Research Article

Maternal Risk Factors of Caesarean Delivery in a Tertiary Care Hospital in Central India: A Case Control Study

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ABSTRACT

One of the most alarming features of modern obstetrics is the relentless increase in c-section rates. Medical, institutional, legal, psychological and socio-demographic factors play a contributing role. Although c-sections can be life-saving, c-section rates above the WHO recommended 15% raises global concern.India is also not excluded from this trend. It is time to realize that c-sections not only put both the mother and child at risk, but also pose huge economic burden compared to normal vaginal delivery. This study was designed to identify the maternal risk factors associated with c-sections. A hospital based case control design was approached. 360 mothers, all consenting 180 consecutive mothers who had c-section in singleton pregnancies and 180 mothers with singleton spontaneous vaginal deliveries were selected from postnatal ward. Data was collected using a pre-tested questionnaire. Out of the 11 variables examined, 7 were found statistically significant. Mothers who had a previous c-section, pre/post term pregnancy and BMI >23 kg/m2 had the highest significant proportion rates. Univariate analysis for risk calculation was done by odds ratio and their 95% Confidence Intervals was done by using Epi Info software. Analyses have revealed several important associations between maternal risk factors and c-section. Most of these factors are modifiable, and if targeted early can reduce the chances of c-section significantly.

KEY WORDS: caesarean, c-section, case control, socioeconomic status, risk factors

INTRODUCTION:

The last couple of decades saw dramatic changes in the realm of maternal and child health. Advances in modern obstetrics helped achieve better pregnancy outcomes both for the mother and child and caesarean sections played a substantial role in this regard. Recent trends show a global phenomenon of increasing rates of c-section.[1] Medical, Institutional, legal, psychological and socio-demographic factors play a contributing role. Although cesarean delivery can be life-saving, the rapid rise in c-section rates above the WHO recommended 15% raises global concern.[2]India is also not excluded from this trend. Two population based cross-sectional studies showed, a c-section rate of 32.6% from Madras city[3] and 34.4% from the city of Nagpur.[4]

The article, published online January 12, 2010 in The Lancet, reports the third phase of the WHO global survey, which was conducted in 9 Asian countries in 2007 and 2008: revealed that women who had a caesarean section without a medical need to were at least ten times more likely to be admitted to intensive care than those who gave birth normally. Where labour had already started, women who had a surgical delivery despite not requiring one were 67 times more likely to be admitted to intensive care than those who had a straightforward natural birth. Lumbiganon and associates maintain that "the most important finding of the survey is the increased risk of maternal mortality and severe morbidity in women who undergo cesarean section with no indication."[5]

There is considerable interest in determining the driving forces behind the global rise in Caesarean section rates. This attention is intensified by a widespread desire to halt and reverse this trend. To achieve this, a detailed understanding of the factors contributing to the increase is required, which may

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also help to explain the variations observed across units. Many purely obstetric factors have of course affected caesarean section rates. Along with obstetric factors, numerous characteristics of individual women like history of previous c-section, parity, height of the mother, maternal age, associated co-morbid conditions (diabetes, hypertension), demography, education and income are just a few of the factors that have been cited in the literature as being associated with Caesarean section. [1,3,4]

If these factors can be clarified, it may indicate key areas that could be targeted to control caesarean section rates. It is time to realize that c-sections not only put both the mother and child at risk, but also pose huge economic burden compared to normal vaginal delivery. With this background, this study was designed to identify the maternal medical and socio-demographic risk factors associated with c-sections.

MATERIALS AND METHODS:

A hospital based case control design was approached. (a) to identify medical and socio-demographic risk factors associated with Caesarean sections; (b) to find the association and calculate Odds ratios of these factors with Caesarean sections. The study was conducted in Obstetrics and Gynecology ward of a tertiary care hospital at NKPSIMS & RC in Nagpur, India from Feb 2014 to July 2014.

The sample size was calculated with the following assumptions, Type 1 error 5%, power of study 80%, prevalence of obesity (a risk factor) among control 17%, ratio of the case and control 1:1 and estimated odds ratio (OR) for obesity was 2.11 Estimated sample size was 177 cases (rounded to 180) for uncorrected Chi-square test and equal numbers of controls. After determining the total sample size of 360 mothers, all consenting 180 consecutive mothers who had cesarean section (cases) and 180 mothers with vaginal deliveries (control) were selected from postnatal ward. Only singleton deliveries were included in the study, mothers with twin and multiple pregnancies were excluded.

Data was collected using a pre-tested questionnaire including maternal and socio-demographic variables: age, education, residence, occupation, income, parity, number of previous cesarean sections, infertility treatment, gestational age at labor, Presence of co-morbid medical illness like diabetes mellitus and hypertension, body mass index (BMI as per proposed criteria for Asian population adopted from the Lancet)[6] and Socio Economic Status as per Modified Prasad's scale for the year 2014[7].

STATISTICAL ANALYSIS:

Data analysis was done by using Epi info software. A Chi square test was used to determine the association of various risk factors with the type of delivery. Univariate analysis for risk calculation was done by odds ratio and their 95% Confidence Intervals.

RESULTS:

The sample comprised of a total of 360 mothers with equally distributed caesarean section in singleton pregnancies (180 cases) and singleton spontaneous vaginal deliveries (180 controls). Majority of the mothers (70%) were from rural area.

Table 1 presents the proportion of mothers reporting caesarean section and non-caesarean delivery by patient characteristics and their significance level. Out of the 11 variables examined, 7 were statistically significant. Mothers who had a previous c-section ($p<0.0000001$), pre/post term pregnancy ($p=0.00012$) and BMI >23 kg/m2 ($p=0.000349$) had the highest significant proportion rates. In addition, height of the mother (<145 cm) and occupation of the mother were found to be statistically significant ($p<0.01$). The same pattern was observed with the birth order. C-section deliveries were found to be less frequent in rural area (48.2%) as compared to urban areas (54.2%).

Mothers who underwent a previous c-section were 14 times more likely to deliver again by c-section than mothers who dint have that history (OR, 14.65; 95% CI 6.49, 33.06). 59.2% of cases had a previous c-section compared to 4.04% of the controls. It was found that mothers who delivered pre or post term tend to have higher risk of c-section than those who delivered at term (OR, 2.69; 95% CI 1.56, 4.65). (preterm <37weeks of gestation; post term >42weeks of gestation)

BMI >23 kg/m2 was reported in 60.71% of the mothers who delivered by c-section compared to 23.82% of spontaneous vaginal deliveries, with an estimated OR = 2.60; 95% CI 1.61, 4.21. Similarly, 42.85% of mothers who underwent c-section were observed to be short statured (height <145 cm) compared to 20.80% of mothers who delivered normally (OR, 2.06; 95% CI 1.25, 3.40) Our study shows that a primigravid mother is 1.5 times more likely to undergo c-section compared to a multigravida (OR=1.59; 95% CI 1.04, 2.43).

Occupations other than housewives were

Table 1: Association of various socio-demographic and maternal variables with type of delivery

Variables	Caesarean	Vaginal	OR (95%CI)
Age at delivery (yrs) <20 or >30	73(56.2)	57(43.8)	1.47 (0.95-2.26)
20 – 29	107(46.5)	123(53.5)	
Literacy of mother			
>12th std	100(54.3)	84(45.7)	1.42 (0.94-2.16)
Up to 12th std	80(45.5)	96(54.5)	
Occupation of mother			
Working	69	48	1.70 (1.09-2.67)*
House wife	111	132	
Birth order			
1	82	62	1.59 (1.04-2.43)*
2 or more	98	118	
Previous CS			
Yes	67	07	14.65 (6.49-33.06)*
No	113	173	
Pregnancy duration			
Pre/post term	51	23	2.69 (1.56-4.65)*
Term	129	157	
Socioeconomic status			
Class I,II and III	75	66	1.23 (0.80-1.88)
Class IV and V	105	114	
Place of residence			
Urban	58	49	1.27 (0.80 -2.05)
Rural	122	131	
Co morbid Condition			
Present	42	23	2.07 (1.19-3.62)*
Absent	138	157	
BMI			
More than 23 Kg/m2	68	34	2.60 (1.61-4.21)*
Up to 23 Kg/m2	112	146	
Height of mother			
<145cm	54	31	2.05 (1.24 – 3.42)*
>145cm	126	149	

CI=Confidence Interval *Significant $p < 0.05$

observed in 62.16% of the cases compares to 36.36% of controls with an estimated OR, 1.709; 95% CI 1.094, 2.672. Socio-economic status (Prasad's Scale) was not found to be a risk factor with 71.4% of cases and 57.9% of controls falling either in upper or middle class (OR, 1.23; 95% CI 0.80, 2.05)

Likewise, place of residence could not be established as a risk factor with 47.54% of mothers who delivered by c-section and 42.98% of normally delivered mothers reside in urban region (OR, 1.27; 95% CI 0.80, 2.05)

Comorbidities (hypertension, diabetes; both gestational and pre-existing) were seen in 30.43% of cases compared to 14.64% of controls with an estimated OR, 2.07; 95% CI 1.19, 3.62. This study failed to identify maternal age and literacy as risk factors for c-section.

DISCUSSION:

The study examined the maternal, socio-demographic and other relevant determinants of c-section in a tertiary care teaching hospital in central India.

A highly significant association was found between caesarean deliveries and previous c-section. This observation is consistent with the findings of many other studies.[3,8-13] Leone T and associate's study conducted in six developing countries revealed that previous c-section delivery was the highest risk factor for subsequent caesarean.[11] Other studies done in developing countries like Pakistan,[8] Jamaica[9] and Oman[13] have also found that there is a strong association between previous c-section and a repeat caesarean. Mothers with a previous history of caesarean section were at an increased risk of uterine rupture and bleeding during pregnancy due to placenta praevia.[14-16] Though trail of labour is recommended, mothers with a previous scar are rarely give the trail and are almost always planned for an elective c-section.

The association between c-sections and obese mothers has been well documented in the literature. Obese mothers are associated with complications such as diabetes (both gestational and pre-existing), pregnancy induced hypertension and pre-eclampsia are at a greater risk to deliver by c-section.[11,12,17-20] Our study revealed similar results, suggesting highly significant association between obesity and c-sections (p value = 0.000349).

Mothers who delivered preterm (<37 weeks gestation) or post term (>40 weeks gestation) were more likely to deliver by c-section compared to mothers who delivered at term. These results were in line with observations of Al Busaidi et al, Patel et al, and Bettegowdaet al.[13,14,21]

Maternal height <145 cm was found to be a risk factor for c-section delivery. 63.5% of mothers with height <145cm underwent c-section. Maternal short stature has been established as an independent risk factor for caesarean delivery.[22-24] WHO recommends mothers with height <140cm be categorized as at risk mothers. Kirchengast et al, Sheiner et al support this association with their studies.

The association between maternal education and risk of c-section has been described by numerous authors,[10,25,26] although some authors could not find such correlation.[8,27] Parazzini et al suggests that when adjusted for maternal age and birth weight, the association between maternal education and c-section markedly decreases. Our study did not show significant association between maternal education and c-section.

Some authors suggest significant association between socio-economic status and place of residence with c-section.[28-30] However, our study could not show them as risk factors for c-section. This might be due to the demographic distribution and geographical difference of the study sample as most of the mothers hail from a rural background. The same is true with maternal age as a risk factor for c-section. Though several studies implicate maternal age as a significant factor for c-section, our study could not make the association.

CONCLUSION:

In conclusion, these analyses have revealed several important associations between maternal risk factors and Caesarean section. Most of these factors are modifiable, and if targeted early can reduce the chances of caesarean section significantly.

It is interesting to note that c-sections are more common in primigravida mothers when compared to multi gravida. Also, mothers with a previous history of c-section are 14 times more likely to deliver again by c-section. This could be due to the fact that trail of labour is rarely given in mothers with a c-section scar. Although, studies from all over the globe showed promising results with vaginal births after caesarean section (VBAC), it is seldom practiced. One of the factors favouring a successful VBAC is a previous vaginal delivery. However, since primi mothers are already predisposed to c-section their chance of a successful VBAC is further diminished. Further studies to check the mode of delivery in primigravid

mothers is advocated. It is also essential to understand the factors in a primi mother that predisposes her to a c-section delivery.

Interventions in the form of legislation and policy making are required to regulate and check the proportion of c-section deliveries. Recently, the govt of Kerala issued guidelines to reduce the rate of c-section in the state of Kerala. Likewise, initiative in this regard is recommended by other states with high rates of c-section too.

LIMITATIONS OF THE STUDY:

There are a few limitations of the current study:

1. Due to the study setting being a single tertiary care teaching hospital, institutional factors that are responsible for caesarean sections were not comparable.
2. The authors acknowledge the fact that multivariate analysis would be best suited to analyse such study design.

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