

Differentials in Place of Delivery and Delivery Assistance in Urban Slum areas, Bangladesh

Housne Ara Begum; M.Sc. PhD- Post Doc¹, Amir Mohammad Sayem; MPS²,
Nilufar Yeasmin Nili; M.D., MPS³

¹ Institute of Health Economics, University of Dhaka, Dhaka, Bangladesh

² Bangladesh Institute of Social Research (BISR), Dhaka, Bangladesh,

³ Officer on Special Duty (Medical Officer), Directorate General of Health Services, Mohakhali, Dhaka, Bangladesh

Received February 2012; Revised and accepted May 2012

Abstract

Objective: This study focused on the factors affecting the institutional delivery and delivery assisted by health professionals in urban slums.

Materials and methods: A semi-structured questionnaire was developed to collect information from women aged 15-49 who had at least one birth. Totally 540 eligible women were interviewed.

Results: The results showed that around 20% of women delivered at an institute while 32.8% were assisted by health professionals. Logistic regression showed that respondent's education, number of ANC received by women, receiving TT, male participation, autonomy, attitude towards maternal health care services and distance from home to clinic had significant impact on both institutional delivery and delivery assisted by health professionals whereas birth order of the last child and respondent's knowledge on maternal health care services had a significant effect only on institutional delivery.

Conclusion: It might be concluded that in order to further increase the institutional delivery and delivery assisted by health professionals consideration should be given on the above-mentioned socio-economic and demographic factors.

Keywords: Place of delivery, delivery assistance, determinants, slum areas, Bangladesh

Introduction

Promotion of maternal and child health has been one of the most important components of the Family Welfare Program of the Government of Bangladesh since its independence in late 1971. Also the National Population Policy-2004 reiterates the government's commitment to the safe motherhood program within the wider context of reproductive health. However, the maternal mortality ratio (3/1000 live births) in Bangladesh is one of the

highest in the world, despite the presence of relevant policy and programmatic initiatives. Moreover, the estimated lifetime risk of dying from pregnancy and child birth-related causes is about 100 times higher than that in developed countries (1). As a result, a significant portion of the babies born to these women are also likely to die within the first week of their life (2).

With respect to the reduction of high level of maternal mortality and morbidity, it has been widely identified in developing countries that better use of antenatal and delivery care would reduce the maternal as well as child mortality. Nevertheless, in Bangladesh, most of the deliveries usually take place at home where the majority of such deliveries are assisted by traditional

Correspondence:

Dr. Housne Ara Begum, Institute of Health Economics, University of Dhaka, Dhaka-1000, Bangladesh.

Tel: +88- 029014925

Email: drhousne@gmail.com

birth attendants who have no medical knowledge on delivery assistance. Data from Bangladesh Demographic and Health Survey revealed that at the national level, 85% of deliveries took place at home while 73.6% of deliveries were assisted by untrained providers (Traditional Birth Attendants or TBA and Relatives or Others). The area wise differences were also observed from Bangladesh Demographic and Health Survey, 2007 (3). The coverage of institutional delivery and delivery assistance by health professional were lower in rural areas where socio-economic status is lower than that of the urban areas. Such a scenario in urban slums is considered to be almost the same as that for the rural areas.

Studies found that women with lower socioeconomic status often do not avail the existing reproductive health care services, particularly delivery care services. Both socioeconomic and demographic factors, however, have been shown to have a particularly greater influence on the use of health care services (4- 8). Also, in studies of preventive and curative services it was often found that the use of health services is related to the availability, quality and cost of services, as well as social structure, health beliefs and personal characteristics of the users (9- 12). Thus, considering such issues an attempt has been made in this study to identify the socio-economic determinants of institutional delivery as well as delivery assistance from health professional. Specifically, The lower institutional delivery and assisted by health professional generates a very relevant query: what are the factors that affects women to utilize institutional as well as assistance from health professional in slum areas where poor socio-economic conditions prevail to a greater extent?

Conceptual Framework

Health- and treatment-seeking behavior models from social psychology, medical sociology and medical anthropology allow for considerable extension of the determinants of health service utilization. The most utilized models from social psychology are the Health Belief Model especially in public health while from medical sociology and medical anthropology the most known models for health service utilization are Socio-Behavioral Model and the Decision Making Model

respectively. All these health behavior models contain associations of variables which are considered relevant for explaining or predicting health-seeking behaviors. In this study, the socio-behavioral model, developed by Anderson, with some modifications was used as a conceptual guide. It should be noted that the socio-behavioral or Andersen model⁹ groups in a logic sequence three clusters or categories of factors (predisposing, enabling and need factors) which can influence health behavior (Figure 1). It should be noted that primarily this model was specifically developed to investigate the use of biomedical health services. The extended versions of this model included other health care sectors, i.e. traditional medicine and domestic treatments (13). An adaptation of the model had been proposed for studying health-seeking behavior for malaria (14).

The socio-behavioral model centers specifically on treatment selection including both material and structural factors that is barely taken into account in the social psychology models. The model has also been used for gaining evidence on the weight of different factors for health service use. This model includes different predisposing factors (age, gender, religion, global health assessment, prior experiences with illness, formal education, general attitudes towards health services, knowledge about the illness etc.) and enabling factors (availability of services, financial resources to purchase services, health insurance, social network support etc.). In addition to the predisposing factors and enabling factors, this model includes Need factors: perception of severity, total number of sick days for a reported illness, total number of days in bed, days missed from work or school, help from outside for caring etc.). Besides health service system factors, referring to the structure of the health care system and its link to a country's social and political macro-system are also included into this model. This is a valuable extension as it puts emphasis on the link of health-seeking behavior with structural levels within a macro-political and economic context.

Materials and methods

Study Area, Population and Data Collection

Three slums were identified using a cluster sampling

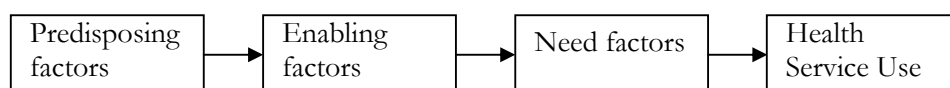


Figure 1. Conceptual framework of the study

for this study came from a randomly selected slum technique in which a cluster of slum areas in Dhaka city was randomly selected from 9 clusters. The data were from married women in their reproductive age (15-49 years) having at least one live birth on/before March 1, 2010 were recruited through a semi structured interview schedule that was developed phase by phase i.e., in the first stage a primary questionnaire was prepared which was later pretested on 20 women. Finally, including necessary insights from the pretest, the questionnaire was modified to apply in the data collection.

The data were collected with the assistance of 8 trained interviewers. The interviewers were trained so that they understood the questionnaire and performed the interview applying ethical issues. It should be noted that a verbal informed consent was taken from each subject before the interview after fully explaining the purpose and rationale of this study. On average, each interview took 20-30 minutes. The interview took place from 6th to 16th March, 2010.

Determination of Sample Size

The sample size (n) was calculated using the following standard formula assuming the total population size N being greater than 10,000.

$$n = \frac{z^2 pq}{e^2} X \quad d.e.$$

Here, p = Proportion of married women aged 15-29 who have at least one live birth = 0.45 (BDHS, 2007), q = 1-P, z = Standard normal deviation set at 1.96 corresponding to 95% confidence interval, e = Degree of accuracy desired = 5% and d.e. = Design effect = 1

With this formula the calculated sample size obtained was $383.78 \approx 384$. However, as an increase in sample size improves the representativeness, in total 600 eligible women were selected based on the available lists provided by the family planning assistants and/or visitors (FWAs/FWVs). But due to non-response and non-availability, 540 women could be successfully interviewed.

Measurements of Variables

In this study, place of delivery and delivery assistant during the last delivery were used as dependent variables. Institutional delivery coded as 1 and home delivery as 0 while delivery assisted by health professional (Qualified doctor/nurse/midwife/paramedic/FWV) was coded as 1 and delivery by traditional birth attendant (untrained traditional provider, relatives/friends/neighbor) as 0.

The independent variables were respondents' education, husband's monthly income, respondents' childhood residence, order of last birth, number of ANC (Ante natal care) visits, receiving TT, distance between home and clinic, respondents' knowledge on MHCS (maternal health care services), knowledge on pregnancy complications, male participation, autonomy of respondents and respondents' attitude towards maternal health care services. Among the independent variables- respondent's autonomy, attitude towards maternal health care services, knowledge on maternal health care services, knowledge on pregnancy complications and male participation were used as composite indices which were respectively measured by asking 8, 8, 10, 10 and 6 items and the cronbach's alpha found 0.7322, 0.7921, 0.7080, 0.7893 and 0.7525 respectively (Appendix). This suggests that the intercorrelations are strong enough to the items of each of the index variable as a single combined measure. All the information regarding these composite variables were later converted into scale scores by arithmetic transformation.

Data Processing and Analysis

The collected data were edited twice in order to check the accuracy and consistency of the data. Also the data were entered twice into the computer using SPSS 12 version for windows to check the accuracy further. The analyses were conducted at uni-variate, bivariate and multivariate levels. At univariate level, simply frequency was distributed in graphical form while at bivariate level, cross tabulation along with chi-square were considered. In order to test the study objective - to identify the factors affecting maternal health care service utilization - multivariate analysis was conducted. As both the dependent variables were dichotomous and independent variables were categorical, we considered using logistic regression. In this regard, the general logistic model used in this study can thus be expressed as:

$$\log_e \frac{p}{1-p} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots \dots \dots \beta_p X_p$$

Here, α =intercept, β =vector of unknown covariates, X=vector of covariates that affect the institutional delivery and delivery assisted by health professional and p= the end number of the series (15).

Results

Place of Delivery and Delivery Assistant

Non-institutional delivery was almost universal

among women in slum areas of Dhaka city (Figure 1). It appeared that 81.9% women delivered at home while 18.1% delivered at a service center. On the other hand, most of the women were likely to deliver at the presence of traditional birth attendants (TBA). Around two third of the women (67.6%) were reported to be delivered by TBA while deliveries conducted by health professions were around one third (32.4%).

Age Specific Place of Delivery and Delivery Assistant

Regarding all the age categories, women were more likely to deliver at home than an institution (table 1). With increasing age a decreasing pattern of both home and institutional delivery were observed, although women aged 15-19 were visibly different. Almost a similar pattern was observed in regard to delivery assistant, i.e., with an increasing age a decrease in delivery assistant regardless of both traditional assistant and health professional was observed.

Bi-variate Analysis

Although women were delivered mostly at home by traditional birth attendant, the significant variation in place of delivery and delivery assistant by different socio-economic, demographic and cultural factors were found (table 2). Women with no education were

significantly less likely to deliver at an institute than home; however, with increasing education i.e., women with primary and >primary education, the percentage of women gradually increased in the case of institutional delivery which was significant at $p<0.001$. Almost similarly, women with increased education were significantly ($p<0.001$) likely to be assisted by health professional. More or less, the similar significant association in both the cases was found by husband's monthly income, number of ANC visits, knowledge on MHCS, male participation and autonomy of respondents. Besides women who received TT injection during pregnancy and spent their childhood in urban areas, had positive attitude towards MHCS (Maternal Health Care Services).

Women with higher birth order were likely to deliver at home and delivery being assisted by traditional birth attendant; however, it was found statistically significant ($P<0.01$) only in regard to delivery assistant. Moreover, women with more distance from clinic were also likely to deliver at home and to be assisted by traditional birth attendant. Similarly, it was statistically significant only in regard to delivery assistant ($p<0.05$). On the other hand, women with no knowledge on pregnancy



Figure 2. Distribution of place of delivery and delivery assistant

Table 1: Distribution of place of delivery and delivery assistant by respondent's age at present

Respondent's Age at Present	Place of Delivery (%)		Delivery Assistant (%)	
	Home	Institute (%)	Traditional Provider (%)	Health Professional (%)
15-19	5.2	1.1	3.5	2.8
20-24	20.6	3.7	14.3	10.0
25-29	17.4	3.9	11.7	9.6
30-34	12.4	1.7	10.7	3.3
35-39	13.3	2.0	11.5	3.9
40-44	9.4	1.5	8.3	2.6
45-49	6.9	.9	6.9	.9

complications were likely to deliver at home and to be assisted by traditional providers. However, it was statistically significant only with place of delivery ($p < 0.05$).

Logistic Regression Analysis

With logistic regression analysis all the variables were not found to have significant influence. Some of the independent variables had significant impact on both institutional delivery and health professional delivery assistants. For example, women with primary and greater than primary education were significantly more likely to deliver at institute (OR=3.361 and 5.784 respectively) and to deliver by health professional (OR=2.362 and 6.479 respectively) compared to women with no education (Table 3). Women who received 1-2 and 3+ANC visits were significantly more likely (OR=2.478 and 3.048 respectively) than that of women with no and 3+ ANC visits to deliver at institute while women with 3+ visits were significantly more likely to receive support from health professional as delivery assistant. Women who received TT injection during their last pregnancy and had positive attitude towards maternal health care services had a significantly higher probability of delivering at an institute and of being delivered by a health professional. Women with male participation also had a significantly higher probability than women with no male participation in delivering at institute (OR for low=3.574, OR for medium=6.078 and OR for high male participation=6.128) and in being assisted by health professional (OR high male participation=3.795). An almost similar impact was found in the case of respondents' autonomy.

Some of the independent variables were found to have a significant impact on institutional delivery while some on delivery assisted by health professional. The order of last birth was found to have significant influence only on institutional delivery. Women with higher birth order (2-3, 4-5 and >5) were significantly more likely to deliver at an institute (OR=2.818, 2.828 and 7.281 respectively) but no significant impact was found for delivery assistants. Similarly, women's high level of knowledge on maternal health care services was found to have a significant influence only on institutional delivery (OR=4.527). On the other hand, women whose home is >4 kilometer apart from health clinic were significantly less likely (OR=0.336) to be assisted by health professional compared to women who were one kilometer apart

from clinic. Other variables used in the multivariate analysis had significant impact neither on institutional delivery nor on delivery assistant.

Discussion

A higher percentage of institutional delivery was observed in the study area than that of the national level; however, it was lower than that of the urban areas. The figure regarding the delivery assistance was also found to be higher. Delivery assisted by health professionals was also found to be higher in the urban areas compare to rural (16). This study aimed at identifying the factors affecting utilization of delivery services based on the framework of Health Service Utilization Model developed by Anderson and Newman (9). The findings of this study suggests that different predisposing, enabling and need factors explained the institutional delivery and delivery assisted by health professionals' among slum dwelling women in Dhaka city. For example, women's education as predisposing factor had significant impact on delivery service utilization. Women with primary and >primary education were more likely to deliver at an institute and at the same time to be assisted by health professionals than women with no education. Almost similar findings were also found in another study conducted in India (17). This is explained by the fact that educated mothers have more confidence in handling the officials and have the ability and willingness to travel outside the home to seek services (18, 19). However, contrary findings were also found in delivery assistant in Bangladesh and Thailand (20, 21).

Usually women who are pregnant with their first child are more likely to have difficulties during labor and delivery than women with a higher parity. This may result in low parity women being more motivated to deliver in medical facilities than high parity women. With respect to the effect of parity on the utilization of delivery care, the results appear that women are significantly more likely to use delivery care services for their first child than later children (22- 28). However, contrary to it, in this study women with higher parity were more likely to deliver at an institute than home.

Women receiving ANC were more likely to deliver at institute and to be assisted by health professional during delivery than that of women with no ANC uptake. It has been argued that receiving antenatal care influences women to have an institutional delivery with a trained attendant at birth

Table 2. Bi-variate associations of institutional delivery and delivery assisted by health professional by some independent variables

Variables		n	Place of Delivery		Chi-Square	Assistant during Delivery		Chi-Square
			Institute %	Home %		Health Professional	Traditional Provider	
Respondents education	No	266	10.2	89.8	51.643***	16.9	83.1	73.208***
	Primary	192	17.7	82.3		40.1	59.9	
	Primary+	82	45.1	54.9		64.6	35.4	
Husband's monthly income	≤3000	84	9.5	90.5	9.324**	27.4	72.6	9.784**
	3001-6000	373	18.0	82.0		30.3	69.7	
	>6000	83	27.7	72.3		47.0	53.0	
Birth origin of respondents	Rural	470	15.1	84.9	22.583***	29.1	70.9	17.574***
	Urban	70	38.6	61.4		54.3	45.7	
	1	157	16.6	83.4		39.5	60.5	
Order of last birth	2-3	140	18.6	81.4	2.655	32.1	67.9	11.461**
	4-5	119	15.1	84.9		35.3	64.7	
	>5	124	22.6	77.4		21.0	79.0	
Number of ANC visits	1	209	7.7	92.3	37.347***	19.1	80.9	41.490***
	1-2	83	12.0	88.0		24.1	75.9	
	≥3	248	29.0	71.0		46.4	53.6	
Receive of TT	No	108	3.7	96.3	18.962***	6.5	93.5	41.425***
	Yes	432	21.8	78.2		38.9	61.1	
	No	24	4.2	95.8		8.3	91.7	
Knowledge on MHCS	Low	119	7.6	92.4	24.037***	21.8	78.2	17.018**
	Medium	314	19.4	80.6		36.0	64.0	
	High	83	32.5	67.5		41.0	59.0	
Knowledge on pregnancy complications	Low	52	9.6	90.4	7.739*	32.7	67.3	1.399
	Medium	368	16.8	83.2		31.0	69.0	
	High	120	25.8	74.2		36.7	63.3	
Male participation	No	40	10.0	90.0	81.476***	42.5	57.5	68.288***
	Low	244	7.8	92.2		15.6	84.4	
	Medium	145	15.9	84.1		38.6	61.4	
Participant's autonomy	High	111	46.8	53.2		57.7	42.3	
	No	397	16.1	83.9	37.834***	25.9	74.1	45.435***
	Low	98	13.3	86.7		39.8	60.2	
	Medium	28	32.1	67.9		67.9	32.1	
Attitude towards MHCS	High	17	70.6	29.4		82.4	17.6	
	Negative	426	13.8	86.2	25.099***	27.7	72.3	20.418***
	Positive	114	34.2	65.8		50.0	50.0	
Distance between home and clinic	1	462	18.2	81.8	0.141	34.4	65.6	6.731*
	2-3	30	20.0	80.0		26.7	73.3	
	≥4	48	16.7	83.3		16.7	83.3	

† * $P \leq <0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$ (2-tailed)

Though conflicting results were observed by several studies; however, similar results were also found with uptake of ANC and health facility delivery in India and in other developing countries (29- 31). Furthermore, similar to receiving ANC, women who received TT vaccination were more likely to deliver at home and be assisted by health professional during delivery.

As expected, women with higher level knowledge on maternal health care services were significantly

more likely to deliver at an institute than women with no knowledge; however, it had no significant impact on delivery assisted by health professional. The institutional delivery by knowledgeable women may be due to the fact that they are more conscious about the dangerous consequences of home delivery with unhygienic environment.

Women with low, medium and high male participation had significant impact on institutional

Table 3. Logistic regression of institutional delivery and delivery assisted by health professional

Variables		Institutional Delivery			Delivery Assisted by health Profession		
		B	Std. Error	Odds Ratio	B	Std. Error	Odds Ratio
Respondents' education	No Education R			1.000			1.000
	Primary	1.212	0.382	3.361**	0.859	0.359	2.362*
	>Primary	1.755	0.420	5.784***	1.869	0.339	6.479***
Husband's monthly income	<3000 R			1.000			1.000
	3000-5999	0.256	0.564	1.292	0.399	0.428	1.490
	>6000	0.004	0.395	1.004	0.516	0.324	1.676
Birth origin of respondents	Rural R			1.000			1.000
	Urban	0.515	0.415	1.673	0.270	0.364	1.309
	1 R			1.000			1.000
Order of last birth	2-3	1.036	0.492	2.818*	-0.209	0.387	0.812
	4-5	1.040	0.456	2.828*	-0.330	0.370	0.719
	>5	1.985	0.436	7.281***	-0.667	0.379	0.513
Number of ANC visits	0 R			1.000			1.000
	1-2	0.908	0.404	2.478*	0.356	0.291	1.428
	≥ 3	1.114	0.462	3.048**	0.891	0.348	2.438*
TT receive or not	No R			1.000			1.000
	Yes	1.224	0.600	3.401*	1.500	0.462	4.480**
Knowledge on MHCS	No R			1.000			1.000
	Low	1.156	1.145	3.178	1.285	0.876	3.613
	Medium	0.671	0.387	1.956	0.911	0.406	2.487
Knowledge on pregnancy complications	High	1.510	0.526	4.527**	0.322	0.336	1.380
	Low R			1.000			1.000
	Medium	0.560	0.644	1.750	-0.539	0.458	0.584
Male participation	High	-0.171	0.379	0.843	-0.299	0.309	0.742
	No R			1.000			1.000
	Low	1.274	0.644	3.574**	0.181	0.453	1.199
Respondent's autonomy	Medium	1.805	0.384	6.078***	1.334	0.327	1.519
	High	1.813	0.383	6.128**	0.418	0.333	3.795***
	NoR			1.000			1.000
Respondent's attitude towards MHCS	Low	1.377	0.699	3.962	0.864	0.755	2.374
	Medium	1.451	0.728	4.266*	1.221	0.762	3.391
	High	2.095	0.850	8.129**	1.819	0.868	6.168*
Distance between home and clinic	Negative R			1.000			1.000
	Positive	1.228	0.369	3.413**	0.689	0.305	1.991*
	1 KMR			1.000			1.000
Constant	2-3 KM	0.228	0.554	1.256	-1.092	0.768	0.353
	≥ 4 KM	-0.537	0.809	.584	-1.041	0.509	0.336*
	Constant	-6.077	1.126	.002***	-3.101	1.003	0.045

2-Log likelihood= 330.544

R= Reference Category

† * P ≤ <0.05; ** p ≤ 0.01; *** p ≤ 0.001

delivery while women with higher male participation had significant effect on delivery assisted by health professional. When husbands participate in maternal health care services it is seen that women usually get more family support. Moreover, husband who participates in maternal health care services are more conscious about the health need and liberal in spending money on health matters when needed.

Autonomy of women does not come alone; rather it represents higher level of education, capacity of making decision, freedom to spend money and able to

convince other family members including husband in the case of family needs including health care service uptake. As expected, we found that women with higher level of autonomy had a significant effect respectively on institutional delivery and delivery assisted by health professional. Similarly, women's positive attitude had also significant impact on both institutional delivery and delivery assisted by health professional. This may be because women with positive attitude are likely to behave positively and hence are more likely to utilize health care services.

Unexpectedly, women whose households were at >4 km distance from home to clinic were more likely to be assisted by health professional during delivery than that of women whose households were at 1km distance. Most probably this was due to the fact that women at distant places were more aware of their health problems earlier, as they lacked the health facility near to their home, they may have alternatively depended on professional health service providers in order to have a better pregnancy outcome.

Acknowledgement

The authors acknowledge to those mothers who participated in this research.

References

1. National Institute of Population Research and Training (NIPORT). ORC Macro, John Hopkins University, ICDDR, B *Bangladesh maternal health services and mortality survey 2001*. Dhaka and Calverton, 2003.
2. World Health Organization. Skilled birth attendance: review of evidences in Bangladesh. Dhaka: WHO Country Office Bangladesh 2004 .
3. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. 2009. *Bangladesh Demographic and Health Survey 2007*. Dhaka, Bangladesh and Calverton, Maryland, USA: National Institute of Population Research and Training, Mitra and Associates, and Macro International.
4. Bhatia J, Cleland J. Determinant of material care in a region of South Asia. *Health Transition Review* 1995;5: 127-42.
5. Kavitha N , Audinarayana N. Utilization and determinants of selected MCH care services in rural areas of Tamil Nadu. *Health Population Perspective Issues* 1997; 20: 112-25.
6. Nuwaha F , Amooti-kaguna B. Predictors of home deliveries in Rakai District, Uganda. *African Journal of J Reproductive Health* 1993; 3:79-86.
7. Stephenson R, Tsui AO. Contextual influences on reproductive health service use in Uttar Pradesh, India. *Studies in Family Planning* 2002;33: 309-20.
8. Magadi MK, Madise NJ, Rodrigues RN. Frequency and timing of antenatal care in Kenya: Explaining the variations between women of different communities. *Social Science and Medicine* 2005; 51: 551-61.
9. Andersen RM , Newman JF. Social and individual determinants of medical care utilization in the United States. *Milbank Memorial Quarterly* 1973 :51:95–124.
10. Kroeger A. Anthropological and socio-medical health care research in developing countries. *Social Science and Medicine* 1983; 17: 147–161.
11. Becker S, Peters DH, Gray RH, Gultiano C, Black RE. The determinants of use of maternal and child health services in Metro Cebu, the Philippines. *Health Transition Review* 1993;3: 77–89.
12. Sarin AR. Underutilization of maternal health services. *World Health Forum* 1997;18: 67–68.
13. Weller SC, Ruebush II TR, Klein RE. Predicting treatment-seeking behaviour in Guatemala: A comparison of the Health Services research and Decision-Theoretic approaches. *Medical Anthropology Quarterly* 1997; 11: 224-45.
14. Raayajin O. Factors affecting malaria related behaviour: A literature review of behavioural theories and relevant research, in *Social and Economic Aspects of Malaria Control*. Sommani S, Fungladda W. eds. Bangkok: MRC-TROPED, 1991.
15. Afifi AA. Computer aided multivariate analysis: variable selection in regression analysis. Third edition. Champion and Hall/CRC, Boca Raton London, Newyork, Washington, D.C. 1996: 166-196.
16. National Institute of Population Research and Training (NIPORT), Mitra Associates, Measures, D.H.S. *Bangladesh Demographic and Health Survey*, Ministry of Health and Family Welfare, Macro International, Calverton, Maryland, USA, preliminary report 2007.
17. Navaneetham K, Dharmalingam A. Utilization of maternal health care services in Southern India. *Social Science and Medicine* 2002; 55: 1849–69.
18. Caldwell JC, Reddy PH , Caldwell P. The social component of mortality decline: An investigation in south India-employing alternative methodologies. *Population Studies* 1983;37: 185- 205.
19. Cleland J, Van Ginneken J. Maternal education and child survival in developing countries: the search for pathways of influence. *Social Science and Medicine* 1988;27: 1357-68.
20. Raghupathy S. Education and the use of maternal health care in Thailand. *Social Science and Medicine* 1996;43: 459-71.
21. Dharmalingam A, Hussain TM , Smith JF. Women's Education, Autonomy and Utilization of Reproductive Health Services in Bangladesh, In A.I.Mundigo (Ed.), *Reproductive Health: Programme and Policy Changes Post-Cairo*. Liege, Belgium: International Union for the Scientific Study of Population (IUSSP) 1999.
22. Wong EL, Popkin BM., Gullkey DK , Akin JS. Accessibility quality of care and prenatal care use in the Philippines. *Social Science and Medicine* 1987;24: 927–44.
23. Leslie J , Gupta GR. *Utilization of formal services for maternal nutrition and health care*. Washington, D.C: International Center for Research on Women, 1989.
24. Adekunle C, Filippi V, Graham W, Onyemunwa P , Udjo E. Patterns of maternity care among women in

- Ondo States, Nigeria. In *Determinants of health and mortality in Africa*, ed. Allan G. Hill, Demographic and Health Survey Further Analysis Series. New York: The Population Council 1990; 10:1-45.
25. Stewart K , Sommerfelt AE. *Utilization of maternity care services: A comparative study using DHS data*. Proceedings of the Demographic and Health Surveys World Conference, Washington, DC.1991; Volume III: 1645-68. 1991, Columbia, Maryland.
 26. Elo TI. Utilization of maternal health-care services in Peru: the role of women's education. *Health Transition Review*, 1992;2: 49-69.
 27. Akin A , Munevver B. Contraception, abortion and maternal health services in Turkey: Results of further analysis of the 1993 Turkish Demographic and Health Survey. Calverton, Maryland: Ministry of Health [Turkey] and Macro International Inc. 1996.
 28. Celik Y, Hotchkiss DR. The socio-economic determinants of maternal health care utilization in Turkey. *Social Science and Medicine* 2000;50: 1797-1806.
 29. Kwast BE , Liff JM. Factors associated with maternal mortality in Addis Ababa, Ethiopia. *International Journal of Epidemiology*, 1988;17: 115-21.
 30. Bloom SS, Lippeveld T , Wypij D. Does antenatal care make a difference to safe delivery? A study in urban Uttar Pradesh, India. *Health Policy and Planning* 1991;14: 38-48.
 31. Dujardin B, Clarysse G, Criel B, Brouwere VDe , Wangata N. The strategy of risk approach in antenatal care: evaluation of the reference compliance. *Social Science and Medicine* 1995;40: 529-35.

Appendix: Distribution of respondents' knowledge on maternal health care services and pregnancy complications, respondents' autonomy, attitude towards maternal health care services and male participation in maternity care

	Variables	n	%
Knowledge on maternal health care servicesa	At least 3 ANC visits are required during pregnancy	341	68.2
	If not taken in earlier pregnancy, 2 TT injections are required	332	66.4
	If taken in earlier pregnancy, 1 TT injection(s) are required	356	71.2
	At normal home delivery, medically trained provider is required	311	62.2
	Complicated delivery should be taken place at institute	281	56.2
	Assistance by trained personnel is necessary during delivery	285	57.0
	Within 4 months since conception, a woman needs to take first visit	298	59.6
	Within 6 months since conception, a woman needs to take 2nd visit	271	54.2
	Within 7 months since conception, a woman needs third visit	309	61.8
	At least one post natal checkup is necessity after birth	321	64.2
Croanbach's alpha= .7080			
Knowledge on pregnancy complicationsa	Excessive bleeding requires emergency obtetric care	331	66.2
	If baby's hand comes first, it requires emergency care	322	64.4
	Convulsion is dangerous that may cause death to mother, if not treated timely	333	66.6
	A healty looking woman may die if not treated properly	304	60.8
	It is possible that every woman may develop pregnancy complications	295	59.0
	Obstructed labor sometimes cause death to mother	296	59.2
	Blurry vision may cause death to mother, if not treated	287	57.4
	A woman must be taken to clinic as soon as the danger signs are identified	278	55.6
	Mother of less than 20 years of age is higher risk at dying due to pregnancy	308	61.6
	Woman with prolong labor must be taken to clinic or else she may die	329	65.8
Cronbach's alpha= .7893			
Respondents' autonomyb	Did you decide of child bearing?	132	26.4
	Did you decide whether to receive ANC services?	125	25.0
	Did you decide whether to receive TT injection?	136	27.2
	Did you decide where the delivery should take place?	103	20.6
	Did you decide whether to receive care services from trained personnel?	98	19.6
	Did you decide whether or not to receive PNC checkup?	92	18.4
	Whether or not you can buy medicine alone?	81	16.2
	Did you decide to spend money in receiving ANC, Delivery and PNC services	79	15.8
	Did you decide whether or not to avoid heavy works during pregnancy	102	20.4
Cronbach's alpha= .7322			
Attitude towards maternal health carec	TT injection is necessary for the betterment of both mother and child	262	52.4
	To reduce the risk of maternal death ANC is effective	275	55.0
	T reduce the risk of dying delivery by trained birth attendant is crucial	166	33.2
	Uptake of PNC is good for both mother and child	373	74.6
	It is unhygienic to deliver by traditional birth attendant	198	39.6
	Home delivery is unhygienic without assistance from health professional	167	33.4
	Every women should uptake ANC	281	56.2
	Every women should have knowledge in pregnancy complications	315	63.0
Cronbach's alpha= .7921			
Male participationb	Did your husband discuss with you about pregnancy complication during your last pregnancy?	162	30.0
	Did your husband discuss with you about the necessity of maternity care during your last pregnancy?	135	25.0
	Did your husband help you in making decision to seek care during your last pregnancy?	216	40.0
	Did your husband help you financially to receive care during your last pregnancy?	351	65.0
	Did your husband accompany you to clinic during your last pregnancy?	297	55.0
	Did your husband help your heavy works during your last pregnancy?	162	32.0
Cronbach's alpha= .7525			