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Factors Affecting Fertility Behavior in Bangladesh: A Probabilistic Approach

[1]Mahmudul Hasan and [2]Sabiruzzaman
[1]Department of Population Science and Human Resource Development,
[2]Department of Statistics, University of Rajshahi, Rajshahi-6205, Bangladesh

Abstract: The study committed to investigate the role of associated determinants that affect the women's fertility behavior. This research work traces socioeconomic, socio-demographic and behavioral background of the study respondents that pressed them into the high parity. It categorically attempts to identify the patterns of such events according to their nature and reasons there in. The empirical data of this study indicates that the mean number of children per woman is 2.59 and the exact age of the respondent, age at marriage, marital status, occupation, monthly family income, contraceptive use, decision maker for child taking, breastfeeding, years of schooling and religion are found to be the direct or indirect source that affect parity. By adopting probabilistic approach, the present research identifies three variables-age at marriage, contraceptive use and decision maker for child taking are the most influential among considered variables. The present study is primarily based on the empirical data gathered through direct interviewing, observation and case studies with the randomly chosen ever married women of the study areas. Statistics from other research works have also been consulted. This study argued that proper control of relevant factors might be useful to get expected fertility transition in Bangladesh.

Key words: Parity, ever married women, fertility behavior, behavioral factors, socio-economic factors, socio-demographic factors

INTRODUCTION

Determinants of fertility behavior measures are a varied manner in Bangladesh. It is still a challenge of finding quality data to make a satisfactory prediction or recommendation. Dyson and Murphy (1985) and Knodel *et al.* (1984) reported that pronounced fertility declines have occurred in many developing countries in the late 1970s, but Bangladesh did not take part on that event. A dramatic change was found in the early 1990s. The Total Fertility Rate (TFR) of Bangladesh has declined from a high level of 6.3 births per woman in 1975 to 3.4 births per woman in 1993-94 (Mitra *et al.*, 1994). Fertility rates in Bangladesh to reach its replacement level may not take long time though the ESCAP Population Data Sheet 2007 reveals it as 2.9 per woman (ESCAP, 2007) and PRB World Population Data Sheet 2007 estimates it as 3.0 (PRB, 2007). The sharp decline in fertility in Bangladesh during the early 1990s has generated much interest among researchers and policymakers. That interest arises from the fact that the remarkable success in the reduction of fertility in Bangladesh has occurred without the substantial improvements in socioeconomic and health status that are thought to be needed to bring about a change in fertility level (Islam *et al.*, 2003).

It is apparent among the researchers that some behavioral factors such as age at marriage, breast-feeding, contraceptive use and induced abortion can achieve success in reduction of fertility in the short term. The family planning program in Bangladesh is an example of such a success story. On the other hand, some biological factors such as fecundability and the prevalence of spontaneous intrauterine mortality and permanent sterility also play vital roles in determining the level of fertility. Bongaarts (1978) termed these biological and behavioral factors as the proximate determinants of fertility, since they directly affect fertility; and all other social, economic and environmental factors affect fertility through these variables.

Some researchers argued that the fertility decline in Bangladesh was achieved primarily due to a successful family planning program (Cleland, 1994; Cleland *et al.*, 1994; Islam *et al.*, 1998; Caldwell *et al.*, 1999) that succeeded in raising the Contraceptive Prevalence Rate (CPR) from a low level of 8% in 1975 to as high as 44% in 1993-94 (Mitra *et al.*, 1994). The current use of all methods of contraceptive is up by 14.1 percentage points, from 44.0% in 1994 to 58.1% whereas the modern methods prevalence rate is 47.3% in 2007 (ESCAP, 2007) while PRB

Correspondence Author: Mahmudul Hasan, Department of Population Science and Human Resource Development, University of Rajshahi, Rajshahi-6205, Bangladesh

estimates for both methods are very much nearer to ESCAP report is as 58.0 and 47.0, respectively (PRB, 2007). Last two decades some changes in fertility had taken place but determinants affecting such operations are creating debates among the researchers till now.

Fertility transition has a long transformational history. A significance changes in the overall levels of total natural fertility, total marital fertility and total fertility is observed by Bongaarts and Potter (1983). Such changes can be traced to one or several proximate determinants such as increase in contraceptive use for stopping and spacing purposes, a rise in age at first marriage, a decline in the proportion married, prolonged breast-feeding and increased induced abortion. The worldwide applicable population policies are anti-natal and neo-natal. Where higher order is considered needed as to the reason of labor force and a financial guarantee to their parents in old ages. The relation between cost and benefits of an additional child determines the offspring size. If the marginal benefit of having more children is larger than the cost of not having them, families will probably continue their procreation (Muniz, 2003). The demand theory is mainly represented by Gary Becker's works (Becker, 1991) states that fertility would be determined by parents' demand for children, which would take into account the utility that the number of children would bring to each family. But some other countries like Bangladesh anti natal population policies are adopted here to arrest the previous growing fertility.

Empirical studies have found that the variables that contribute most to the explanation of variability of fertility are union patterns, practice of lactation and its consequent effect on the length of the postpartum amenorrhea period and the adoption of contraceptive methods (Bongaarts, 1982; Hobcraft and Litlle, 1983).

An important study examining the impact of intermediate variables on the reproductive process was conducted by Palloni (1984). In his study he proposed a technique to assess the effects of exposure to intercourse, the practice of contraception, breastfeeding and others variables on the dynamics of birth intervals. Palloni also suggested a technique to aggregate such effects across births of different order. He estimated models for the conditional probability of a birth after the previous birth initiating one of the 6 monthly intervals considered. Among the results he found out that the users of efficient methods of contraception are less likely to move from one birth order to the next one and that breastfeeding effects appear to be stronger at higher parities. He also confirmed that union discontinuation has a significant and strong effect for all segments of 10 months of width and for all births of order higher than one.

According to Bongaart's classification, Bangladesh is in the second phase of transition, during which the use of contraception is modest; the effect of breast-feeding is a dominant factor, however. Analysis of this trend confirmed that most of the decline was due to adoption of modern contraception and partly due to a rising age at marriage (Kabir *et al*., 1987).

The dramatic fall in fertility is consistent in recent years where contraception, impact of marriage component, reflecting the effect of increased non-married and/or increased age at marriage, cultural and social norm have emerged as the highest fertility reducing factors in Bangladesh (Islam *et al*., 2003).

Many distinguished scholars developed theories related to the fertility decline as well as fertility behavior, but none applied a universal appraisal in this regard. They claimed that it is too hard to make a general stand but Bongaarts (1982), Burch (1996), Lesthaeghe (1997) and Mason (1997) observed that in explaining the fertility transition in a more precise and less tentative approach, capable of giving more universal and fewer challengeable outcomes. It is because many factors related with fertility declining are viewed diverse for different countries. To realize the actual situation of fertility behavior of Bangladesh, it is important to analyze the role of associated determinants. The realization is essential, because it may bring out ways to enhance the effectiveness of national population program. So, this is an empirical attempt to explore how and in what levels some relevant factors affect the probabilities of women's parity.

MATERIALS AND METHODS

Data collection: The data collected from northern districts of Bangladesh. We considered each of 16 districts as a cluster and then we randomly chose three districts-Rajshahi, Rangpur and Thakurgaon. The clusters are assumed to be within homogeneous and a sample of 1000 respondents, ever married women, was selected by applying simple random sampling method. Information from respondents was collected by direct interviewing.

The probabilistic nature of fertility behavior of Bangladeshi women can be described through a logistic regression model. We may consider the reproductive history of a woman as a stochastic process (Muniz, 2003). Suppose, a woman is at state 0, when she has no child or only one child and she reaches at state 1 when she get more than one children. We assume that the transition from state 0 to state 1 depends on some determinants such as exact age of the respondent, age at marriage, marital status, occupation, monthly family income,

contraceptive use, decision maker for child taking, breastfeeding, years of schooling and religion. The probability that a woman change her state is determined by a logistic model. Here the response variable is a binary deterministic variable denoted by t, which takes values 0 at state 0 and 1 at state 1. The predictor variables may be quantitative or categorical. The mathematical model can be formalize as:

$$\ln\left[\frac{\Pr(t=1)}{1-\Pr(t=1)}\right] = \beta_0 + \beta_1 D_1 + \beta_2 D_2 + \ldots\ldots\ldots\ldots + \beta_k D_k$$

Where, D_i represents the determinants.
Pr (t = 1) can be estimated by

$$\frac{\sum t_i}{n}, n$$

is the total number of observations. As the disturbance term (omitted in the equation) is heteroscedastic, an application of Weighted Least Square (WLS) will give the estimate of parameters (Gujarati, 1995). The choice of explanatory variables was made by suggestions of existing literatures. The significance of association between predictors and response variable has also been tested.

Hence, exp (β_i) is the effect of a unit increase in X_k on the odds.

RESULTS AND DISCUSSION

Table 1 shows the distribution of the number of children of women those were considered as our study respondents. Most of the women (29.3%) have one child. After that 23% women have 2 children. Box plot (Fig. 1) shows that the number of children per woman ranges from 0 to 10. Twenty five percent of the respondents have only one child and 75% of them have 4 children. The mean number of children per woman in the study areas is estimated as 2.59 whereas the current TFR of Bangladesh is about 2.9 per woman (ESCAP, 2007), which indicates that Bangladesh has a tendency of higher order parity.

Fertility behavior versus determinants: The associations of respondents' fertility with exact age, age at marriage, marital status, education, occupation, religion, monthly family income, contraceptive use, decision maker for child taking, breastfeeding and abortion are shown in Table 2.

From Table 2, it is transparent that exact age is highly associated with fertility behavior. As the age increases, a woman is more likely to have more children. An opposite

Table 1: Distribution of respondents according to parity

No. of children	Frequency	(%)	Mean (SD)
0	36	3.6	2.59 (1.69)
1	293	29.3	
2	230	23.0	
3	167	16.7	
4	130	13.0	
5	78	7.8	
6	49	4.9	
7	10	1.0	
8	2	0.2	
9	4	0.4	
10	1	0.1	
Total	1000	100.0	

SD: Standard Deviation

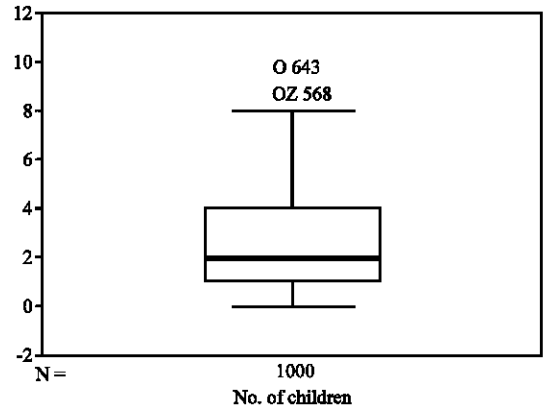

Fig. 1: Box plot for respondents' parity

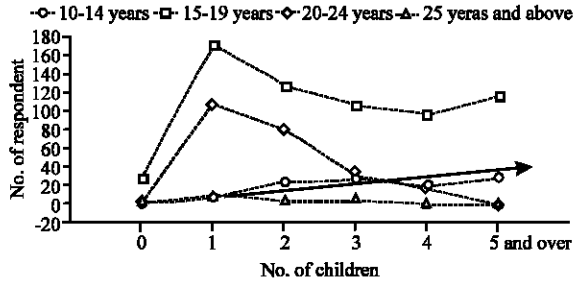

Fig. 2: No. of children vs age at marriage

scenario is apparent for the age at marriage (Fig. 2). A sharp decrease is found in number of children for an increase in age at marriage after one child with only exception for the women who got married between 10 to 14 years. It shows a moderate increasing trend. So, this may be an important factor to decline fertility. Our study found that the modal age group is 15-19 years. That is most of the women got married at their age between 15 to 19 years. Marital status is also significantly associated with parity. The number of children per woman is gradually decreasing for those who are living with husband. Women of all other status have at least one child. This simply refers to the high fertile condition of

Table 2: Association of parity versus determinants

		No. of children								Significance of association	
Variables	Class	0	1	2	3	4	4+	Total	Mean	Chi-square	Likelihood ratio
Exact age	15-19 years	14	40	9	0	0	0	63	30.09	0.000	0.000
	20-24 years	9	133	60	10	1	1	214			
	25-29 years	8	86	94	44	23	6	261			
	30-34 years	3	22	42	68	34	10	179			
	35-39 years	1	9	11	36	39	28	124			
	40-45 years	1	3	9	5	26	58	102			
	45-49 years	0	0	4	3	6	27	40			
	49+ years	0	0	1	1	1	14	17			
Age at marriage	10-14 years	3	7	24	27	18	28	107	17.62	0.000	0.000
	15-19 years	28	171	125	105	97	116	642			
	20-24 years	3	108	79	31	15	0	236			
	24 years+	2	7	2	4	0	0	15			
Marital status	Living with husband	36	287	212	159	113	116	923	--	0.000	0.000
	Widowed	0	3	11	5	12	26	57			
	Divorced	0	1	4	3	4	1	13			
	Separate	0	2	3	0	1	1	7			
Years of schooling	1-5 years	19	56	82	77	80	109	423	6.31	0.000	0.000
	6-10 years	12	143	97	62	45	33	392			
	11-12 years	5	60	33	18	1	2	119			
	12+ years	0	34	18	10	4	0	66			
Occupation	Service	3	50	35	22	9	4	123	--	0.000	0.000
	Business	0	4	10	4	3	6	27			
	Housewife	33	231	172	125	89	112	762			
	Others	0	8	13	16	29	22	88			
Religion	Islam	29	265	192	141	109	129	865	--	0.247	0.164
	Hindu	5	21	26	20	13	12	97			
	Christian	0	4	3	1	3	0	11			
	Buddhist	0	1	4	2	0	2	9			
	Others	2	2	5	3	5	1	18			
Monthly family income	1000-6000 TK	17	89	117	87	69	77	456	7,870 TK	0.000	0.000
	6001-11000 TK.	4	122	64	61	42	37	330			
	11001-16000 TK.	7	50	34	14	8	13	126			
	16001-21000 TK.	8	21	5	5	10	11	60			
	21000 TK and above	0	11	10	0	1	6	28			
Contraceptive use	No	28	40	29	15	25	48	185	0.815	0.000	0.000
	Yes	8	253	201	152	105	96	815			
Decision maker in child taking	Herself	0	18	11	9	3	9	50	--	0.000	0.000
	Husband	8	36	48	40	54	78	264			
	Both	28	239	171	118	73	57	686			
Breastfeeding	No	34	31	32	20	12	12	141	0.859	0.000	0.000
	Yes	2	262	198	147	118	132	859			
Abortion	No	32	273	203	146	113	126	893	0.107	0.241	0.203
	Yes	4	20	27	21	17	18	107			

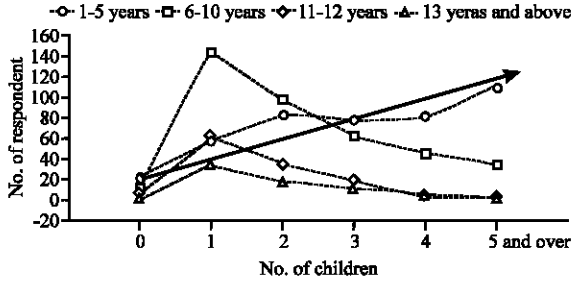

Fig. 3: No. of children vs years of schooling

Bangladesh. Education is found to be another important factor of fertility. Most of the women's have less than 10 years of schooling. A firm decrease in parity is found for higher educated women indicating that higher education deteriorate women to move for high parity but the trend is just opposite for women who have only 1-5 years of schooling (Fig. 3). So, lack of higher education may be one of the important factors of high fertility.

Occupation is found to be significantly affected fertility. There is a positive attitude among housewives to have more children. But the working women are less likely to have more children. The association between religion and parity is found to be insignificant. The no. of children per woman is gradually decreasing among Muslim women. The transition is almost stationary for other community. Monthly income of interviewed women seems to be affected fertility significantly. As the income level increases parity moves downwards (Fig. 4). Contraceptive use gives positive signal to fertility decline. The parity distribution is almost stationary for the women who are

not using any contraceptive method, but the trend is downward for those who are using (Fig. 5). Decision maker for child taking plays significant role in fertility behavior. Women who are motivated by their husbands are more likely to have additional children (Fig. 5).

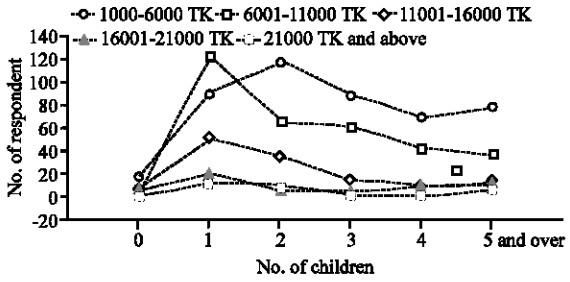

Fig. 4: No. of children vs income

Breastfeeding is also found to be significantly associated with parity. Breastfeeding tendency among women decreases with increases in no. of children (Fig. 5). Abortion is not significantly affecting women's parity.

Probabilistic approach : The output of logistic regression model for fertility on various factors is shown in Table 3. The Nagelkerke R^2 (0.573) indicates that the model has a good fit. Coefficients for some variables in few of their categories are found to be insignificant. They were not removed from the model as they don't appear to change the consistency of other coefficients.

To describe the probabilistic behavior of fertility behavior through this model, we set some general rules. For unit increase in a quantitative variable, the estimated odds of having 2 or more children multiply by exp(β). More clearly, for each one-year increase in women's exact

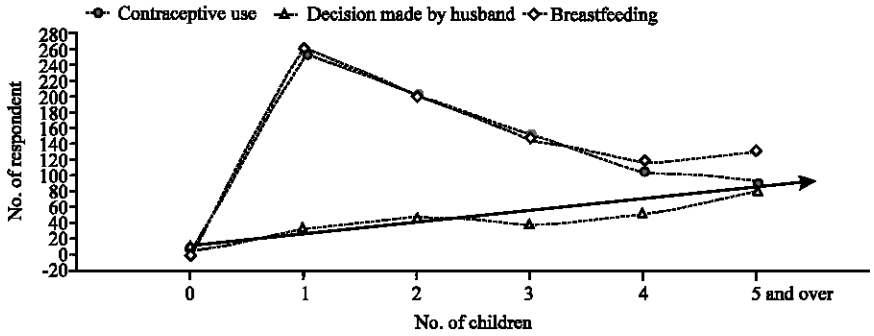

Fig. 5: No. of children vs contraceptive use, decision made by husband and breastfeeding

Table 3: The output of logistic regression of fertility behavior on associated factors

								95.0% CI for EXP(β)	
Variables	Category	β	SE	Wald	df	Sig.	Exp(β)	Lower	Upper
Exact age	--	0.319	0.026	153.381	1	0.000	1.376	1.308	1.447
Age at marriage	--	-0.273	0.043	40.181	1	0.000	0.761	0.700	0.828
Marital status	Living with husband	1.084	0.627	2.990	1	0.084	2.956	0.865	10.100
Occupation				5.090	3	0.165			
	Service	0.379	0.577	.432	1	0.511	1.461	0.472	4.524
	Business	1.875	0.983	3.640	1	0.056	6.520	0.950	44.744
	Housewife	0.108	0.517	.043	1	0.835	1.114	0.405	3.065
Monthly family income				8.927	4	0.063			
	1000-6000 TK	-0.473	0.569	.693	1	0.405	0.623	0.204	1.899
	6001-11000 TK	-0.790	0.566	1.948	1	0.163	0.454	0.150	1.376
	11001-16000 TK	-1.115	0.597	3.489	1	0.062	0.328	0.102	1.056
	16001-21000 TK	-1.383	0.717	3.721	1	0.054	0.251	0.062	1.023
Contraceptive use	Yes	-1.379	0.318	18.795	1	0.000	0.252	0.135	.470
Decision maker for child taking				7.809	2	0.020			
	Wife	-0.583	0.421	1.922	1	0.166	0.558	0.245	1.273
	Husband	0.635	0.277	5.256	1	0.022	1.888	1.097	3.249
Breast feeding	Yes	-0.491	0.277	3.150	1	0.076	0.612	0.356	1.053
Years of schooling	--	-0.044	0.029	2.325	1	0.127	0.957	0.904	1.013
Religion				15.540	4	0.004			
	Islam	1.215	0.886	1.879	1	0.170	3.371	0.593	19.155
	Hindu	1.638	0.929	3.106	1	0.078	5.144	0.832	31.792
	Christian	-1.919	1.271	2.281	1	0.131	0.147	0.012	1.771
	Buddhist	2.007	1.620	1.535	1	0.215	7.444	0.311	178.226
Constant	--	-3.194	1.247	6.559	1	0.010	0.041		

No. of observation = 1,000, Nagelkerke $R^2 = 0.573$, Hosmer and Lemeshow $\chi^2_8 = 34.63$ ($p = 0.000$)

age, there is a 37.6% [exp(0.319)−1] increase in the chance of having two or more child. The variables which give negative coefficients have negative impact on higher order parity. Consider the variable age at marriage. There is 23.9% [1−exp(−0.273)] less chance of having 2 or more children for each additional increase in age at marriage. In the case of categorical variables, the odds are related to the omitted category. Women who are living with husband, for example, have 195.6% [exp(1.084)−1] more chance to have two or more children than those who are not.

The overall impact of occupation is insignificant except housewife. Housewives have little positive chance (11.4%) to enhance its fertility level. Women with high income levels are seemed to process soaring negative effect on parity (67.2 and 74.4%). The coefficient for an important variable years of schooling is not highly significant rather it is significant at 12.7 % level of significance. A very useful finding is that contraceptive use has highly significant but negative impact. There is 74.8% [1−exp(−1.379)] less likely of fertility behavior for the women who use contraceptive methods than who avoid it. Another interesting result is that there is an insignificant negative probability (16.6%) of fertility behavior when the decision maker for child taking is wife, but the chance is positive (88.8%) when the decision maker is husband. Lastly, breastfeeding has significant negative impact in fertility behavior.

CONCLUSION

Using both contingency analysis and probabilistic approach this study found that behavioral factors, socio-economic and socio-demographic factors have significant effect on fertility behavior. The behavioral factors age at first marriage, contraceptive use and breastfeeding are found to be significantly negatively related which implies that increase in the level of these behavioral factors decreases higher order parity. Some socio-economic factors years of schooling, monthly family income are significantly negatively associated but the association is positive for occupation. The socio-demographic factors exact age, marital status and decision maker for child taking were also found to be associated with parity. More concisely, age at first marriage, contraceptive use, breastfeeding, years of schooling and monthly family income are negatively related with fertility behavior. Therefore, an increase in the levels of these variables will decline the chance of high parity. Furthermore, it is evident from the discussion that women who are motivated by their husband are pressed into getting additional children.

POLICY FORMULATION

Bangladesh is a small country. Its position is 7th among 10 most populous countries in the world (PRB, 2007). From ESCAP report 2007, the estimated population of Bangladesh is 158,665000 whereas PRB report 2007 estimated it as 149,000000. The countries where population growth rate is higher than national resources, like other developing countries in the world, Bangladesh is presently experiencing unprecedented population growth. In fact, it has now the highest density of population in the world approaching 1,035 people to the square kilometer. The present rate of population growth is of around 1.9 (PRB, 2007) is unsatisfactory because it is considered to be too high. By analyzing the overall situation discussed above, the following policy recommendations are made not only for the study area but also for overall Bangladesh as well:

- It needs intervention program to the government of Bangladesh for the improvement of some behavioral, socio-economic and socio-demographic variables in relation with population.
- To increase the mean age at first marriage, the GOs and NGOs should come forward taking some campaigning programs.
- Create awareness program through special Information, Education and Communication Campaigns (IEC), regular home visits by family welfare visitors and family welfare assistants to promote contraceptive using among the respondent.
- Provide general plus reproductive education that would create more employment opportunities as well as for increasing the social status of women.
- Devise programs designed to overcome the resistance of husbands and in-laws.
- Improve the quality of care of reproductive health services and make them available at the door step.
- The government should take necessary programs to avoid unwanted pregnancies together with strictly forbidden abortion practices that may cause a mother premature death.

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