# Indications and Determinants of Cesarean Section: A Cross-Sectional Study

**Neetu Singh,**
**Yasodhara Pradeep,**
**Sugandha Jauhari[1]**

*Departments of Obstetrics and Gynaecology and [1]Community Medicine, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India*

## Abstract

**Background:** Cesarean section is one of the most commonly performed surgeries in obstetric practice for saving the lives of women and their newborns from pregnancy- and childbirth-related complications. Its prevalence has increased alarmingly in the last few years, which has motivated this research to identify the indications and determinants, influencing cesarean section delivery in the study area and determine the associated correlates for emergency and elective cesarean sections. **Materials and Methods:** This was a hospital-based cross-sectional study conducted at a tertiary care center from April 2019 to September 2019. A quantitative tool was designed to capture all the relevant information regarding sociodemographic factors, obstetric characteristics, and indications of cesarean section among the pregnant women delivering at the tertiary care center. **Results:** A total of 150 women with cesarean deliveries were included in this study. The percentage of primigravida women was significantly higher among emergency than elective cesarean section ($\chi^2 = 28.19$, $P = 0.0001$). Majority of the women were illiterate or had primary education in emergency cesarean section than elective ($\chi^2 = 44.9691$, $P = 0.0001$). Majority of the women with no or only one antenatal visit underwent emergency than elective cesarean sections ($\chi^2 = 42.2195$, $P = 0.0001$). Those females who presented with previous Lower Segment Cesarean Section (LSCS) had greater chances of elective cesarean section, and it was statistically significant ($P = 0.004$). **Conclusion:** The increase in cesarean section rate causes burden to the general health system and also strain on the family members. Hence, caution should be exercised in decision-making to perform cesarean section, especially for primigravida, and a comprehensive evidence-based approach needs to monitor the indication of cesarean section.

**Keywords:** *Cesarean section, determinants, elective, emergency*

## Introduction

Cesarean section delivery is the most important operation in obstetrics, and its incidence is on the rise throughout the world.[1] It is one of the most commonly performed major surgeries in obstetric practice intended to save the mother and child, in turn, reducing the maternal and perinatal mortality. The steadily increasing global rate of cesarean section has become one of the most debated topics in maternity care as its prevalence has increased alarmingly in the last few years.[2,3]

The World Health Organization (WHO) has recommended that the population-based cesarean section rate should lie between 5% and 15%[4] which will have an optimal impact.[5,6] Although the cesarean section rate has increased globally over the past decade, recent data from both developed and developing countries have documented an average rate of 27% cesarean section during the year 2013.[7] The WHO states no additional health benefit associated with cesarean section if its rate goes above 10%–15%. Maternal wish has nowadays become a new indicator for the cesarean section. Other factors attributed to the high and rising cesarean section rates include recent progress in social determinants of health, improvement in road transportation system, and extensive growth of for-profit private facilities capable to providing comprehensive emergency obstetric services.[8]

Unnecessary cesarean section may have an adverse impact upon maternal, neonatal, and infant morbidity and mortality. The high cost of cesarean section may result in catastrophic health expenditure for families and additional pressure upon health systems, especially in low- and middle-income countries.[7,9] Nonmedical indications constitute one-third of the total 18.5 million cesarean sections performed annually. The

**Access this article online**

**Website:**
www.ijabmr.org

**DOI:**
10.4103/ijabmr.IJABMR_3_20

**Quick Response Code:**

**How to cite this article:** Singh N, Pradeep Y, Jauhari S. Indications and determinants of cesarean section: A cross-sectional study. Int J App Basic Med Res 2020;10:280-5.

high cesarean section rate warrants monitoring indications of all cesarean sections in public and private facilities.[10]

The present study aims to explore the indications of cesarean section along with their sociodemographic and obstetric determinants to identify factors needed to be addressed for strategies for ending maternal and neonatal mortality.

## Materials and Methods

This hospital-based cross-sectional study was conducted from April 2019 to September 2019, at a government tertiary care center.

### Inclusion criteria

All pregnant women who underwent cesarean section either booked in antenatal clinic or unregistered admitted in early pregnancy were included in the study.

### Exclusion criteria

Women who did not give their consent to participate were excluded from the study.

### Sample size

For the purpose of sample size estimation, finite population correction has been applied to the sample size formula, i.e.,

$n = NX/(X + N - 1)$.

$X = Za/2*p \ (1 - p)/d^2$.

where

$n$ = Sample size for finite population

$X$ = Sample size for infinite population

$Z_{a/2}$ – Critical value of the normal distribution at $a/2$ (for a confidence level of 95%, $a = 0.05$, and the critical value is 1.96).

$P$ – Estimated sample proportion, i.e., prevalence of cesarean section delivery from a tertiary care center (value is 49.62%).[11]

$d$ – Margin of error for appropriate level of precision (value is 0.05).

$N$ – Estimated population size, i.e., approximate frequency of pregnant females attending the hospital during the study period (value is 245).

At 95% confidence interval and power of 80%, the minimum sample size ($n$) required is 150 patients.

### Data collection

A total of 150 women with cesarean section were included in the study. A detailed pro forma was completed regarding the relevant information about registered or unregistered, elective or emergency cesarean section. Elective cesarean section was defined as those performed without emergencies, and the decision was made before the onset of labor. Emergency cesareans were defined as those performed for maternal or fetal emergencies.

All women who delivered in the study period were identified, and their facility records were reviewed, including patient admission file, in-patient register, operation theater register, and bed-head tickets. Their demographic characters were noted such as age, parity, socioeconomic status, body mass index (BMI), residence, education, and employment status. Obstetric characters were also recorded such as gestation age at birth, fetal number, number of antenatal visits, and history of fetal loss, and their indication for cesarean section was also noted down.

### Data analysis

The data were analyzed using the licensed Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) version 22.0 software purchased by the institute (license number: DOEJWLL). Descriptive summary using frequencies, percentages, graphs, and cross tabs was used to the present study results. Probability (*P*) was calculated to test statistical the significance at the 5% level of significance. The association between independent and dependent variables was determined using the Chi-square test and logistic regression. Factors which were statistically significant in univariate analysis were subjected to multivariate logistic regression after eliminating confounding variables.

## Results

A total of 150 women with cesarean section were enrolled in the study. Out of them, 88% were elective cesareans and 62% were emergency cesarean sections. Table 1 shows the sociodemographic and obstetric characteristics of the study participants. The maternal age for women undergoing cesarean section ranges from 19 years to 35 years. Age distribution showed that majority of the women were in the age group of 20–29 years, i.e., 67 (77%) in elective and 48 (79%) in emergency cesarean groups, respectively. Eight (9%) and six (9%) women were in the age group of 30–34 years in the elective and emergency cesarean groups, respectively. Similarly, 9% of the women were in the age group of 19 years in both the groups. The percentage of women in the two groups did not differ significantly ($\chi^2 = 1.0295$, $P = 0.905$)**.** The percentage of primigravida women was higher in emergency cesarean section, whereas the percentage of multigravida women was higher in the elective cesarean section group ($\chi^2 = 28.1948$, $P = 0.0001$).

The percentage of upper- and upper-middle socioeconomic status women were maximum in elective, whereas lower-middle socioeconomic status women were in emergency cesareans ($\chi^2 = 18.798$, $P = 0.0009$). The distribution of percentage of BMI of women was significantly higher in elective than in the emergency

## Table 1: Distribution of sociodemographic and obstetrics characteristics among the study participants (*n*=150)

| Characteristics | Elective CS, *n* (%) | Emergency CS, *n* (%) | $\chi^2$ | *P*# |
|---|---|---|---|---|
| Age (years) | | | | |
| 16-19 | 8 (9) | 6 (9) | 1.0295 | 0.905 |
| 20-24 | 45 (51) | 30 (48) | | |
| 25-29 | 22 (26) | 18 (31) | | |
| 30-34 | 8 (9) | 6 (9) | | |
| >35 | 2 (5) | 2 (3) | | |
| Parity | | | | |
| Primipara | 36 (40) | 48 (77) | 28.195 | 0.0001* |
| Multipara | 52 (60) | 14 (23) | | |
| Socioeconomic status@ | | | | |
| Upper | 29 (33) | 11 (18) | 18.798 | 0.0009* |
| Upper middle | 31 (35) | 12 (19) | | |
| Lower middle | 18 (20 | 29 (47) | | |
| Upper lower | 6 (7) | 3 (5) | | |
| Lower | 4 (5) | 7 (11) | | |
| BMI | | | | |
| <18.5 | 19 (32) | 14 (23) | 17.563 | 0.002* |
| 18.5-24.9 | 31 (35) | 26 (42) | | |
| 25-29.9 | 18 (20) | 19 (31) | | |
| 30-34.9 | 12 (14) | 2 (3) | | |
| >35 | 8 (9) | 1 (1) | | |
| Residence | | | | |
| Rural | 22 (25) | 42 (68) | 33.580 | 0.0001* |
| Urban | 66 (75) | 20 (32) | | |
| Education | | | | |
| Illiterate | 9 (10) | 28 (46) | 44.969 | 0.0001* |
| Primary | 8 (9) | 12 (19) | | |
| Secondary | 40 (45) | 12 (19) | | |
| Higher secondary | 31 (36) | 10 (16) | | |
| Employment status | | | | |
| Employed | 30 (34) | 38 (61) | 14.617 | 0.0001* |
| Unemployed | 58 (66) | 24 (39) | | |
| Gestation age at birth | | | | |
| Preterm (<37 weeks) | 40 (45) | 36 (58) | 3.383 | 0.066 |
| Term (>37 weeks) | 48 (55) | 26 (42) | | |
| Fetal number | | | | |
| Singleton | 83 (94) | 50 (81) | 7.7257 | 0.005* |
| Multiple | 5 (6) | 12 (19) | | |
| Number of ANC visits | | | | |
| 0 | 7 (8) | 27 (44) | 42.2195 | 0.0001* |
| 1 | 9 (10) | 10 (16) | | |
| 2 | 32 (37) | 14 (23) | | |
| >3 | 40 (45) | 11 (17) | | |
| History of fetal loss | | | | |
| Yes | 34 (39) | 22 (34) | 0.5393 | 0.463 |
| No | 54 (61) | 40 (66) | | |
| Total | 88 | 62 | | |

*$P<0.01$ is significant, #Chi-square test, @Modified B.G. Prasad Classification (2019). BMI: Body mass index; ANC: Antenatal care; CS: Cesarean section

cesarean section ($\chi^2 = 17.563$, $P = 0.002$). Majority of the women, i.e., 66 (75%), belonged to urban area in elective, whereas 42 (68%) were of rural area in the emergency cesarean group ($\chi^2 = 33.58$, $P = 0.0001$). The percentage of level of literacy was significantly associated in both the groups ($\chi^2 = 44.969$, $P = 0.0001$). Maximum percentage of employment (58, 66%) was found in elective whereas 38 (61%) were unemployed in emergency cesarean

sections ($\chi^2$ = 14.617, $P$ = 0.0001) [Table 1]. For gestation age at birth, majority of the women (48, 55%) were term (>37 weeks) in elective and 36 (58%) women were preterm, which showed a significant association ($\chi^2$ = 3.383, $P$ = 0.066).

Majority of the women (83, 94%) in elective and 50 (81%) in emergency cesarean sections had singleton pregnancy ($\chi^2$ = 7.726, $P$ = 0.066). Majority of the women (40, 45%) were booked in elective and 27 (44%) were unbooked in emergency cesarean sections, and they were significantly associated ($\chi^2$ = 42.2195, $P$ = 0.0001). History of fetal loss was significantly associated in elective cesarean sections ($\chi^2$ = 0.5393, $P$ = 0.463).

Table 2 shows the various indications for cesarean sections. The most frequent indications for elective cesarean sections were previous cesarean section, 29 (33%). Other indications were fetal distress, 17 (19%); malpresentations, 11 (13%); and maternal request, 8 (9%). The main indications for emergency cesarean sections were fetal distress (39 (62%)) and others were previous cesarean section in labor (12 (19%)).

Table 3 shows the variables responsible for elective cesarean section after adjusting for confounding variables.

**Table 2: Various indications of cesarean section among the study participants (*n*=150)**

| Indications of CS | Elective, *n* (%) | Emergency, *n* (%) |
|---|---|---|
| Previous cesarean section | 29 (33) | 12 (19) |
| Maternal request | 8 (9) | 1 (2) |
| Fetal distress | 17 (19) | 39 (62) |
| Malpresentation | 11 (13) | 1 (2) |
| Failed induction | 6 (7) | 2 (3) |
| Bad obstetric history | 7 (8) | 2 (3) |
| Macrosomia | 3 (3) | 2 (3) |
| Abnormal umbilical cord Doppler study | 5 (6) | 2 (3) |
| Multiple pregnancy | 2 (2) | 1 (2) |
| Total | 88 | 62 |

CS: Cesarean section

Those females who presented with previous history of cesarean had greater chances of elective cesarean section, and it was statistically significant ($P$ = 0.0001). Maternal request was also significantly associated with elective cesarean section (0.022). Those females who had presented with fetal distress had 1.5 times more chances of elective cesarean section, but this was not statistically significant ($P$ = 0.474). Females with failed induction had 3.2 times more chances of elective cesarean section, but this was statistically insignificant ($P$ = 0.251). The other indications such as malpresentation, bad obstetric history, macrosomia, and abnormal umbilical cord Doppler study had a protective effect on the type of cesarean section as their adjusted odds ratio was <1, so females with these indications had more chances of elective cesarean section, but none was statistically significant ($P$ > 0.05).

## Discussion

The aim of study was to find the maternal and fetal outcomes of elective and emergency cesarean sections. In our study, majority of the women were in the age group between 20 and 24 years (51%) in elective and (30%) in the emergency group, whereas in Verma *et al*.'s study, majority of the women were in the age group of 26–30 years (51%) in elective and 21–25 years (49%) in the emergency group.[12] Primigravida constituted 73.8% in the elective group and 37.5% in the emergency group. Quin *et al*. found in their study that primigravida are at higher risks and, therefore, a higher incidence of cesarean section is found among them.[13] In our study, primigravida 77% constituted in the emergency group, whereas multigravidas 60% were in the elective group. This finding coincides with other studies also.[14,15]

In our study, upper- and upper-middle socioeconomic status was common (65%) in the elective group, whereas lower middle was common in the emergency group (47%). In many other studies, socioeconomic status was found to be positively associated with cesarean section delivery.[16] The opposite trend has also been observed in developed countries, where higher economic status was protective against cesarean section.[17] In our study, 68% of the women

**Table 3: Binomial logistic regression analysis of indications and type of cesarean section**

| Indications | *B* | SE | *P* Value | Adjusted OR | 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Previous CS | −2.275 | 0.615 | 0.0001* | 0.103 | 0.031 | 0.343 |
| Maternal request | −2.754 | 1.201 | 0.022* | 0.064 | 0.006 | 0.670 |
| Fetal distress | 0.432 | 0.604 | 0.474 | 1.541 | 0.472 | 5.033 |
| Malpresentation | −2.988 | 1.187 | 0.012* | 0.050 | 0.005 | 0.516 |
| Failed induction | 1.179 | 1.027 | 0.251 | 3.250 | 0.434 | 24.345 |
| Bad obstetric history | −1.644 | 0.987 | 0.096 | 0.193 | 0.028 | 1.338 |
| Macrosomia | −1.080 | 1.073 | 0.314 | 0.340 | 0.041 | 2.780 |
| Abnormal umbilical cord Doppler study | −1.591 | 1.009 | 0.115 | 0.204 | 0.028 | 1.471 |
| Multiple pregnancy | −1.368 | 1.348 | 0.310 | 0.255 | 0.018 | 3.577 |

SE: Standard error; CI: Confidence interval; OR: Odds ratio; CS: Cesarean Section; *$P$<0.05 is significant

belonged to a rural background in the emergency group, whereas 75% of the women were from an urban area in the elective group, and the main reason probably was due to better facilities and patient care available to the urban population.[18] In our study, majority of the women (81%) were educated at secondary or higher secondary levels in the elective group, whereas majority of the women (46%) were illiterate in the emergency group. They observed that higher education, awareness, and knowledge of childbirth are expected to be high among this group of women.[17] In our study, majority of the women (66%) were employed in the elective group, whereas 61% were unemployed in the emergency group and the reason for this was probably due to the earning status.

Table 1 shows that 55% of the women with gestation age >37 weeks of gestation had cesarean section in the elective group, whereas 58% of the women with gestation age <37 weeks had cesarean section in the emergency group. The reason was that in the elective group, the most common indication was repeat cesarean which was electively performed at term gestation. Delnord *et al.* stated that the cesarean section rate was highest for very preterm birth and declined to a nadir at 40 weeks of gestation.[19]

Most of the women had 94% and 81% cesarean section in singleton pregnancy in the elective and emergency groups, respectively, whereas 6% and 19% cesarean for multiple pregnancies in the elective and emergency groups, respectively. Reason for the difference of cesarean in multiple pregnancies was that most of the women came directly in labor in emergency. Hofmeyr *et al.* studied that women had planned cesarean section with twin pregnancy.[18] Lee *et al.* also reported the different trends of cesarean delivery for twin births in their study.[20]

Majority of the women (45%) had more than three antenatal visits in the elective group, whereas in the emergency group, majority of the women (60%) had one or no antenatal visits. The WHO recommended that antenatal care (ANC) visits are crucial and responsible to identify complication in advance.[21] The quality of ANC needs to be prioritized along with the number of ANC taken with emphasis on sensitive discussion on risk and benefits of both normal delivery and cesarean section to provide emotional support on taking decision.[22]

In our study, the most common indication of cesarean section in the elective group was previous cesarean section (33%), followed by fetal distress (19%), malpresentation (13%), and failed induction (7%). Similar findings have been reported by other researchers.[23,24]

The most common indication in the emergency group was fetal distress (62%) and previous LSCS in 19% in the present study; this was because that most of unbooked women directly came in labor and showed abnormal fetal tracing. Fetal distress has a reported global prevalence of about 20%,[25] and it was accounted for about 16% cesarean section at tertiary level hospitals in Bangladesh.[26,27] Malpresentation was the indication in 13% of elective and 25% in the emergency group. Ali *et al.* reported in their study that 11.9% malpresentation was the indication in emergency sections.[28]

Failed induction was the indication in 7% in the elective group, whereas it was 3% in the emergency group. This was lower than what we found in other studies.[15] Macrosomia was the indication in 3% of both the groups. It leads to cephalopelvic disproportion and hence cesarean section. A high proportion of cesarean section for cephalopelvic disproportion diagnosed before the onset of labor suggests a more aggressive approach, thus causing an increase in cesarean section rate.[13] In this study, most of the cesarean sections were performed with a definite indication. The women in our region do not accept cesarean section as a primary mode of delivery. Nine percent of the cases in the elective group and 2% in the emergency group were reported in our study. This situation is different in a developed country where cesarean section on maternal request was a primary mode of delivery.[29]

There is currently no evidence that elective cesarean is safer than vaginal delivery; in fact, most studies suggest that cesarean section has a much higher risk than labor. Therefore, obstetric care providers should promote vaginal delivery as the optimum mode of delivery.[30]

## Conclusion

Cesarean section is a major obstetric intervention and considered as a process indicator in maternal health to monitor progress. There is a tremendous increase in population based on all different causes of cesarean section rate globally. This causes burden to the general health system and also strain on family members and may complicate maternal and child health. Hence, caution should be exercised in decision-making to perform cesarean section delivery. The government should also develop better health-care infrastructure and inform policy for strategies for ending preventable maternal and neonatal mortality.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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