Maternal Socio-demographic Factors and Nutritional Status as Predictors of Caesarean Delivery at Hospitals in Rajshahi City, Bangladesh

Farhana Hasan, Md. Sabiruzzaman, Chironjib Kumar Joardar & Md. Golam Hossain

Department of Statistics, University of Rajshahi, Rajshahi-6205, Bangladesh

ABSTRACT

Introduction: A caesarean delivery is a major surgery with risks of severe bleeding, scarring, infections, reactions to anesthesia and long-lasting pain. The aim of the study was to determine the predictors of caesarean delivery at hospitals in Rajshahi city, Bangladesh. **Method:** Data was collected from 194 women who delivered at three private and one public hospital maternity wards in Rajshahi city between January and March 2013. A questionnaire was used to collect socio-demographic background of the mothers. Body mass index was computed to determine overweight and underweight status of the women. **Results:** The prevalence of caesarean delivery at the hospitals studied was 77.3%. Socio-demographic factors and nutrition status that were significantly associated with the type of birth delivery were considered as independent variables in a logistic regression model. Multiple logistic regression analysis showed that older women (age ≥ 25 year) were more likely to undergo caesarean delivery than younger women. Women with higher education were more likely to have caesarean delivery as compared to women without formal schooling. Overweight women had a higher likelihood of caesarean delivery than women with normal weight and underweight. **Conclusion:** The study recorded a high prevalence of caesarean deliveries at the hospitals in Rajshahi city. Age, educational level and BMI status of the women were associated with caesarian deliveries.

Key words: Caesarean delivery, hospital, multiple logistic regression, nutritional status, Rajshahi city

INTRODUCTION

The prevalence of vaginal delivery has declined because of the development of caesarean section (C-section) (Clark & Taffeles, 1997). C-section delivery reduces the risk of foetal death in breech presentations and the risk of intra-partum foetal death in cephalic presentations. On the other hand, C-sections increase the risk of severe maternal and neonatal morbidity and mortality in cephalic presentations. The Global Survey on Maternal and Perinatal Health (WHO, 2009) found that risks for adverse short-term maternal outcomes (death, intensive care unit admission, blood transfusion and hysterectomy) increased among women undergoing C-sections without medical indication in America, Africa and Asia (Souza *et al.*, 2010).

Increasing C-section rates have been reported in several South Asian countries over the past decade. In Bangladesh, rates rose from 2% to 17%; in India, from 3% to 11%; and in Nepal, from 1% to 5% (NIPORT, 2013; IIPS 2007; MOHP, 2012). The World Health Organization suggests that C-section rates should not exceed 15% in a particular country, but it has increased

---

Correspondence: Md. Golam Hossain; Email: *hossain95@yahoo.com*

worldwide in the last three decades (WHO, 2009). The rate is about 22% in USA, 25% in Brazil, 27% in Chili and about 17-40% in 19 countries in Latin America (Hopkins, 2000). A recent analysis of Demographic and Health Survey (DHS) data in 26 South Asian and sub-Saharan African countries found that the rates of caesarean deliveries were highest among the 'urban rich' in all countries, and lowest among the 'rural poor' (Betrán *et al.*, 2007). World-wide, less than 5% of women in the poorest wealth quintile delivered by caesarean (Cavallaro *et al.*, 2013).

In Bangladesh prior to 1970, C-section was an uncommon procedure, but in the last two decades it has been increasing rapidly. Based on Bangladesh Demographic Health Survey (BDHS), during the period 2003-2004, the C-section rate was only 3.5%, but the rate at BDHS-2007 was 7.5%, while according to the BDHS-2011, in the three years preceding the survey, 17.1% of live births were delivered by C-section (NIPORT, 2013). C-section delivery has become more common in Bangladesh among women who give birth at a hospital or clinic (Ravindran, 2008). Delivery by caesarean section in Bangladesh was highest among births to mothers who completed secondary education (49%), highest wealth quintile (41%), living in urban areas (29%), and first births (24%) (NIPORT, 2013).

Lack of knowledge on caesarean delivery and misinformation about natural childbirths are important reasons for women choosing delivery by caesarean section (Arjmandi & Farzin, 2005). On the other hand, maternal satisfaction from previous childbirth experience has a high impact on the type of delivery. Also, studies showed that fear, anxiety and pain have an important role in the choice of delivery type (Monar *et al.*, 2008). The increase in caesarean deliveries has been attributed to multiple factors ranging from maternal, socio-demographic and institutional factors. Caesarean delivery

rates are known to vary widely among different population groups, with known risk factors that include maternal age (Kun *et al.*, 2013), baby weight (Onwude, Rao & Selo, 2005), place of residence, socio-economic status, high levels of maternal education (Tatar *et al.*, 2000), previous C-section (Lynch, Kearney & Turne, 2002), obstetric complications (Joshua *et al.*, 2004), maternal request (refers to a primary caesarean delivery performed because the mother requests this method of delivery in the absence of conventional medical or obstetrical indications) (Druzin & El-Sayed 2006), high income level (Tatar *et al.*, 2000), and physicians' choices especially within private hospitals (Parkhurst & Rahman, 2007). A large number of studies have stressed that as the age of a mother increases, so does the likelihood of caesarean birth (Kassak, Mohammad & Abdallah, 2009). Age at marriage is also a significant cause of caesarean birth rates in the developing countries (Rahman *et al.*, 2012). A previous study presented the most recent estimate of C-section deliveries in the northern region of Bangladesh and examined the association of reported complications around delivery as well as socio-demographic and relevant characteristics of women with C-section using data from a sample survey (Rahman *et al.*, 2014).

Women who can afford the hospital charges tend to prefer delivering in the hospital for perceived good nursing and care by specialist doctors. This study aims to investigate the prevalence and associated factors of caesarean deliveries at hospitals in Rajshahi City, Bangladesh. Rajshahi City is one of the big cities in Bangladesh with a population of 4.49 million (BBS, 2011).

METHODS

A cross sectional study was conducted where the data were collected by direct interviews using a pre-tested

questionnaire. Most of the questions were close-ended and the answers chosen by the respondents were indicated by tick marks. All interviews were conducted within 24 to 48 hours of delivery. Three private and one public hospital were selected randomly from a list of 19 private and 3 public hospitals located in Rajshahi.

Based on Rahman *et al.* (2012), 80% power and 5% level of significance, a minimal number of birth deliveries needed for the study was computed as 190. This included both caesarean and non-caesarean deliveries. The participants were selected by convenience sampling. A total of 215 women after delivery were contacted for the study, 21 of them did not agree to give their information. A final sample of 194 women who had either caesarean or non-caesarean delivery from the selected hospitals was recruited. Data was collected from January 2013 to March 2013 by one of the co-authors.

Outcome variable
The outcome variable in the present study was dichotomous variable, cesarean delivery, (i) Yes or (ii) No. This variable was measured by a question to participants; did you deliver by caesarean?

Selected predictors
The socio-demographic factors studied include age, education, family income, body mass index, previous C-section, residence, age at first marriage.

Webster *et al* (1992) suggested that women with medical complications near delivery are more likely to undergo C-section in order to improve their survival prospects as well as their newborns. Therefore, maternal factors (clinical) were considered as risk factors in the present study which includes previous C-section, swollen leg, breathing difficulty, child aborted around delivery time, birth control process, mother's height, weight and food habits. Previous works also suggested that a thorough understanding of decisions

to perform C-section should recognise many non-medical factors as playing an important part in such decisions. In order to investigate the non-medical determinants of C-section, a set of socio-demographic factors such as maternal age at birth, age at marriage, birth order, mother's educational level, mother's occupation, and family income was identified. Padmadas *et al.* (2000) have also found that there is a strong association between C-section and place of residence. Moreover, height and weight were measured for each women, and body mass index (BMI) was derived from weight and height, using the formula:

$$BMI = \frac{Weight\ in\ kg}{(Height\ in\ meter)^2}$$

BMI was considered an indirect measure of nutritional status. In this study BMI was classified into four classes according to body size and these were underweight (under nutrition) (BMI≤18.5 kg/m²), normal weight (healthy) (18.5 < BMI <25 kg/m²), overweight (over nutrition) 25≤BMI < 30 kg/m²) and obese (BMI≥30 kg/m²) (Flegal *et al.*, 2005).

Ethics approval
Permission for conducting the study on patients who had delivered was obtained from the selected hospitals. The rules and regulations of the ethics committee of the Rajshahi Medical College, Rajshahi University, Bangladesh were adhered to. Written consent forms were collected from each participant after a detailed oral explanation about the study.

Statistical analyses
Chi-square (χ^2) –test was performed in this study to determine the association between delivery systems and socio-economic, demographic and nutritional factors. Actually, χ^2 –test was used in this study for selecting the independent variables for the multiple logistic regression model. Multiple logistic regression analysis was

utilised to determine the effect of socio-economic, demographic and nutritional factors on cesarean deliveries among women who delivered at hospitals.

The underlying multiple logistic regression model was:

$$\text{Log}\left[\frac{p}{1-p}\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9$$

$$= \beta_0 + \sum_{i=1}^{9} \beta_i X_i$$

where

p = probability of caesarean delivery (coded 1)

$1-p$ = probability of non caesarean delivery (coded o)

X_1 = residence (Rural coded 1 and Urban coded 2)

X_2 = mother's education (Primary coded 1; Secondary coded 2 and higher coded 3)

X_3 = age group (15≤Age<20 years coded 1; 20<Age<25 years coded 2 and Age ≥25 years coded 3)

X_4 = age at first marriage (10≤Age<15 years coded 1; 15<Age<20 years coded 2 and Age ≥20 years coded 3)

X_5 = food habits (Did you take additional nutritious food during pregnancy?) No coded 1, and Yes coded 2)

X_6 = birth control practice (Did you ever use contraceptive method? Yes coded 1 and No coded 0)

X_7 = family income (per month) (<12000 Taka coded 1 and ≥12000 Taka coded 2)

X_8 = BMI (kg/m²) (Underweight coded 1; Normal weight coded 2 and Overweight coded 3)

X_9 = previous C-section (Yes coded 1 and No coded 0)

β_0 = intercept term

β_i = coefficient of independent variables (i= 1,2,3,...,9).

The parameter β_i refers to the effect of X_i on the log odds such that Y=1, controlling the other X_i. Results of the logistic regression analysis were presented as odds ratio (OR) with 95% confidence interval (C.I.) with significance level p □ 0.05. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version IBM 20.

RESULTS

A total of 194 women who delivered at the selected hospitals in Rajshahi city between January-March 2013 was studied. Their age ranged from 17 to 34 years (average 23.9±3.8 years). The prevalence of caesarean among the participants was 77.3%. Out of 16 variables considered, 9 were significantly associated with the type of delivery. These variables were age, residence, education level, age at first marriage, family income, having taken additional nutritious food during pregnancy, practised birth control, had previous C-section and body mass index (BMI) (Table 1).

Multiple logistic regression analysis demonstrated that the older women (age ≥25 years) were more likely to deliver by caesarean compared to women aged 15-25 years (OR=0.050, 95% CI: 0.010-0.248; p<0.01) and 20-25 years (OR=0.140, 95% CI: 0.041-0.479; p<0.01). Women having higher education had a higher likelihood of having a caesarean delivery compared to those who had primary education (OR=0.192, 95% CI: 0.045-0.818; p<0.05). Women who did not practise birth control had a higher chance of having a caesarean delivery than their counterparts (OR=0.229, 95% CI: 0.076-0.687; p<0.05). Overweight women were more likely to undergo caesarean delivery compared to women of normal weight (OR=0.048, 95% CI: 0.013-0.176; p<0.01) and who were underweight (OR=0.021, 95% CI: 0.002-0.196; p<0.01). Women who had previous C-sections were also more likely to have a caesarian delivery (OR=0.008, 95% CI: 0.023-0.414; p< 0.01).

These results indicated that maternal age, education, birth control practice,

Table 1. Association between maternal, socio-economic and demographic factors by type of delivery (N=194)

Selected variables	Total n=194 44(22.7)	Birth Process Non caesarian 150 (77.3)	Caesarian	χ^2-value	p-value
Age group					
15-20	31(16.0)	12(38.7)	19(61.3)	12.057	0.002
20-25	77(39.7)	22(28.6)	55(71.4)		
25+	86(44.3)	10(11.6)	76(88.4)		
Residence					
Urban	107(55.2)	30(28.0)	77(72.0)	3.904	0.035
Rural	87(44.8)	14(16.1)	73(83.9)		
Educational qualification					
Primary	51(26.3)	19(37.3)	32(62.7)	8.381	0.015
Secondary	69(35.6)	12(17.4)	57(82.6)		
Higher Secondary	74(38.1)	13(17.6)	61(82.4)		
Occupation					
Housewife	129(66.5)	30(23.3)	99(76.7)	1.301	0.729
Service	26(13.4)	4(15.4)	22(84.6)		
Students	26(13.4)	6(23.1)	20(76.9)		
others	13(6.7)	4(30.8)	9(69.2)		
Husband's occupation					
Service	67(34.5)	11(16.4)	56(83.6)	2.826	0.419
Agriculture	51(26.3)	13(25.5)	38(74.5)		
Business	61(31.4)	15(74.6)	46(75.4)		
Others	15(7.7)	5(33.3)	10(66.7)		
Age at marriage					
10-15	15(7.7)	8(53.3)	7(46.7)	9.030	0.011
15-20	150(77.3)	29(19.3)	121(80.7)		
20+	29(14.9)	7(24.1)	22(75.9)		
Family Income					
<12000	127(65.5)	34(26.8)	93(73.2)	3.510	0.043
12000+	67(34.5)	10(14.9)	57(85.1)		
Did you take additional nutritious food during pregnancy?					
No	82(42.3)	11(13.4)	71(86.6)	6.594	0.006
Yes	112(57.7)	33(29.5)	79(70.5)		
Did you ever use contraceptive method?					
Yes	131(67.5)	36(27.5)	95(72.5)	5.301	0.015
No	63(32.5)	8(12.7)	55(87.3)		
Previous C-section					
Yes	54(27.8)	2(3.7)	52(96.3)	15.366	0.0001
No	140(72.2)	42(30.0)	98(70)		
Pregnancy induced swollen leg					
Yes	117(60.3)	25(21.4)	92(78.6)	0.290	0.356
No	77(39.7)	19(24.7)	58(75.3)		

Table 1. Continued

Selected variables	Total n=194 44(22.7)	Birth Process Non caesarian 150 (77.3)	Caesarian	χ^2-value	p-value
Child abortion					
Yes	55(28.4)	10(18.2)	45(81.8)	0.886	0.229
No	139(71.6)	34(24.5)	105(75.5)		
Child death in pregnancy					
Yes	60(30.9)	11(18.3)	49(81.7)	0.936	0.219
No	134(69.1)	33(24.6)	101(75.4)		
Multiple birth					
Yes	21(10.8)	7(33.3)	14(66.7)	1.524	0.168
No	173(89.2)	37(21.4)	136(78.6)		
Birth order					
0-2	146(75.3)	32(21.9)	114(78.1)	0.197	0.396
2+	48(24.7)	12(25)	36(75)		
BMI					
Under weight	12(6.2)	4(33.3)	8(66.7)	18.004	0.0001
Normal	97(50.0)	33(34.0)	64(66.0)		
Over weight	85(43.8)	7(8.2)	78(91.8)		

nutritional status (BMI) and previous C-section were significant factors influencing women towards a caesarean delivery.

DISCUSSION

The prevalence of caesarean delivery in selected private and public hospitals in Rajshahi city was 77.3%. Rising caesarian delivery rates in cities in Bangladesh, especially among middle class families who are social security users has been of concern among healthcare professionals. The reasons for mothers preferring a C-section delivery include fear of childbirth pain, the perception that C-sections are safe, and that the caesarean delivery takes a much shorter time compared to a vaginal delivery. There is also the perception of financial motives of doctors in encouraging mothers to deliver by C-section. The rate of caesarean delivery in private hospitals is generally higher than in public hospitals (Sufang et al., 2007).

Logistic regression analysis showed that maternal age, birth control practice, and nutritional status (BMI) were important determinants of delivery by C-section. Padmadas et al., 2000 also reported a similar finding on maternal education and increased likelihood of caesarian delivery among women in Kerala, India, while Kassak et al., 2009 also established that age of mother was closely related to having C-section delivery. Nassar & Sullivan (2001) suggested that age and parity (order of birth) accounted for most demographic changes due to a high caesarean rate for first birth in women aged 30 years and older. Mothers with a low birth order who undergo C-section explained that the choice was made mainly because of their greater risk of pregnancy and delivery-related complications (Webster et al. 1992;

Table 2. The effects of socio-economic and demographic factors on C-section

Variable	Coefficients	S.E	p-value	OR	95% CI for odds ratio	
					Lower	Upper
Age Group						
15-20	-2.996	0.817	0.001**	0.050	0.010	0.248
20-25	-1.963	0.626	0.002**	0.140	0.041	0.479
25+ ®						
Residence						
Urban	0.213	0.502	0.671	1.238	0.463	3.311
Rural ®						
Mother's Education						
Primary	-1.653	0.741	0.026*	0.192	0.045	0.818
Secondary	0.079	0.668	0.906	1.082	0.292	4.010
Higher secondary ®						
Family Income						
<12000	0.427	0.753	0.571	1.533	0.350	6.711
12000+ ®						
Age at marriage						
10-15	-1.553	1.462	0.288	0.212	0.012	3.717
15-20	0.656	0.814	0.420	1.927	0.391	9.505
20+ ®						
Did you ever use contraceptive method?						
Yes	-1.473	0.560	0.009**	0.229	0.076	0.687
No ®						
Did you take balance diet regularly during pregnancy?						
No	0.887	0.527	0.092	2.428	0.865	6.818
Yes ®						
BMI						
Under weight	-3.847	1.132	0.001**	0.021	0.002	0.196
Normal	-3.042	0.666	0.001**	0.048	0.013	0.176
Over weight ®						
Previous C-section						
No	-4.853	1.478	0.001**	0.008	0.023	0.414
Yes ®						

Note: ® represents the reference group; ** 1% and * 5% level of significance

Padmadas *et al.*, 2000). Padmadas *et al.* (2000) also reported of a strong association between C-section and place of residence, indicating the importance of social status in determining the type of delivery.

The prevalence of caesarian delivery reported in this study is higher than the rates as reported in national surveys, which included deliveries at home and clinics. According to the BDHS 2011 data, only 17.1% women delivered by caesarean, while NIPORT (2013) reported that nationally, 70% women delivered at home.

Limitations of the study
First, in the present study, we considered only women who delivered at hospitals in Rajshahi city, Bangladesh. We did not compare the differences between public and private hospitals regarding cesarean

deliveries. Second, some subjective factors such as subjects' food habit were considered as independent variables in this study, but several risk factors have been mentioned in the literature (Mossialos *et al.*, 2005) all of which were not considered. Another limitation is that although all the women expressed their desire in the oral interviews to be involved in decisions on delivery options, they however did not feel "medically capable" of making a decision on elective and non-elective C-sections. As a result, we could not include maternal choice directly as a factor. Finally, patient's medical records were not examined to determine on what grounds the doctors opted for caesarean delivery; therefore, we did not include the physician factor in relation to caesarean birth rates. There are several other potentially influencing factors that were not included e.g. accessibility, quality, and costs of delivery services, and social factors such as women's status and role in decision-making.

CONCLUSION

The present study provides evidence of a relatively high prevalence of C-section delivery in an urban area of Bangladesh. Considering the key reasons for caesarean prevalence reported here are limited, more studies should be conducted to identify other reasons for women choosing to have a C-section delivery. Women of child bearing age should be better informed about having a caesarian delivery only on medical grounds.

Conflict of interest
All authors declared that they have no conflicts of interests. There was no grant, technical or corporate support for this research project.

ACKNOWLEDGMENTS
The authors gratefully acknowledged the authorities of the selected private and public hospitals in Rajshahi city in Bangladesh for giving permission to conduct this study.

REFERENCES

Arjmandi B & Farzin M (2005). Assessment of the level of pregnant women's knowledge towards the advantages and disadvantages of normal vaginal delivery and cesarean section, Tehran. *Iran Uni Med Sci J*,14(55):13-22 [in Persian].

Bangladesh Bureau of Statistics (BBS) (2011). Population Census. Available at *http://www.bbs.gov.bd/userfiles/Image/RptPopCen.pdf*.

Betrán AP, Merialdi M, Lauer JA, Bing-Shun W, Thomas J, Van Look P &Wagner M. (2007). Rates of caesarean section: analysis of global, regional and national estimates. *Paediatr Perina Epidemiol* 21: 98–113.

Clark S C & Taffeles S (1997). Cesarean rate decreasing. *Obstet Gynecol New* 31: 10.

Cavallaro FL, Cresswell JA, França GVA, Victora CG, Barros AJ & Ronsmans C (2013). Trends in caesarean delivery by country and wealth quintile: cross-sectional surveys in Southern Asia and Sub-Saharan Africa. *Bull World Health Organ* 91: 914-6.22D.

Druzin ML & El-Sayed YY (2006). Caesarean delivery on maternal request: wise use of finite resources? A view from the trenches review article. *Seminars in Perinatology* 30(5): 305-308.

Flegal KM, Graubard BI, Williamson DF & Gail MH (2005) Excess deaths associated with underweight, overweight, and obesity. *J Am Med Assoc* 93(15): 1861–1867.

Hopkins K (2000). Are Brazilian women really choosing to deliver by Cesarean? *Soc Sci Med* 51(5): 725-740.

International Institute for Population Sciences (IIPS), Macro International (2007). National Family Health Survey (NFHS 3), 2005–06. Vol I. IIPS, Mumbai, India.

Joshua LW, Fergal DM, Danielle E, Robert HB, David AN, Christine HC, George S, Keith E, Suzanne MC, Sabrina DC, Stephen RC & ME D'Alton (2004). Obesity, obstetric complications and caesarean delivery

rate–a population-based screening study. *Am J Obstet Gynaecol* 190(4): 1091-1097.

Kun H, Fangbiao T, Brian F, Joanna R, Rachel T, Shenglan T & Nynke van den Broek (2013). A mixed-method study of factors associated with differences in caesarean section rates at community level: the case of rural China. *Midwifery* 29(8): 911-920.

Kassak KM, Mohammad AA & Abdallah AM (2009). Opting for a caesarean: what determines the decision? *Public Admin Management* 13(3): 100-122.

Lynch CM, Kearney R & Turner MJ (2002). Maternal morbidity after elective repeat caesarean section after two or more previous procedures. *Eur J Obstet Gynaecol Reprod Biol* 4320: 1–4.

Ministry of Health and Population (MOHP) [Nepal] (2012). New ERA, and ICF International Inc. Nepal Demographic and Health Survey 2011. Kathmandu, Nepal, Ministry of Health and Population, New ERA, and ICF International, Calverton, Maryland.

Monar F, Mario S, Facchinetti F & Basevi V (2008). Obstetricians' and midwives' attitudes toward cesarean section. *BIRTH* 35(2): 129-135.

Mossialos E, Allin S, Karras K & Davaki K (2005). An investigation of Caesarean section in three Greek hospitals: the impact of financial incentives and convenience. *Eur J Pub Health* 15(3): 288-295.

National Institute of Population Research and Training (NIPORT), Mitra and Associates & ICF International (2013). Bangladesh Demographic and Health Survey 2011. Dhaka, Bangladesh.

Nassar N & Sullivan E (2001). Australia's Mothers and Babies. AIHW Cat. no. PER19, Perinatal Statistics Series no. 11 2001, AIHW National Perinatal Statistics Unit, Sydney.

Onwude JL, Rao S & Selo-Ojeme DO (2005). Large babies and unplanned caesarean delivery. *Eur J Obstet Gynaecol Reprod Biol* 118(1): 36-39.

Parkhurst JO & Rahman SA (2007). Life saving or money wasting? Perceptions of caesarean sections among users of services in rural Bangladesh. *Health Policy* 80: 392–401.

Padmadas S, Kumar S, Nair S & Kumari A (2000). Caesarean section delivery in Kerala, India: evidence from a national family health survey. *Soc Sci Med* 51: 511–521.

Ravindran J. (2008). Rising caesarean section rates in public hospitals in Malaysia in 2006. *Med J Malaysia* 63(5): 434-435.

Rahman M, Shariff AA, Saaid R & Shafie A (2012). Age at marriage, maternal age and caesarean delivery of first birth in the northern region of Bangladesh: a study on curve estimation. *Man in India* 92(1): 93-113.

Rahman M, Shariff AA, Shafie A, Saaid R, Tahir RM (2014).Determinants of Caesarean Risk Factor in Northern Region of Bangladesh: A Multivariate Analysis. *Iranian J Publ Health* 43(1): 16-27.

Souza JP, Gülmezoglu A, Lumbiganon P, Laopaiboon M, Carroli G, Fawole B & Ruyan P (2010). Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004-2008 WHO Global Survey on Maternal and Perinatal Health. *BMC Med* 8:71. DOI:10.1186/1741-7015-8-71.

Sufang G, Padmadas SS, Fengmin Z, Brown JJ & Stones RW (2007). Delivery settings and caesarean section rates in China. *Bulletin of World Health Org, Geneva* 85, 10.

Tatar M, Gunalp S, Somunoglu S &Demirol A (2000). Women's perceptions of caesarean section: reflections from a Turkish teaching hospital. *Soc Sci Med* 50: 1227–33.

World Health Organization(WHO)(2009). Monitoring Emergency Obstetric Care: a hand book Geneva, Switzerland.

Webster L, Daling J, Mcfarlane C, Ashley D &Warren C (1992). Prevalence and determinants of caesarean section in Jamaica. *J Biosoc Sci* 24: 515–525.