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Original Article

Prevalence and Associated Factors of Caesarean Section in Punjab, Pakistan: Evidence from Multiple Indicators Cluster Survey, (2017-18) Punjab

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Abstract

Background: Caesarean section was one of the major issues in worldwide both in developed and developing countries. In Punjab, high prevalence of C-section had been perceived.
Objective: To assess the prevalence, socio-demographic and socio-economic factors of caesarean section in the Punjab.
Methodology: The study was based on the data of Multiple Indicators Cluster Survey 2017-18 (MICS Punjab). Two-stage, stratified cluster sampling technique was adopted. Almost 53,840 households were selected to obtain the data from Punjab. Target population was currently and ever married women (15,656) who have given birth in last two years. From these women, a question was asked whether the delivery was normal or by C-section. We gave value 1 if delivered by C-section and 2 otherwise by using the Statistical Package for Social Sciences (SPSS) version 23.
Results: The prevalence of C-section was 28.9% in the Punjab with 95% C.I (28.9%, 29.7%) and odds ratio (OR) 3.13. Out of ten, three women delivered baby by C-section. Area of residence, number of antenatal care visits, mother's age at time of marriage, education, wealth index quintile, and tetanus toxoid injection during last pregnancy were highly associated with the C-section. Educated and rich women were more attracted to deliver by C-section as compare to a women who were uneducated and belonged to poor socioeconomic group. In Central Punjab higher cases were found as compare to the South Punjab and Northern Punjab.
Conclusion: The prevalence of C-sections is very high in Punjab when compared with WHO standard. The contributing factors to this rising trend of increased rate of C-section, higher education, improvement of socioeconomic status and easy accessibility of C-section facilities.
Key words: Caesarean section, age of marriage, multiple indicator cluster survey.

Introduction

The increasing prevalence of the caesarean section is one of the major health related issue worldwide affecting both developed and developing countries.[1] Although in Pakistan, high prevalence of C-section had been perceived, in past few decades. Pakistan had highest burden of global maternal mortality with 6% death rate.[2] According to recent report of Index mundi, the estimated maternal mortality rate was 178 deaths per 100,000 live births. In 2000, the estimated percentage of C-section for live births worldwide was about 12.1% which was almost double in 2015 around 21%. Although in south Asia, the estimated percentage of C-section in 2000 was about 7.2% which was more than double in 2015 i.e.18.1%.[3] In 2012- 13 the C-section rate in Punjab was 19.1% which crossed the WHO acceptable threshold of 10% [4] In the high income countries like USA the C-section rate was 30.3% while in United Kingdom it was 22%, in Canada 26%, France 19% and in Australia it was 30%.[5] In the same way in low income countries, the

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Authors Contribution

MZ & AI conceptualized the project. SR, IS & SA did the data collection statistical authority. AI did the literature search. MZ & IS performed the statistical analysis. Drafting, revision & writing of manuscript were done by MZ, SR, IS, SA & AI.

C-section rate also rapidly increased i.e. in Bangladesh the C-section rate increased from 2% in 2000 to 17% in 2011.[6] In 1985, WHO quantified that C-section rate should be justified about 15% at population level.

The surgical procedure of C-section is done to avoid the difficult normal delivery for safety of both mother and fetus. Moreover, some socio-demographic and psychological factors also influenced the rise in C-section rate.[7] Nilsen et al. 2014 had found the demographic factors like age, socio economic status, education level of female, and occupation has positive association with mode of delivery.[8] Most of the C-sections were done on because of mothers preference primarily to just avoid the pain of normal delivery.[9] Behague, 2002 also focused on physiological fear of women for normal delivery, due to this fear the rate of C-section was extensively increases both in developed and developing countries. On the other hand, literature showed that because of financial benefit and time management, many physicians prefer for C-section without any medical reason.[10] However, in developing countries, it was found that doctors decision was the significant factor to perform C-section in spite of woman's choice.[5] The huge rise in rate of C-section is questionable at each forum because only physician are the authority to decide on the mode of delivery. Main medical indication to perform C-.section is to mange complications of pregnancy. However, in case of public sector health facility C-sections are not perfomed in patients request only to avoid pain. It is evident from literature that major reason of C-section is deliveries in private sector as in private maternity, the C-section's charges are usually more than double as compared to normal delivery and it depends on physicians profile.

Neuman et al. (2014) analyzed that in south Asia the rate of C-section increased in almost every private sector health facility and mostly it is on demand of more educated mothers.[6] Numerous studies also showed that sometimes C-section procedure was performed without any medical reason.[11] (Karkee et al. 2014) analyzed that the rate of C-section increased because of scheduled or provider-induced operations without any medical reason.[12]

Some studies explained about the complications which might occurred during a C-section and after a C-section to the mother.[13-16] After the delivery, some complications were occurred like heavy blood loss, infection, a blood accumulation in the legs , sickness, retching, and severe headache and some damage the another organs (13). Yassin and Saida (2012) analyzed that the rate of C-section is highly significant among the younger age of women, women with first pregnancy, those who received prenatal care during pregnancy and women living in urban areas.[17] If C-section was considered to be the life saving method for both the mothers and children, then there was no such indication that it would decrease the rate of 10% deaths of children and mothers and therefore it might not be helpful in succeeding the lower rate of child and multiple maternal deaths.[18] However, if C-section is considered to be life-saving technique than creates multiple problems for future pregnancies like maternal and perinatal risks.[19]

Another study also showed that the performance of C-section is linked with complications that occur during pregnancy, maternal age and high birth weight.[20] There was an increase in the choice of patients for private health facility because of some factors like socioeconomic status, professional status and urbanization, literacy rate and maternity care. Women who were more conscious about their health and went for more maternity care are more expected to move for private facility for delivery.[21] In Indian Gujrat, it was observed that urban women with economically strong were more likely to switch for public facility over private facility for normal delivery.[1]

In Punjab the C-section rates were more than the optimal level (15%) set by WHO in order to determine the prevalence and the associated factors of C-section we have done secondary data analysis of results of the Multiple Indicators Cluster Survey (MICS) of Pakistan.

Methodology

The study was based on the secondary data by MICS Punjab 2017-18. For the selection of the survey sample, two-stage, stratified cluster sampling technique was adopted. The sampling frame was adopted which was based on the 2017 National Census of Population and Housing.

So, by this method, 53,840 households were selected as a sample size for this survey. All households and the members in the households in all rural and urban areas in the Punjab considered as the sampling units for the MICS Punjab 2017-18. The Punjab province was divided into nine divisions and thirty six districts. Two-stage stratified cluster sampling technique was used to select the survey sample from the rural and urban areas of the Punjab.

By using probability proportional to size, the first-stage sampling units were selected. While, the second-stage units were selected through the systematic sampling. From 2,692 Primary Sampling

Units (PSUs), the whole sample of households was selected at the first sampling stage. While, the distribution of rural and urban areas was considered as 1,893 and 799, respectively.

Out of 53,840 households, 52,765 were occupied and 51,660 were interviewed. The overall response rate was 97.9%. 79,510 women between age 15-49 eligible for interview, 74,010 were interviewed successfully and the response rate was 93.1%. Of these 74,010 interviewed women, 26,980 were ever and currently married and 15,656 women gave birth in last two years in any place. From 15,656 women, a question was asked whether the delivery was normal or by C-section. The response variable was taken whether a woman get delivered by C-section or not. We gave value 1 if delivered by C-section and 2 otherwise by using the Statistical Package for Social Sciences (SPSS)-23 (MICS, Punjab report. Vol.III).[22]

Area of residence, number of antenatal care visits, mother's age at first marriage, education, wealth index quintile, three regions of the Punjab. and any tetanus toxoid injection during last pregnancy were the expected factors informed by the studies[6,23] and from the judgment based on our knowledge/perception. Bahawalpur, D.G Khan and Multan divisions were included in South Punjab. Lahore, Faisalabad, Sahiwal and Gujranwala divisions were included in Central Punjab. While, Sargodha and Rawalpindi divisions were included in Northern Punjab. We applied descriptive analysis considering frequency and percentage of the variables with respect to the C-section by cross tabulation method. Chi-square test was used to check the association and testing of hypothesis. Binary logistic regression was applied for modeling the response variable. Hosmer Lemeshow goodness-of-fit test was used to check the goodness of fit of fitted model. Large p-value indicated that the model was good fit. We registered as a MICS data user after filling a form provided by the Bureau of Statistics (BOS), Punjab and take the assess to the data. *p*-value ≤0.05 considered as significant.

Results

Among 15,656 women who gave live births in last two years, 28.9% delivered by C-section while 71.1% delivered normally. The estimated proportion was 0.289 with 95% confidence interval (28.9%, 29.7%). C-section was most frequent in urban areas. 40.4% women delivered by C-section who had 4 or more antenatal care visits. High percentage of C-section was noted between 26-30 years and >30 years. Educated and rich women were more attracted to deliver by C-section as compare to the women who were uneducated and belong to poor families. In Central Punjab higher cases were found as compare to the South Punjab. High percentage was found in the women who get tetanus toxoid injection during last pregnancy as compare to the women did not get any tetanus toxoid injection during last pregnancy (Table-1).

In Table-2, we set the null hypothesis according to our perception and on the basis of the findings of parent studies. The entire null hypothesis was rejected. It leads to the conclusion that the C-section was strongly associated with the included variables of our study.

The slope coefficient represented the rate of change in the log of odds of C-section with one unit change in the explanatory variable. We calculated the odds ratios. If odds ratio was equal to one, it meant that there was no relationship between the C-section and the corresponding explanatory variable. If the odds ratio was greater than one, it represented the positive relationship of C-section and if the odds ratio was less than one it explained the negative relationship with the corresponding explanatory variable. We also calculated standard error and probability values. Standard error represented the reliability of the estimate and *p*-value represented the significance. We used the enter method in logistic regression by using SPSS-23 (Table-3).

Area of residence represented that if all other explanatory variables holding constant, a woman who lived in rural areas, she had 24% less chances in log of odds of C-section. As the age of marriage increased, the chances of C-section will also be increased. As the levels of education increased, the chances would also be increased in the log of odds of C-section. Similar pattern would be seen in wealth index quintile. The most hazardous region was northern Punjab, 1.7 times in risks. While the Central Punjab had 1.2 times more risks as compare to the South Punjab towards C-section, according to odds ratio. Tetanus toxoid injection during last pregnancy had a positive relationship with C-section. The odds ratio of intercept represented that any woman in the Punjab had 3 times in risk of C-section if any other factor has not been considered. Hosmer and Lemeshow test revealed that the model was good fit as test value is 5.41 with 8 degrees of freedom (p =0.714). Overall percentage of the classification table is 72.8, it means that 72.8% cases are correctly specified.

Table 1: Descriptive statistics of the socio-demographic and socio-economic variables on caesarean section basis

Variable		*Delivery by caesarean section*		*Total*
		Yes n=4538 (28.9%)	*No* n=11,117 (71.1%)	*N=15,656*
Area	Urban	n=1,848 (35.2%)	n=3,409 (64.8%)	n=5,257
	Rural	n=2,691 (25.9%)	n=7,708 (74.1%)	n=10,399
Number of antenatal care visits	None	n=155 (8.8%)	n=1,614 (91.2%)	n=1,769
	1-3	n=1,005 (18.3%)	n=4,500 (81.7%)	n=5,505
	4+ visits	n=3,344 (40.4%)	n=4,942 (59.6%)	n=8,286
	Missing/DK	n=35 (36.8%)	n=61 (63.2%)	n=96
Mother's age groups (years) at first marriage	<15	n=121 (15.5%)	n=661 (84.5%)	n=782
	15-20	n=1,715 (23.5%)	n=5,575 (76.5%)	n=7,290
	21-25	n=1,813 (33.1%)	n=3,660 (66.9%)	n=5,474
	26-30	n=740 (42.1%)	n=1,018 (57.9%)	n=1,758
	>30	n=150 (42.6%)	n=202 (57.4%)	n=352
Ever attend the school	Yes	n=3,511 (36.8%)	n=6,031 (63.2%)	n=9,542
	No	n=1,027 (16.8%)	n=5,086 (83.2%)	n=6,114
Education	None/preschool	n=1,082 (17.0%)	n=5,284 (83.0%)	n=6,365
	Primary	n=851 (27.2%)	n=2,275 (72.8%)	n=3,126
	Middle	n=539 (32.4%)	n=1,124 (67.6%)	n=1,663
	Secondary	n=919 (40.9%)	n=1,328 (59.1%)	n=2,248
	Higher	n=1,147 (50.9%)	n=1,106 (49.1%)	n=2,254
Wealth index quintile	Poorest	n=419 (12.2%)	n=3,015 (87.8%)	n=3,433
	Second	n=681 (21.9%)	n=2,429 (78.1%)	n=3,110
	Middle	n=974 (30.6%)	n=2,208 (69.4%)	n=3,182
	Fourth	n=1,071 (34.8%)	n=2,009 (65.2%)	n=3,080
	Richest	n=1,394 (48.9%)	n=1,456 (51.1%)	n=2,850
Region	South Punjab	n=1,271 (24.6%)	n=3,886 (75.4%)	n=5,157
	Central Punjab	n=2,572 (32.7%)	n=5,289 (67.3%)	n=7,861
	Northern Punjab	n=695 (26.4%)	n=1,942 (73.6%)	n=2,637
Any tetanus toxoid injection during last pregnancy	Yes	n=3,874 (31.7%)	n=8,332 (68.3%)	n=12,206
	No	n=639 (19.0%)	n=2,729 (81.0%)	n=3,368
	Don't know	n=25 (29.0%)	n=56 (69.1%)	n=81

Table 2: Null hypothesis and its testing.

Sr. #	*Null Hypothesis*	*Chi-square value*	*D.F*	*p-value*	*Result*
1.	There is no association between area of residence of women and C-section	145.93	1	0.000	Associated
2.	There is no association between number of antenatal care visits and C-section	1182.57	3	0.000	Associated
3.	There is no association between mother's age at first marriage and C-section	398.97	4	0.000	Associated
4.	There is no association between education of women and C-section	1139	4	0.000	Associated
5.	There is no association between wealth index of women and C-section	1149.69	4	0.000	Associated
6.	There is no association between regions of Punjab and C-section	109.25	2	0.000	Associated
7.	There is no association between tetanus toxoid injection during last pregnancy and C-section	209.11	2	0.000	Associated

Discussion

This study examined the prevalence and associated factors of C-section in the Punjab province. The increasing trend of C-section in Pakistan is still stable with some variables from other developing countries. Even though, there are certain reasons behind this increasing trend that was not fully understood, [7] but have been carefully analyzed.

The finding of our study reveals that 28.9% women delivered by C-section. It is observed that majority of the women belongs to urban areas. Other studies also shows the increasing trend of C-section among women living in urban areas.[24] Women ever attend the school and education level of women is also associated with by C-section. Our results also confirmed the results of other studies identifying highly educated women are more attracted to deliver by C-section.[6] Various studies also show the

Table 3: Logistic regression analysis of the Caesarean section.

Covariate		Coefficient	S.E	p-value	Odd Ratio
Area	Urban (Ref.)				
	Rural	-0.243	0.047	0.000	0.784
Mother's age at first marriage	<15 (Ref.)				
	15-20	-0.160	0.107	0.137	0.853
	21-25	-0.358	0.109	0.001	0.699
	26-30	-0.663	0.117	0.000	0.515
	>30	-0.708	0.156	0.000	0.493
Number of antenatal care visits	None (Ref.)				
	1-3	-0.701	0.094	0.000	0.496
	4+ visits	-1.423	0.092	0.000	0.241
	Missing/DK	-1.301	0.237	0.000	0.272
Ever attended the school	Yes (Ref.)				
	No	0.243	0.163	0.136	1.275
Education level	None/preschool (Ref.)				
	Primary	0.005	0.165	0.976	1.005
	Middle	-0.038	0.169	0.822	0.963
	Secondary	-0.229	0.168	0.171	0.795
	Higher	-0.383	0.169	0.024	0.682
Wealth index quintile	Poorest (Ref.)				
	Second	-0.460	0.072	0.000	0.631
	Middle	-0.703	0.074	0.000	0.495
	Fourth	-0.779	0.082	0.000	0.459
	Richest	-1.152	0.091	0.000	0.316
Region	South (Ref.) Punjab				
	Central Punjab	0.190	0.047	0.000	1.210
	Northern Punjab	0.514	0.061	0.000	1.672
Any tetanus toxoid injection during last pregnancy	Yes (Ref.)				
	No	0.131	0.053	0.014	1.140
	Don't know	-0.175	0.259	0.499	0.839
Constant		1.141	0.119	0.000	3.131

significant relationship of C-section with women education.25-28 C-section rates are also high and related with none/primary education among women in rural areas.[8]

The rising trend of C-section rate in Pakistan is consistently observed from other developing countries.[29-31] The factors of this trend are not fully assessed.[32] Although the factors have been examined in terms of demand supply factors from literature.[33] The main purpose of this study was to define the prevalence of C-section and to analyze leading factors to C-section in Punjab, Pakistan. The prevalence of women undertaking C-section in this study was 28.9%. This finding is lower as compared to the studies conducted in other developing or underdeveloped countries.[34] Although, this rate is also higher than the similar studies conducted in other countries.[35] This difference might be due to a large sample size and lack of guide lines and recommendation to the lower high rate of C-section. The discrepancy might also be due to study period difference and this study includes both private and public health facility but the previous study was only public hospitals. According to this study high percentage of C-section was noted in respondents who were in the age group of 26-30 years and >30 years. This finding is not inline with findings of other studies where it was found that the age group of 15-20 was more likely associated with caesarean section than others.[36] The finding of this study is higher than study conducted in Northwestern Nigeria which showed that the prevalence of C-section was 11.3%.[37] The discrepancy might be due to socio economic and cultural difference.

Consistent with other prior studies[38-40], our findings showed that the women belong to the poorest households and from the rural areas had lower C-section rates than their counterparts in all study periods. This study also highlighted education as a strong predictor of a high C-section rate, consistent with other studies in developing countries.[41] As education is directly linked with women's autonomy, more highly educated women can make their own decision to choose to give birth through a C-section. However, high education is not always positively associated with the likelihood of having a C-section. Evidence showed a negative attitude of highly educated women towards C-section in South Korea,[42] probably because education provides information on health promoting behavior; more educated women have more knowledge about the risk of unnecessary C-section.

It can be concluded that overall prevalence of C-sections is on the rise in Punjab, Pakistan. The contributing factors to this rise are education,

betterment of socioeconomic status of patients and easy availability of C-section facilities. Therefore, in order to control this gradual rise in prevalence of C-section, the factors contributing to this rise must be addressed and steps must be taken to enhance patient awareness about health and overall socioeconomic status.

The present study recommended that adequate awareness regarding the reduction of pregnancy complications can also help to reduce the chances of malpractice involving caesareans. Additionally, qualitative research needs to be conducted to understand the cultural beliefs, psychological factors and perceptions of Pakistani women that may be contributing to the upsurge in the cesarean section in Pakistan.

This study used data from the MICS Punjab 2017-18, which is representative of Punjab at district level; hence we cannot generalize the results at a national level. It is not possible with the available data to establish role of midwives and maternity homes in C-section.

Conflict of interest: None declared.

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