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Structural equation modeling to assess the impact of socio-demographic variables on fertility of ethnic *manipuri* women

Abstract

Background: Fertility behavior of the tribes particularly in *Manipuri* women in Bangladesh is scanty. A number of socio-demographic factors influence on fertility, in general. Therefore, the aim of the study is to examine the effects of socio-economic and demographic variables on fertility of *Manipuri* women.

Methods: A cross-sectional study was conducted among 201 ever-married *Manipuri* women during 2008-2009 from randomly selected 13 *paras* in Sylhet city in Bangladesh. Of which 194 ever-married women of aged below 50 years were selected in this study. The number of children ever born was used as a proxy for fertility. Path analysis, Structural Equation modeling technique was used to examine the effects of various socio-demographic variables on fertility.

Results: The overall mean age at marriage of *Manipuri* women was found to be 24.13±4.51 years and the mean parity per women was 1.66. The Path analysis revealed that age at first marriage, contraceptive use and fetal loss had significantly direct negative effects on the number of children ever born. Women's education and place of residence were found to have significantly direct positive effects on fertility.

Conclusion: Based on the findings, the attention should be focused on the need for health care and educational facilities among the women in neighborhood areas in Sylhet city in Bangladesh.

Keywords: fertility, *manipuri*, path analysis, socio-demographic variables, tribal

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Abbreviations: REDU, Respondents Education; RESI, Place of Residence; SLI, Standard of Living Index; AFM, Age at First Marriage; CU, Contraceptive Use; HCDP, Health Care During Pregnancy; FL, Fetal Loss; CEB: Children Ever Born

Introduction

Fertility is being determined by the actual bearing of children and or the demand for children. It is a measure of rate at which population increases to itself by relating number of births to size of some selection of population such as number of married couples or number of women of child bearing age.[1-3] Fertility is high in Bangladesh even by the principles of developing countries. The reduction in fertility in Bangladesh was not preceded by any remarkable change in the socio-economic status. However, recent evidence suggests that fertility has started to decline in Bangladesh. The total fertility rate has declined from nearly seven births per woman in 1975 to about five births per women in 1989, 4.3 in 1990, 3.3 in 2000 and 2.3 births per woman in the recent survey of 2014.[4-7] The total fertility rate in the rural areas is 2.4 births per woman which is higher than that in urban areas 2.0 births per woman.[7] Fertility behavior is not only determined by the characteristics of individuals, but also by social, cultural, community factors. Ethnicity is also an influential factor that affects all aspects of life at the individual and community levels. Hence, in a community intermediate fertility behavior is influenced by beliefs, norms, ideology and other predominant socioeconomic characteristics.[8]

The situation of the tribal people in the world is not encouraging. Bangladesh is a homogeneous country with respect to religion, ethnicity and languages as compared to other countries. There are fairly a few varieties of tribal communities (e.g. *Chakma*, *Santal*, *Marma*, *Garo*, *Manipuri* etc.) living in different parts of the country.[8] Among those communities most of the people of *Manipuri* community live in Sylhet, a North-east part in Bangladesh. The tribal people of the Bangladesh practices their uniqueness e.g. religion, cultural norms, customs and language different from those of the dominant country people.

Researches on fertility of the tribes in Bangladesh are lacking. Conducted an empirical study in India and showed that tribal fertility was higher than national level. He found an inverse relationship between age at first marriage and fertility showed that the TFR of the Australian indigenous women were higher than their non-indigenous counterparts. However, Singh[9] observed lowest number of ever born live births among the *Manipuris*. His study included four communities e.g. Meiteis (*Manipuris*), Pangals, Kabuis and Nepalese, of two valley districts in Manipur, India namely Imphal East and West. The author also mentioned the highest pregnancy wastage recorded among the *Manipuris*.

Reliable information about the factors influencing fertility is indispensable in the process of planning for the overall socio-economic development of a developing country. The mechanism of factors influencing fertility is that intermediate variables influence fertility directly, while socio-demographic variables affect fertility indirectly through intermediate variables.[10-13] Therefore, the aim of the study is to examine the direct, indirect and joint effects of some selected socio-economic and demographic variables on fertility of *Manipuri* women in Sylhet city in Bangladesh, employing the technique of path analysis.

Materials and methods

Data

The data used in this study were from the sample survey on the ever-married *Manipuri* women in Sylhet city in Bangladesh conducted during 2008-2009 under the financial support of Ministry of Science and Technology, Government of the People's Republic of Bangladesh. The primary data consists of the Socio-economic Status, Cultural Norms and Reproductive Behavior of *Manipuri* Community. Cluster sampling procedure was used to collect the data. There are thirteen *Manipuri paras* (a small area where few *Manipuri* family live) in Sylhet city e.g. *Lamabazar, Manipuri Rajbari, Laladighirpar, Kewapara, Narsinghtilla, Sagardighirpar, Subidbazar, Ambar-khana, Barabazar, Brajanathtilla, Shibganj, Nayabazar* and *Dakshingach*. Each of the *Manipuriparas* of Sylhet city was considered as a cluster and covered all the married women. The information was recorded in a pre-structured questionnaire. A total 201 ever-married women were successfully interviewed of which 194 ever-married women of aged below 50 years were selected in this study.

Selected explanatory and outcome variables

Standard of living index by scoring method

The standard of living index represents the economic grade of a household in a society. It is a composite measure of the cumulative living standard of a household. The standard of living index is calculated using easy-to-collect data on a household's ownership of a number of consumer items such as televisions and bicycles, materials used for housing construction, type of drinking water source, sanitation facilities and other characteristics that are related to wealth status.[14] In order to measure the standard of living index by scoring method the qualitative variables have been categorized. The variables are assigned as 0 for the lowest value and 8 for the highest value on the basis of their market value and level of needs. The list of qualitative variables and their ranks from lowest to highest are presented in the Appendix Table A1. The score ranges from 0 and does not exceed 66 for any household. The total score of the households is calculated by using the scores of the variable assigned in the Appendix Table A1. This score has measured the standard of living (Range: 17-56). Initially these scores have been cut off into five quintiles e.g. poorest, poorer, middle, richer and richest according to the report of BDHS, 2004-2014. But for the purpose of this study, we categorized into two groups e.g. lower class (score <36) and upper class (score ≥36).

In order to construct a path model eight socio-economic and demographic variables are selected and described in Table 1. Respondents' education, place of residence and standard of living index are considered as the socio-economic and background variables; age at first marriage, contraceptive use, health care during pregnancy, and fetal loss are regarded as the demographic as

Table 1 Description of explanatory and dependent variables

Variable	Abbreviation	Causal Order no.	Measurement
Respondents Education (X_1)	REDU	1	1 = Schooling 0 = No schooling
Place of Residence (X_2)	RESI	2	1 = Mid-town 0 = Suburb area
Standard of Living Index (X_3)	SLI	3	1 = Upper class 0 = Lower class
Age at first Marriage (X_4)	AFM	4	Completed years
Contraceptive use (X_5)	CU	5	1 = Ever use 0 = Never use
Health Care during Pregnancy (X_6)	HCDP	6	1 = Taken 0 = Not taken
Fetal Loss (X_7)	FL	7	Number of wasted pregnancies
Children Ever Born (X_8)	CEB	8	Number of live births (dependent variable)

Well as intermediate variables. As a proxy for the measure of fertility, the number of children ever born to each woman is used. The selected explanatory variables are chosen because these are also found from the past literatures that influenced on fertility behavior of women.[12,13,15]

Statistical analysis

The descriptive statistics are documented to show the mean and standard deviation for continuous variables, percentages for categorical variables and also show some graphical representations.

Structural equation modeling

Path analysis: Path analysis is employed in this study to observe the effects of various factors on fertility. It has been used by many social scientists in various fields of enquiry for quantifying and interpreting causal linear models.[16] The primary task in path analysis is to construct a path diagram in which variables are arranged in a meaningful manner. Arrows show the direction of influences. A path

diagram is constructed by using selected variables. The diagram represents the hypothetical causal model of relationships between fertility and some of its socio-demographic determinants in which each variable is assumed to be dependent upon all prior causal variables.[17] The relationships among the variables in the model are linear, additive and causal. Each residual is not correlated with the explanatory variables that precede it in the model. There is only one way causal flow in the system. Path analysis permits one to estimate the direct, indirect and joint effects of predetermined variables on the dependent variable by decomposing the correlation coefficient between the dependent variable and any predetermined variable.[16,18,19] The method of path analysis reduces the system to one or more multiple linear regression analysis, and path coefficients are estimated by standard regression coefficients in a system of linear equation indication the direct effects of an independent variable on the dependent variable method is used in this study to estimate the indirect and total effect. The structural equation model considered here is the recursive type, in which each variable is assumed to be dependent upon all prior causal variables, used to show the interrelationship between the variables written as follows:

$$X_4 = P_{43}X_3 + P_{42}X_2 + P_{41}X_1 + P_{5u}e_u$$

$$X_5 = P_{54}X_4 + P_{53}X_3 + P_{52}X_2 + P_{51}X_1 + P_{5v}e_v$$

$$X_6 = P_{64}X_4 + P_{63}X_3 + P_{62}X_2 + P_{61}X_1 + P_{6w}e_w$$

$$X_7 = P_{76}X_6 + P_{75}X_5 + P_{74}X_4 + P_{73}X_3 + P_{72}X_2 + P_{71}X_1 + P_{7x}e_x$$

$$X_8 = P_{87}X_7 + P_{86}X_6 + P_{85}X_5 + P_{84}X_4 + P_{83}X_3 + P_{82}X_2 + P_{81}X_1 + P_{8y}e_y$$

Where, P_{ji} values are path coefficients from standardized variables X_i to X_j, and e_u, e_v, e_w, e_x and e_y are random disturbance terms.

Results and discussion

The mean age and mean age at first marriage of the study women are found 35.58±6.73 years and 24.13±4.51 years respectively. Most of the respondents (93%) know about family planning but only 31.0% respondents ever use contraceptive. Again, about 55.3% respondents will not use contraceptive in future indicating contraceptive use will be decreased. Among the non-users about 31% show children expectation as reason of not using contraceptive but 28% respondents answered that they do not need to use it. The mean parity per women is to be found 1.66. Figure 1 shows that parity of the respondents is lower than that of their mothers and grandmothers.

Figure 2 shows a skewed percentage distribution of parity of the women (aged 15-49) under study. Where about 19% women were found having no children, about 28-29% women have one or two and the rest have more than two children. Table 2 presents the means and standard deviations (S.D.) of the variables included in this study.

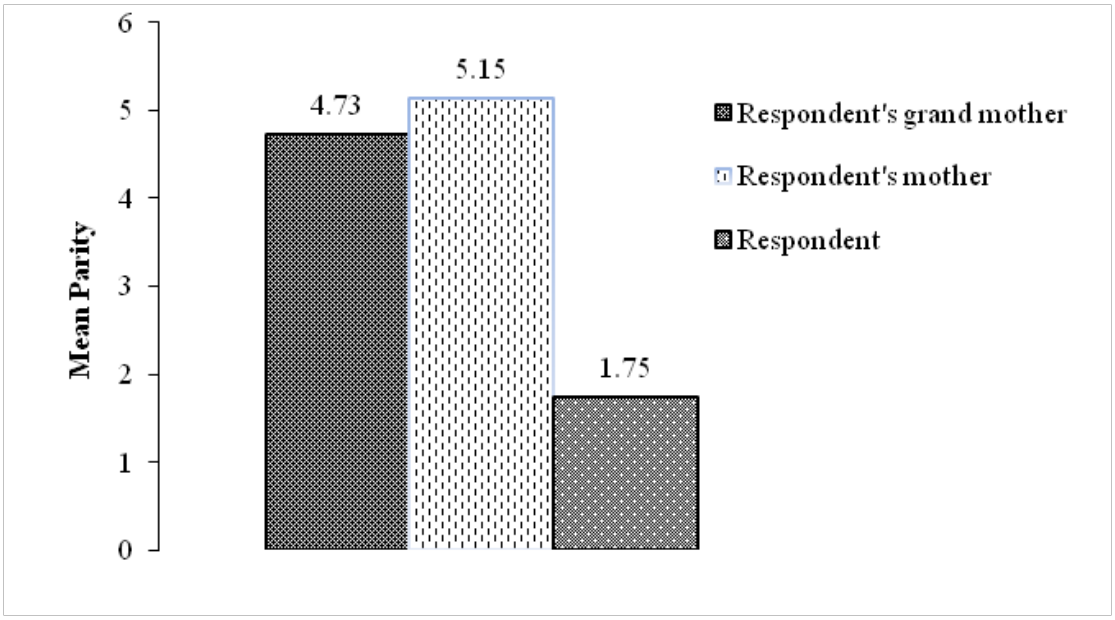

Figure 1 Mean parity of respondents, their mothers and grandmothers.

Path analysis

The estimated path coefficients and residual path coefficients are shown in the path diagram Figure 3 along with their paths (arrows), representing the direct effect on the dependent variable. 17 hypothesized paths are designed based on the recursive linear regression model. Among them 3 paths (Respondents education, Place of residence and Standard of living index) assume direct effect on Age at first marriage; 4 paths (Age at first marriage, Respondents education, Place of residence and Standard of living index) assume direct effect on contraceptive use; 4 paths (Age at first marriage, Respondents education, Place of residence and Standard of living index) also hypothesize direct effect on Health care during pregnancy; 3 paths (Age at first marriage, Contraceptive use and Health care during pregnancy) assume direct effect on Fetal loss; and finally 3 paths (Fetal loss, Contraceptive use and Age at first marriage) have also hypothesized direct effect on Fertility (number of children ever born). Out of 17 hypothesized paths, 4 paths are found to be statistically significant. Among three variables that influence directly on fertility, age at first marriage is found higher and significantly direct negative effect (-0.51).

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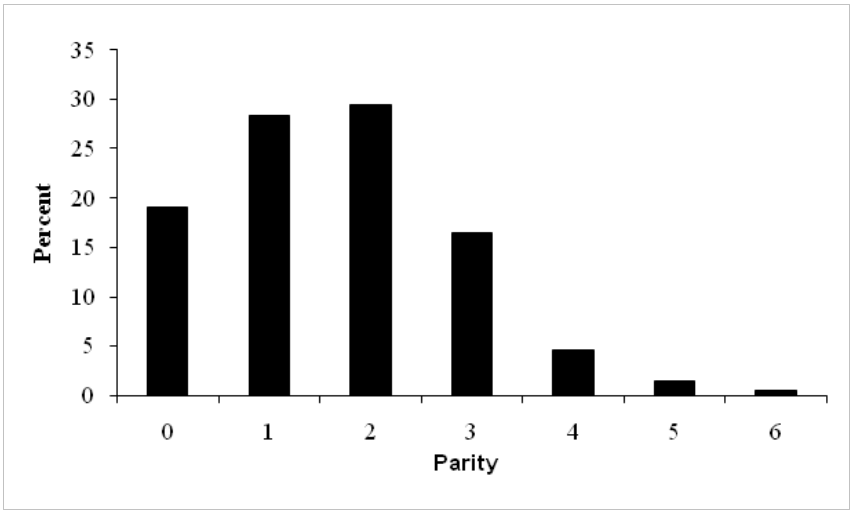

Figure 2 Distribution of the parity.

Table 2 Number of women (N), means and standard deviations (S.D.) of variables*.

Variable	N	Mean	S.D.
REDU	194	0.98	0.14
RESI	194	0.83	0.38
SLI	194	0.13	0.34
AFM	194	24.03	4.52
CU	180	0.32	0.47
HCDP	166	0.95	0.23
FL	194	0.07	0.32
CEB	194	1.66	1.22

*REDU: Respondents Education; RESI: Place of Residence; SLI: Standard of Living Index; AFM: Age at First Marriage; CU: Contraceptive Use; HCDP: Health Care During Pregnancy; FL: Fetal Loss; CEB: Children Ever Born.

Table 3 Effects of variables used in the path model for explaining fertility of ever-married women*.

Dependent Variable	Predetermined Variable	Direct Effect	Implied Effect	Joint Association	Indirect Effects Through									Total Effect
					X4	X5	X7	X4X5	X4X7	X4X6X7	X4X5X7	X5X7	X6X7	
X8 CEB	X1 REDU		-0.06	0.001	0.02	0.001		0.000	-0.000	-0.000	-0.000	-0.000	0.001	-0.04
	X2 RESI		-0.15	0.001	0.01	-0.004		0.000	-0.000	0.000	-0.000	0.000	-0.002	-0.14
	X3 SLI		0.03	0.002	-0.002	0.004		-0.000	0.000	0.000	0.000	-0.000	0.001	0.03
	X4 AFM	-0.51				-0.002	0.001					0.000	0.002	-0.50
	X5 CU	-0.01					0.001							-0.01
	X6 HCDP		-0.05				0.01							-0.041
	X7 FL	-0.02												-0.02

*REDU: Respondents Education; RESI: Place of Residence; SLI: Standard of Living Index; AFM: Age at First Marriage; CU: Contraceptive Use; HCDP: Health Care During Pregnancy; FL: Fetal Loss; CEB: Children Ever Born.

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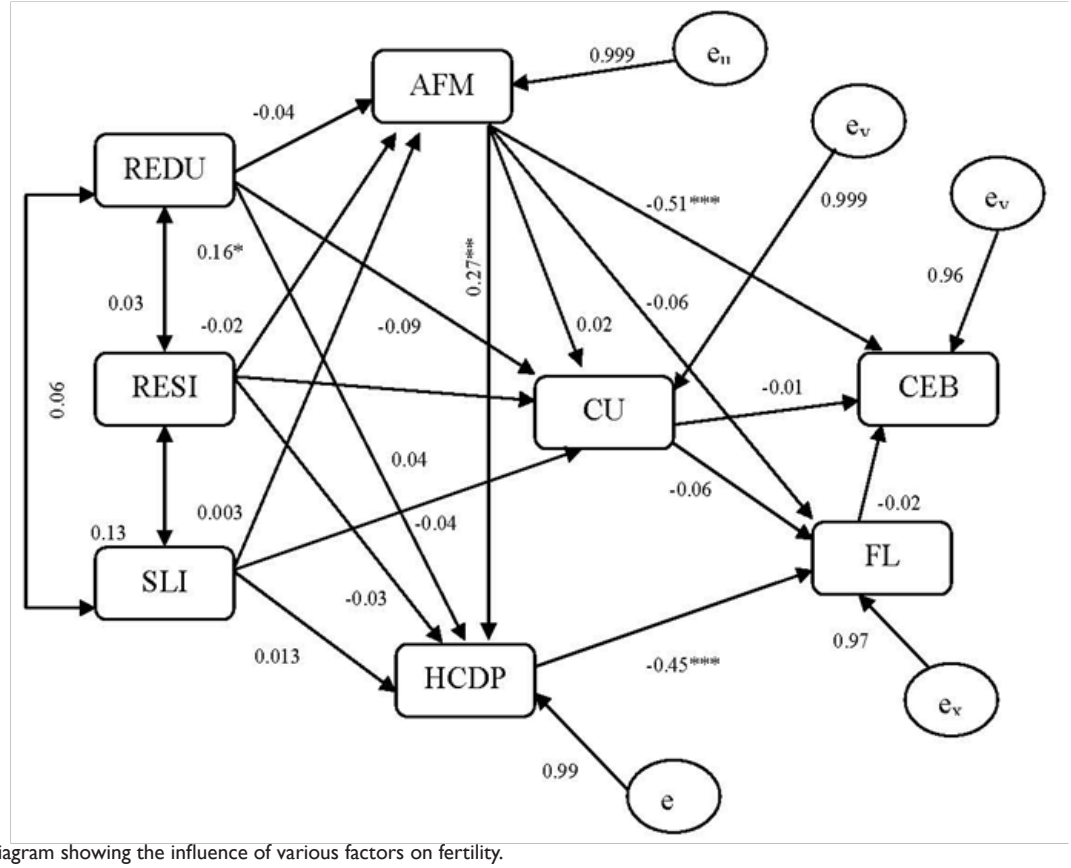

Figure 3 Path diagram showing the influence of various factors on fertility.

Notes: REDU, respondents education; RESI, place of residence; SLI, standard of living index; AFM, age at first marriage; CU, contraceptive use; HCDP, health care during pregnancy; FL, fetal loss; CEB, children ever born

Significant Path coefficient *p<0.05, **p<0.01, ***p<0.001

The direct, indirect and joint effects of each of the selected variables are represented in Table 3. Total effects of respondents' education and place of residence on fertility are negative while that of standard of living is positive (0.03). This indicates that women with more education and living in mid-town area have fewer children ever born to them as compared with those having less education and living in suburb area, whereas women of upper class families have more children ever born to them as compared with them of lower class families. The implied effect (P_{81}) of respondents' education is found to have negative effect while its indirect effect (0.02) and joint association (0.001) is found positive effect. Place of residence has the highest negative implied effect (-0.16), and indirect effect through contraceptive use (-0.004) is also negative while the effect is positive through age at first marriage (0.01). Both the education and place of residence have positive effect through age at first marriage. And both the place of residence and age at first marriage have effects in the opposite direction through contraceptive use. But through contraceptive use standard of living has positive effect. This indicates more educated mid-town women with upper class standard of living get late married and have fewer children ever born to them though influence of contraceptive use is negative.

The total negative effects of age at first marriage, contraceptive use and health care during pregnancy are observed. Among their total effects they have positive effect through fetal loss whereas they have negative direct effects (-0.51, -0.01) and negative implied effect (-0.05) respectively which means the influence of fetal loss is very low on fertility.

Conclusion

Some findings of this study are considered from the viewpoint of their policy implications. It has been found that age at first marriage contraceptive use and fetal loss have direct negative effect on fertility. Women with more education and living in mid-town area have fewer children ever born to them and both of them have positive effect on fertility through contraceptive use. Women of upper class families (only 12.4%) have more children ever born to them. Women who took health care facilities during pregnancy have fewer children ever born to them. In this study about 69% percent *Manipuri* women did not use contraceptive, the mean parity per woman is 1.66, most of the exogenous variables (education, place of residence, age at first marriage, contraceptive use, Health care during pregnancy) have negative influence on fertility which is aligned with Singh[21] study who found lowest number of ever born live births is observed among the *Manipuris*. Therefore, it might be concluded that in case of fertility they may have some genetic problem. The total negative effects of education and age at first marriage are fully supported with the results of Islam & Khan.[16] But the negative effect of fetal loss is fully an opposite position. Since education and standard of living index have positive effect through contraceptive use, with the basis of above results it can be summarized that there might be more explanatory variables that could not be included in the model.

Considering the results and evidence of the study, necessary steps should be taken to supervise this *Manipuri* community who are the original inhabitants of Bangladesh. Finally, further investigations

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should be done on the factors influencing their fertility to determine the actual cause of their low fertility to save the community from extinguish.

Acknowledgement

None.

Conflict of Interest

The authors have declared that there are no conflicts of interest.

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