE ☐ DELAY NEXT BIRTH ☐
HEALTH REASONS ☐ OTHERS _____
(SPECIFY)

10. If the reason is 'LIMIT FAMILY SIZE', Why you want to limit your family size?

11. In case of sterilisation, why did you go for sterilisation? Please specify.

12. Do you regret that you/ your husband had the operation not to have any more children?

YES ☐ NO ☐

13. Why do you regret?

RESPONDANT WANTS ANOTHER CHILD ☐
HUSBAND WANTS ☐
SIDE EFFECTS ☐
CHILD DIED ☐
OTHER REASON _____
(SPECIFY)

14. Why don't you practice FP?

HUSBAND'S OBJECTION	<input type="checkbox"/>	PARENT-IN-LAW'S OBJECTION	<input type="checkbox"/>
FEAR OF HEALTH INJURY	<input type="checkbox"/>	LACK OF KNOWLEDGE	<input type="checkbox"/>
WANT MORE CHILD	<input type="checkbox"/>	STERILITY	<input type="checkbox"/>
RELIGIOUS CAUSE	<input type="checkbox"/>	NEWLY WED	<input type="checkbox"/>
OTHER REASONS (SPECIFY) _____			

15. Who is the expert on family planning issues in your area, you think?

16. Do you discuss about family planning with her/him?

DAILY	<input type="checkbox"/>	WEEKLY	<input type="checkbox"/>	MONTHLY	<input type="checkbox"/>
NEVER	<input type="checkbox"/>	OTHERS	_____ (SPECIFY)		

17. Who and/or what factors influenced you most in your family planning decision? Please also mention the degree of influence on a scale of 0-10, where 10 is very intense.

HUSBAND	<input type="checkbox"/>	<input type="checkbox"/>	OPINION LEADER	<input type="checkbox"/>	<input type="checkbox"/>
PARENTS	<input type="checkbox"/>	<input type="checkbox"/>	TV ADVERTISEMENT	<input type="checkbox"/>	<input type="checkbox"/>
IN-LAWS	<input type="checkbox"/>	<input type="checkbox"/>	RADIO FP PROGRAMMES	<input type="checkbox"/>	<input type="checkbox"/>
RELATIVES	<input type="checkbox"/>	<input type="checkbox"/>	VILLAGE THEATRE	<input type="checkbox"/>	<input type="checkbox"/>
FRIENDS	<input type="checkbox"/>	<input type="checkbox"/>	MAGAZINES	<input type="checkbox"/>	<input type="checkbox"/>
FP-WORKERS	<input type="checkbox"/>	<input type="checkbox"/>	MOVIE	<input type="checkbox"/>	<input type="checkbox"/>
POSTER	<input type="checkbox"/>	<input type="checkbox"/>	PAMPHLET	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC LECTURE	<input type="checkbox"/>	<input type="checkbox"/>	MOBILE VAN	<input type="checkbox"/>	<input type="checkbox"/>
OTHERS	<input type="checkbox"/>	<input type="checkbox"/>	(SPECIFY)	_____	

**SECTION 5: SOCIOMETRIC
QUESTIONNAIRE**

Now I would like to know about the people in your locality whom do you perceive as your friends and/or feel their opinion and various behavioural practice important in your life. Could you please think about them and fill out a page for each one. If there is one special person fill out one page. If there are two, fill out two pages and so on. There are up to 5 pages. Please be sure of the utmost confidentiality of your given information.

1. Name of the Person: _____

2. Type of Relationship: FRIEND ☐ COLLEAGUE ☐ RELATIVE ☐
OPINION LEADER ☐ FP WORKER ☐
OTHERS (SPECIFY) ☐

3. For how long do you know her/him?

3 -5 YEARS ☐ 1-2 YEARS ☐
6 MONTHS- 1 YEAR ☐ LESS THAN 3 MONTHS ☐
MORE THAN 5 YEARS ☐ OTHERS _____
(SPECIFY)

4. Intensity of Relationship: ☐
(Please rate on a scale of 0-5, where 5 is very intense)

5. Frequency of Meeting: DAILY ☐ WEEKLY ☐ MONTHLY ☐
OTHERS _____
(SPECIFY)

6. Most Common Method of Communication:

FACE-TO-FACE ☐ LETTER ☐
TELEP ☐ OTHERS _____
(SPECIFY)

7. Location of their Living :

SAME VILLAGE ☐ SAME PARA/MAHALLA ☐
SAME APPARTMENT ☐ SAME TOWN ☐
CLOSEST VILL./TOWN ☐ OTHERS (SPECIFY) _____

8. Meeting Place: AT WORKING PLACE ☐ VISIT EACH OTHER ☐
ANY SOCIAL OR CULTURAL ORGANISATION ☐
AT HOME ☐ OTHERS (SPECIFY) _____

9. Do you turn for advice and information to him/her for your various mundane problem?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

10. Do you feel his/her influence in your personal decision-making?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

11. Do you discuss about family planning with this person?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

12. Does s/he approve of family planning?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

13. Do you think s/he uses a family planning method?

YES ☐ NO ☐ DON'T KNOW ☐ N/A ☐

14. If 'YES', what type of method s/he uses do you think?

TRADITONAL ☐ MODERN ☐ DON'T KNOW ☐

15. Has s/he ever encouraged you to practice family planning?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

16. Have you ever encouraged her/him to practice family planning?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

17. Does his/her view on family planning influence your fertility behaviour anyway?

NEVER ☐ SELDOM ☐ OFTEN ☐ ALWAYS ☐

18. Finally, do you know whether these person(s) you mentioned as your friend(s) are also connected with each other. Could you please mention who is connected with whom:

- a)
- b)
- c)
- d)
- e)

19. Would you please name five other people, at the most, outside this village with whom you speak about family planning and also mention the relationship type with them?

- a)
- b)
- c)
- d)
- e)

Thank You Very Much For Your Help

APPENDIX 4

List of Variables

List of Variables

Explanatory Variables

Demographic Variables

W_AGE	Wife's Age
AGE_FCH	Age of First Child Born
F_MEM	Family Members
D_MCHI	Demand for Male Children
D_FCHI	Demand for Female Children
S_FCHIB	Sex of First Child Born
MCHID	Male Child Died
FCHID	Female Child Died
MFC_BAL	Male-female Child Balance

Health Variables

DELHP	Delivery Assistant-Health Professional
DELREL	Delivery Assistant-Relatives
DELUNQ	Delivery Assistant-Unqualified Health Professional
Pl_gbrth	Place of Giving Birth

Socio-economic-cultural Variables

INCS	Income Source
EDU_SCO	Education Score
WJOB	Women's Job
FMLAB_SC	Family Members Live Abroad Score
H_SCO	Housing Score
FAUTO_SC	Female Autonomy Score
RELIGION	Religion
EQUIP_SC	Equipment Score
MCO	Micro-credit Organisation
LAND_PRO	Land Property
FOODCONS	Food Consumption

Communication Variables

Inf_score	Information Score
off_fpinf	Family Planning Information Source-Official
fr_fpinf	Family Planning Information Source-Friends Relatives
rt_fpinf	Family Planning Information Source-Radio Television
Inflf1-display	Influencing Factor1-Display
Influf2-interp	Influencing Factor2-Interpersonal
Influf3- mass	Influencing Factor3-Mass Media
F_DFPW	Frequency of Discussing with Family Planning Workers
Husband	Husband
FWA	Family Welfare Assistants

Social Network Variables

ind_strength	Indegree Centrality-Strength
outdc strength	Outdegree Centrality-Strength

APPENDIX 5

Images from the survey



Data collection in Brahmin Shasan

Data collection while respondent attends to household chores



Accessing village for data collection



Data collection in Brahmin Shasan



Mother in law and daughter in law who both gave birth on the same night.

"In" network in Karnataka



“Ja” network in Paygram



“Ja” network in Kamarpara

APPENDIX 6

Fit Statistics for the Full Path Model in Chapter 6

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	56	70272.884	268	.000	262.212
Saturated model	324	.000	0		
Independence model	24	3235.991	300	.000	10.787

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	-20.716	-23.309	-22.587	-25.691	.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.893	-18.506	.000
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	70004.884	69136.791	70879.260
Saturated model	.000	.000	.000
Independence model	2935.991	2756.859	3122.479

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	54.139	53.933	53.264	54.607
Saturated model	.000	.000	.000	.000
Independence model	2.493	2.262	2.124	2.406

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.449	.446	.451	.000
Independence model	.087	.084	.090	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	70384.884	70387.083		
Saturated model	648.000	660.726		
Independence model	3283.991	3284.933		

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	54.226	53.557	54.899	54.227
Saturated model	.499	.499	.499	.509
Independence model	2.530	2.392	2.674	2.531

HOELTER

Model	HOELTER	HOELTER
	.05	.01
Default model	6	6
Independence model	137	145

APPENDIX 7

Fit Statistics of the Optimal Path Model in Chapter 6

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	30	4651148.539	74	.000	62853.359
Saturated model	104	.000	0		
Independence model	13	1104.643	91	.000	12.139

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	-4209.544	-5176.831	-4511.788	-5641.582	.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.813	-3423.146	.000
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	4651074.539	4643982.950	4658172.401
Saturated model	.000	.000	.000
Independence model	1013.643	910.257	1124.457

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	3583.319	3583.262	3577.799	3588.731
Saturated model	.000	.000	.000	.000
Independence model	.851	.781	.701	.866

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
-------	-------	-------	-------	--------

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	6.959	6.953	6.964	.000
Independence model	.093	.088	.098	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	4651208.539	4651209.193		
Saturated model	208.000	210.268		
Independence model	1130.643	1130.927		

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	3583.366	3577.902	3588.834	3583.366
Saturated model	.160	.160	.160	.162
Independence model	.871	.791	.956	.871

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	1	1
Independence model	135	148