Predictors of Caesarean Section and Normal Vaginal Delivery among the Women of Punjab, Pakistan

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Abstract

The aim of this study was to explore the burgeoning maternal risk predictors for selecting the mode of delivery (MOD) among the women of Punjab, Pakistan. This research is capable to contribute to the research field and provide an important foundation for researchers learning about factors contributing to childbirth delivery decisions in Pakistan. Over the course of the study period, the conscription of a sample of 399 expectant women was done. Chi-square analysis was used for comparison of baseline characteristics, delivery outcomes and mode of delivery. To evaluate predictive factors, logistic regression analysis was used. The 95% confidence interval and odds ratios were also calculated. Overall, 61.4 percent of women had caesareans, while 38.6 percent delivered vaginally. In the domain of organisational and biological factors, the findings of the binary logistic regression show that the odds of caesarean section (CS) were significantly higher among women who preferred a private hospital for delivery, were advised by their doctor to have CS, were too lazy to walk during pregnancy, suffered from Meconium Aspiration Syndrome, foetal distress, maternal anaemia, and had an abnormal baby presentation. The indicators of organisational predictors (hospital level and physician's recommendation) were the most important drivers in predicting MOD among women.

Keywords

Mode of delivery, Caesarean section, Normal vaginal delivery, Binary logistic regression.

1. Introduction

Pregnancy is usually considered a pleasant and blissful period in women's life, however, it may be cause of fear owing to some complexities. According to the theory of psychoanalytic, period of expectancy and mode of delivery (MOD) plays significant role in women's lifecycle. However, based on Chinese proverb, "If the labour is success, the sesame oil spreads the fragrance, while the labour is failure, the coffin board turns up" point out that it may be risky in some situation for both infant and mother. However due to the advancement in medical science, a surgical process known as caesarean section has been introduced for the sake to increase the survival odds. Caesarean section (CS) is performed when the life of mother or infant is in alarming situation (Gjonej *et al*., 2015).

The trend of CS has been growing over the worldwide (Betran *et al*., 2016 and Lumbiganon *et al*., 2010). All countries either developed or developing are threatening from this issue (Ashimi *et al*., 2013; Gomes *et al* 1999; Leone *et al*., 2008 and Vogel *et

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al., 2015). Latin America and the Caribbean region have increasingly high rates of CS (Boerma *et al*., 2018).

Pakistan is also facing this problem and there is a striking increase in caesarean cases since last two decades. World Health Organization (WHO) has recommended in Fortaleza, Brazil clearly that the C-section rate must fall within the most adequate range of 5% to 15 % (Appropriate technology for birth). Nevertheless, Pakistan has exceeded this defined standard. Surprisingly, C-section in Pakistan has touched the figure of 27.9% (Karim, *et al*., 2011). In Pakistan both medical and non-medical factors are liable for the prevalence of CS. By performing a caesarean section, the risk of maternal and fetus mortality and morbidity is decreased and there exist a converse association among them (Betran *et al*., 2007).

A vast range of factors like demographic, interpersonal, socio-economical, biological urge to have a good off springs, feedback from family, depression, medical personnel, prior delivery experience, psychiatric illness in women as well adequate knowledge about reproduction are responsible of this painful surgical intervention (Loke *et al*., 2015). C-section is persistently higher in upper class families (35.3%) as compared to lower class families 5.5% in Pakistan (Mumtaz *et al*., 2017). Moreover, preference of the husband towards CS (Vafaee *et al*., 2013), considering CS as a usual mode of delivery (Pang *et al*., 2008); patient's interaction with the physician, a fear of expectant mother of ending normal vaginal delivery (NVD) due to pain and a physician's referral for CS has contributed their role in CS. Many health issues including cardiovascular-disease, respiratory problems, high blood pressure, and persistent infections in women also lead to Caesarean Section (Padmadas *et al*., 2000). Evidence shows that trend of CS is high due to the abnormal breech presentation of baby (Fianu, 1976) and maternal anemia (Cotta *et al*., 2011). Risk of CS due to fetal distress is substantially increased from 2% to 7% (Placek and Taffel, 1988). In developed countries, this surgical intervention is mostly performed on demand by expectant mothers without any medical complexity just to keep away from the pain of vaginal delivery (Nazir, 2015). Nonetheless, in Pakistan the situation is opposite, and doctor's decision is considered foremost over women's opinion (Amjad *et al*., 2018).

While considering above aspects and determinants, this study was done to access the various organizational, interpersonal, socio-economic, and clinical factors associated with mode of delivery among Pakistani Women. The demand-supply imbalance has resulted in higher sugar prices. The market's supply is insufficient to satisfy the demand currently. In 2009, more than a million hectares of sugar cane were planted, and this provided the raw materials for 81 sugar mills in Pakistan.

2. Sample setting and statistical design

The study was a hospital-based study for indication of the factors for selection of mode of delivery. The study was conducted from obstetrics and gynaecology department of different private and public hospitals of Punjab, Pakistan. A multi-stage probability sampling technique was implemented for selection of a representative sample. On the last stage, data were collected from women meeting the criteria of interest using systematic sampling within multi-stage sampling. All women delivering at least one parity birth either vaginally or by CS after 36-42 weeks of gestation within age 14 to 45 years were included in the study. After the collection of data, it was statistically analysed.

3. Data collection tool

The mode of collecting information was a self-structured questionnaire. The questionnaire comprised of five sections. Description of all these sections used in this analysis is as follows:

1. Demographic characteristics (mode of delivery (NVD/CS), Marital Status (Married/Re-married/Divorced), Residence (Rural/Urban), no children, age of mother, education and weight of the mother).
2. Socio economic characteristics (employment status of mother, income and occupation of husband, choice of mode of delivery according to the affordability of CS expenses (yes/No).
3. Interpersonal and social characteristics (preference of a husband and mother-in-law towards CS (yes/No), capacity to bear pain in vaginal delivery (yes/No), maternal preference of CS as a safe procedure for her and her baby's health (yes/No).
4. Organizational factors (level of hospital (Public/Private), doctor's referral towards CS (yes/No).
5. Biological characteristics (optimal nutrition (yes/No), habit of walk or physical activity for half an hour (yes/No), underweight fetus (yes/No), maternal anemia (yes/No), abnormal presentation of baby (yes/No), fetal distress (yes/No), long duration of healing CS scars (yes/No), repetition of CS after prior CS (yes/No), Meconium Aspiration Syndrome (yes/No).

Multiparous women were also asked about their previous mode of delivery along with recent mode of delivery. Despite of presence of complications, biological factors, neonatal and maternal morbidity, and the information about the stamina of bearing pain of normal delivery was a main question for selection of mode of delivery.

4. Methodology

For continuous variables "Mean ± Standard Deviation (SD)" was calculated whereas for categorical variables number (percent) was evaluated. Chi-square analysis was used to examine the relationship between method of delivery and emerging maternal risk factors. Binary logistic regression analysis with "forward LR technique" was done by incorporating just those predictors that were deemed significant (p-value < 0.05) in bivariate chi-square analysis. To determine the best predictors, odds ratios and 95% confidence intervals were calculated. Analyses are carried out using statistical package for social sciences (SPSS) version 23.0.

5. Results

The response variable used in this study was mode of delivery. The question was pretended by asking the women about their opted mode of delivery. There are two possible responses: 'caesarean section' (CS) and 'Normal vaginal delivery' (NVD). Among the women who participated in this study (61.4%) women underwent for CS and (38.6%) women delivered vaginally.

Table 1 displays the association between mode of delivery and demographic maternal risk factors. Among study sample, mean age score of women with CS was persistently higher

(28.96) as compared with the women who experienced NVD (25.04%). About less than half (38.3%) of the women had secondary education of which (67.32%) had announced CS as their MOD. From the total sample mostly women belonged to urban areas (71.7%) among them (56.64%) experienced caesarean section. Results of chi-square show that association occurs among education, age and residential area and mode of delivery.

Table 2 exhibits the interpersonal factors that are related to choose the mode of delivery (MOD). The trend of caesarean section on maternal demand is not high as the majority of the women had 79.7% capacity to bear NVD pain out of which only 51.88% had CS due to any complication during delivery process. However, a smaller portion (22.8%) of the women considered CS as a safe and reliable obstetric procedure for her and her baby's health out of them (92.30%) woman had CS. However, husband and his family don't prefer for CS in case expectant mother carries a male baby.

Table 1: Demographic factors for MOD among women of Punjab, Pakistan.

Demographic factors	MOD frequency (%)			p-value
	Total	CS	NVD	
Age	27.45±5.338	28.96±5.202	25.04±4.633	0.000
15-20	41 (100)	11 (26.82)	30 (73.17)	
21-25	109 (100)	58 (53.33)	51 (46.78)	
26-30	146 (100)	89 (60.95)	57 (39.04)	
31-35	71 (100)	57 (80.28)	14 (19.71)	
Above 35	32 (100)	30 (93.75)	2 (6.25)	
Education				0.057
No education	115 (100)	59 (52.21)	56 (48.69)	
Primary	66 (100)	41 (62.12)	25 (37.87)	
Secondary	153 (100)	103(67.32)	50 (32.67)	
Higher	65 (100)	42 (64.61)	23 (35.38)	
Residence				0.007
Rural	113 (100)	83 (73.45)	30 (26.54)	
Urban	286(100)	162 (56.64)	124 (43.35)	

* MOD= mode of delivery; NVD= Normal vaginal delivery; CS =caesarean section

In the domain of socio-economic factors, Table 3 shows that Majority of the women (94.4%) among all respondents were housewives among them (60.63%) had CS, but it is not a significant factor of CS (P value=0.204). Chi-square analysis showed that the husband's affordability towards caesarean section is also associated with mode of delivery.

One of the most interesting results is that hospital level has a strong association with mode of delivery. The organizational factors have influence on MOD (Table 4).

Unsurprisingly, Table 5 displays that all the biological factors have a strong association with mode of delivery. Fatal distress is frequently signal of deleterious effects and urgent C-section. A fetus having weight less than 2500g is considered a low birth fetus. Prevalence of Low weight of the new-born baby is highly concerned for neonatal morbidity as well as mortality. On the other hand, high birth weight is also dangerous. Weight of an infant is also highly associated with mode of delivery. There is a perception that underweight fetus can be delivered easily via normal delivery and overweight fetus is difficult to deliver via normal delivery. Abnormal presentation of the fetus is associated with mode of delivery. 197 fetuses had an abnormal presentation among them 161 (81.72)

were delivered by caesarean section and 36 (18.27) fetuses were delivered by vaginal delivery. Maternal anaemia is also associated with mode of delivery. Out of the total sample size 232 women suffered from maternal anaemia among them 188 (81.03) underwent for caesarean section and 44 (18.96) delivered by vaginal delivery. Among associated factors of caesarean section previous caesarean section is also a significant factor (p <0.001). Meconium Aspiration Syndrome has harmful effects on baby and urgent C-section is required. Above table shows that bowel obstruction is highly associated with mode of delivery.

The process of regression modelling is the outcome of the extended modelling process. It covers all the covariates that have statistically significant association with the dependent variable. The covariates who did not display a statistically significant association were not displayed. Table 6 represents the findings of final estimated logistic regression model.

Table 2: Inter-personal factors for MOD among women of Punjab, Pakistan.

Interpersonal factors	MOD frequency (%)			p-value
	Total	**CS**	**NVD**	
Enough capacity of NVD pain				0.000
Yes	318 (100)	165 (51.88)	153 (48.11)	
No	81 (100)	80 (98.76)	1 (1.23)	
Reliable procedure for mother and fetus				0.000
Yes	91 (100)	84 (92.30)	7 (7.6)	
No	308 (100)	161 (52.27)	147 (47.72)	
Husband and his family preference for CS for male carrier				0.289
Yes	34 (100)	18 (52.94)	16 (47.05)	
No	365 (100)	227 (62.19)	138 (37.80)	

* MOD= mode of delivery; NVD= Normal vaginal delivery; CS =caesarean section.

Table 3: Socio-economic factors for MOD among women of Punjab, Pakistan.

Socio-economic factors	MOD frequency (%)			p-value
	Total	**CS**	**NVD**	
Husband's affordability of CS				0.001
Yes	198(100)	138 (69.69)	60 (30.30)	
No	201 (100)	107 (53.23)	94 (46.76)	
Employment status of mother				0.204
Housewife	376 (100)	228 (60.63)	148 (39.36)	
Employed	23 (100)	17 (73.91)	6 (26.08)	

* MOD= mode of delivery; NVD= Normal vaginal delivery; CS =caesarean section.

Table 4: Organizational factors for MOD among women of Punjab, Pakistan.

Organizational factors	MOD frequency (%)			p-value
	Total	CS	NVD	
Hospital level				0.000
Private	199 (100)	163 (81.90)	35 (17.58)	
Public	200 (100)	82 (41.0)	119 (59.50)	
Doctor suggestion				0.000
Yes	179 (100)	146 (81.56)	35 (17.58)	
No	220 (100)	99 (45)	119 (59.50)	

* MOD= mode of delivery; NVD= Normal vaginal delivery; CS =caesarean section.

Table 5: Biological factors for MOD among women of Punjab, Pakistan.

Biological factors	MOD frequency (%)			p-value
	Total	CS	NVD	
Walk or physical activity				0.000
Yes	248 (100)	120 (48.38)	128 (51.61)	
No	151 (100)	125 (82.78)	26 (17.21)	
Optimal maternal diet				0.013
Yes	291 (100)	168 (57.73)	123 (42.26)	
No	108 (100)	77 (71.29)	31 (28.70)	
Fetal distress				0.000
Yes	192 (100)	151 (78.64)	41 (21.35)	
No	207 (100)	94 (45.41	113 (54.58)	
Underweight fetus				0.000
Yes	194 (100)	92 (47.42)	102 (52.57)	
No	205 (100)	153 (74.63)	52 (25.36)	
Abnormal presentations				0.000
Yes	197 (100)	161 (81.72)	36 (18.27)	
No	202 (100)	84 (41.58)	118 (58.41)	
Maternal anemia				0.000
Yes	232 (100)	188 (81.03)	44 (18.96)	
No	167 (100)	57 (34.13)	110 (65.86)	
Meconium Aspiration Syndrome				0.000
Yes	173(100)	147 (84.97)	26 (15.02)	
No	226(100)	98 (43.36)	128 (56.63)	
Previous caesarean				0.000
Yes	229 (100)	163 (71.17)	66 (28.82)	
No	170 (100)	82 (48.23)	88 (51.76)	

* MOD= mode of delivery; NVD= Normal vaginal delivery; CS =caesarean section.

Table 6: Estimates of logistic regression for the factors associated with MOD among women of Punjab, Pakistan.

Factors	Covariates	Co-efficient (S.E)	OR (95% CI)	p-value
Demographic Indicators	**Age**			
	15-20	-5.334**(1.248)	0.005 (0.000-0.056)	0.000
	21-25	-3.326**(1.059)	0.036 (0.005-0.287)	0.002
	26-30	-3.747** (1.065)	0.024 (0.003-0.190)	0.001
	31-35	-2.851* (1.118)	0.058 (0.006-0.517)	0.011
	>35 (RC)	Reference	Reference	Reference
Organizational indicator	**Hospital level**			
	Private	1.407** (0.430)	4.082 (1.758-9.479)	0.001
	Public (RC)	Reference	Reference	Reference
	Physician's suggestion			0.048
	Suggested	0.772* (0.391)	2.164 (1.006-4.659)	
	Not suggested (RC)	Reference	Reference	
Interpersonal and social indicators	**CS reliable for mother and fetus**			0.006
	Yes	1.694** (0.612)	5.440 (1.638-18.064)	
	No (RC)	Reference	Reference	
	In my opinion, I have enough stamina to tolerate NVD.			0.000
	Yes	-4.274** (1.174)	0.014 (0.001-0.139)	
	No (RC)	Reference	Reference	
Biological/clinical indicators	**Fetal distress**			0.011
	Yes	0.981*(0.388)	2.667 (1.247-5.703)	
	No (RC)	Reference	Reference	
	Abnormal presentations			0.000
	Yes	1.713** (0.389)	5.547 (2.589-11.885)	
	No (RC)	Reference	Reference	
	Anemia			0.001
	Yes	1.299** (0.383)	3.665 (1.729-7.767)	
	No (RC)	Reference	Reference	
	Meconium Aspiration Syndrome			0.000
	Yes	2.251** (0.428)	9.499 (4.105-21.983)	
	No (RC)	Reference	Reference	
	Walk or physical activity (during pregnancy)			0.001
	Yes	-1.361**(0.407)	0.256 (0.115-0.570)	
	No (RC)	Reference	Reference	
Constant		4.771 (1.577)	118.052	

*p-value < 0.05; **p-value < 0.01; S.E = Standard error; OR = Odds ratio;
CI = Confidence Interval; RC = Reference category.

We applied binary logistic regression model with "Forward LR" method. Age, type of hospital, Physician's suggestion, and all biological factors are burgeoning factors for opting MOD. Women who were suggested for caesarean section by their physician are 2.045 times more likely to have caesarean section intention. Women who consider caesarean section as a safe and reliable obstetric procedure had 4.738 times higher odds of having caesarean section. Compared with the women who had not carry a fetus with abnormal presentation the women who carried a fetus with abnormal presentation had 5.547 times more risk of delivering baby via caesarean section. Also, the women who had maternal anemia during pregnancy had 3.665 times more odds to practice caesarean section. One more interesting result is that the women who suffered from Meconium Aspiration Syndrome have 9.499 times more odds of experiencing caesarean section than the counterparts.

6. Discussion

The aim of this study was to report the predicting factors of selecting the Mode of delivery among women of Punjab, Pakistan. The CS rate in the present study was 61.4%, which was much higher than the figure reported in previous studies from Pakistan (27.9%; Karim *et al*., 2011) and consistent with a study in Iran (63.6%; Bakhtari *et al*., 2019). Turkey has 48% (Yuksel *et al*., 2016) and China has 54.1% (Zhang *et al*., 2008). World Health Organization (WHO) has recommended (Fortaleza, Brazil) that the C-section rate must fall within the most adequate range of 5% to 15 % but the rate revealed in the present study had cracked this recommendation.

The findings of this study give potency to the existing published literature on this topic. In our study, Residence is significant (p<0.05) factor for mode of delivery that is consistent with the previous researches (Anwar *et al*., 2015 and Ronsmans *et al*., 2006), it has been identified that the pregnant women belonging to the rural area had a low chances of experiencing the Caesarean section rates than the women who belong to urban areas that is consistent with (Long *et al*., 2015 and Mumtaz *et al*., 2017).

Wealth index also plays vital role in high C-section rate. Accumulated studies in different countries highlights that rather than medical problems and doctor's referral (Ronsmans *et al*., 2006) women of elite socio-economic status prefer CS (Islam and Yoshimura, 2015 Kambo *et al*., 2002 and Singh *et al*., 2008) with the misconception that CS is best obstetric care for them (Blencowe *et al*., 2016 and Boatin *et al*., 2018). Fashionable and up-to-date societies take elective CS as a trending MOD (Amyx *et al*., 2018).

In the domain of interpersonal characteristics contributing for mode of delivery, surprisingly, the trend of caesarean section on maternal demand is not high (51.88%) as the majority of the women had (79.7%) capacity to bear NVD pain. That is consistent with the study (Amjad *et al*., 2018).

However, some expectant mother preferred CS because they consider CS reliable and safe procedure for her and her baby's health due to previous adverse birth experience and this indicator is associated with caesarean section and findings are familiar with (Areskog *et al*., 1983 and Gjonej *et al*., 2015) and according to them Caesarean section should be performed when the life of mother or infant is in alarming situation. This fear within pregnant women creates a high risk of operative delivery during the labor process (Ryding *et al*., 1998).

The findings of this study suggested that organizational factors such as level of hospital is a significant factor ($p<0.05$) for mode of delivery. In Pakistan, the mode of delivery depends on the doctor's referrals, and it is cause of high trend of CS (Ji *et al*., 2015).

In bivariate analysis, previous caesarean section is also found significant factor in this study that is consistent with the study of (Mascarello *et al*., 2017 and Ham *et al*., 1997). Rate of repetitive CS after previous CS is (3.6%) in Norway, (6.6%) in Sweden and (10.5%) in USA (Vogel, *et al*., 2015). However, Literature unveiled that natural birth can also occur after CS (Roumen *et al*., 1990). In our study, abnormal presentation of a baby is a significant factor as reported by many other researchers (Brenner *et al*., 1974; Fianu, 1976; Kauppila, 1975; Lyons, *et al*. 1978 and Wright, 1959;) that CS is considered a safe obstetric procedure to slow down the morbidity and mortality rate in the abnormal breech presentation of the baby. In our study caesarean section due to abnormal presentation is (81.72%) which is relatable with (Hibbard *et al*., 1976) who considered the need of caesarean section 80% to 60% for safe delivery. Maternal anemia in our study is mostly caused for caesarean section which is similar in the study of (Cotta *et al*., 2011). However, according to a study iron deficiency anemia (IDA) is not associated with mode of delivery (Bogaert, 2006). However, additional research with larger cohorts could better define other risk factors that are associated independently with mode of delivery.

The findings of the logistic regression showed that the major significant indicators of caesarean section are maternal anemia, abnormal presentation of baby, fetal distress, lack of physical exercise, level of hospital, age and physician's suggestion which coincide with the studies of (Barakat, 2012; Brenner *et al*., 1974; Carolan *et al* 2011; Cotta *et al*., 2011; Lidegaard *et al*., 1992 and Martinez, 2015), respectively.

7. Conclusion

Majority (61.4%) of the expectant women having abnormal presentation or maternal anemia or Meconium aspiration syndrome, suggested by physician for CS as well as preferred private hospital for delivery had the probability of 91% to practice caesarean section as compared to their counterpart (38.6%) having less than 1% probability (0.83%) to undergo for caesarean section.

8. Limitations and recommendations

Each study has some limitations. In this study as the sample of pregnant women conscripted from few hospitals due to shortage of time and resources. Therefore, the results may not be necessarily generalized to all pregnant women in Pakistan. However, this work is capable to contribute to the research field and provide an important foundation for researchers learning about factors contributing to childbirth delivery decisions in Pakistan. Moreover, in this research, data were composed by asking or requesting the expectant women, their selves, therefore clinicians' perspective and clinical data are lacking. However, they explained all the reasons about their mode of delivery clearly.

In this study mostly the expectant women were illiterate and belong to the poor socio-economic status. Usually, they came to hospital due to failure in vaginal delivery by untrained staff in a very critical condition and in this condition only emergency caesarean section is life-saving choice. Moreover, in the developing countries, usually women do not visit antenatal centres because of lack of money and knowledge, guidance, and facilities.

Therefore, these pregnancies with severe complications are brought to the hospital as an emergency case and consequently caesarean section considered an important and life-saving obstetric procedure.

Caesarean section is a major instrumental practice, which is linked with increased maternal and neonatal risk as compared with vaginal delivery. Poor maternal physical status and poor nutrition in developing countries, including Pakistan, and additionally obstetric troubles such as hypertension, haemorrhage and dystocia raise the odds of maternal and neonatal morbidity and mortality. Therefore, counselling at national level is necessary for women and their spouses to delineate the rationale and criteria for practicing caesarean section also aware them consequences and risks associated with caesarean section. In Pakistan, no federal policies or laws and regulations are set for selection of the Mode of delivery, so this is not considered in the present study. For future research, it is recommended to consider this as well.

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