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Original Research Article

Analysis of socio-economic factors influencing caesarean section rates in Maharashtra, India

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ABSTRACT

Background: The aim of the present study is to investigate the socio-demographic and economic determinants of caesarean (C-) section deliveries in Maharashtra. The paper also focuses to estimate inequalities in C-section deliveries in the state.
Methods: The fifth round of the National Family Health Survey (NFHS) 2019-21 was used to accomplish the objective. Univariate, bivariate and logistic regression were used to ascertain the determinants of C-section.
Results: The prevalence of C-section delivery in India rose from 2.9% during 1992-93 to 10.6% in 2005-06 and to 21.5% during 2019-21. The proportion of C-section delivery in Maharashtra during 2019-21 is observed to be 25.4%, with 18.3% of the deliveries occurring at public health facility, while 38.9% of the deliveries takes place in private health care settings. Women residing in urban areas, belonging to richer wealth asset index and having higher educational qualification are found to have greater chance of caesarean deliveries.
Conclusions: The study reveals that C-sections have increased dramatically in Maharashtra over the previous three decades. The hospital administration is encouraged to take effective actions to reduce the likelihood of needless C-sections while retaining medical justification for C-section births.

Keywords: C-section, Inequality, Regions, Maharashtra

INTRODUCTION

The global caesarean section (C-section) delivery is unevenly distributed and results in more than 15 percent of all abdominal deliveries. While C-section is a critical lifesaving procedure for both mother and babies; it can result in adverse short-and-long term maternal health complications outcome if performed without medical indications.[1] C-section procedure is preferred only when the mother or baby has an endangering problem during the natural birth procedure. C-section rates are observed to be greater in high-income and upper-middle-income countries as compared to low-middle-income countries.[2] Although the World Health Organization (WHO) recommends that prevalence of C-section delivery case should not exceed 15 percent in India between 2006 and 2016, almost 22 states had prevalence of C-section deliveries greater than this standard. Choosing C-section delivery is complex as it has serious risk to mother and child.[3] Deliveries through C-section is an unacceptable burden for the state with limited resources, especially for countries who lack adequate emergency obstetric care.[2]

Women age 35 years and more are greater likely to have C-section deliveries.[4] Moreover, women who are progressive, reside in urban areas and who belong to higher wealth asset class have a greater probability of repeated C-section delivery.[5] According to religion, Muslim women are less likely to have repeated caesarean sections compared to Hindu women.[5] Socio-economic factors are seen to have a significant correlation with C-section and repeated C-section deliveries. It is also

observed that women with higher educational attainment and belonging to the high wealth quintile prefer to opt for C-section deliveries without medical indication to avoid labour pains that occurs during the natural birth process.[6] Women who had regular check-ups during pregnancy, and more than four antenatal care visits are found to have a greater chance of undergoing C-section compared to women who did not have regular check-ups and antenatal care visits.[7] Women with high body mass index, who had at least one ultrasound imaging during their current pregnancy, whose babies weighed more than three kg, had multiple births had a higher risk of C-section delivery.[8]

Despite numerous literatures addressing the socio-demographic and economic aspects of C-sections in India, regional estimates are still missing in the country. The aim of the present study is to investigate the socio-demographic and economic determinants of C-section deliveries in Maharashtra. The paper also focuses to estimate inequalities in C-section deliveries in the state.

METHODS

The study uses data from the fifth round of the National Family Health Survey (NFHS) conducted during 2019-21(9). The NFHS provides information on fertility, infant and child mortality, family planning, maternal and child health, reproductive health, nutrition, anemia etc. obtained from representative household samples at the federal, state and district across India.

Statistical analysis

Chi-square test of association was used to determine the relationship between the observed and expected frequencies in one or more categories, denoted by x and described as:

$$\chi^2 = \Sigma\,(xi - mi)^2 / mi, xi\ (for\ i = 1, 2 \ldots . K)$$

Binary logistic regression analysis was applied to determine the odds of C-section deliveries. The model is given by the equation below where occurrence of C-section deliveries was considered to be the dependent variable and various demographic and socio-economic characteristics of women were observed to the predictor variables.

$$log\,\frac{p}{(1-p)} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 \ldots \ldots . \beta_n k_n$$

The analysis was carried out using STATA version 16 as well as ArcGIS 10.8 was used to prepare a district-level map of Maharashtra while Microsoft excel was used to prepare graphs.

Dependent variable

C-section among married women aged 15-49 years was taken as the dependent variable. Information on C-section delivery was obtained through the following two questions asked to currently married females: "was the child delivered by C-section?" or "did they cut your belly open to take the baby out?". Responses were recorded as "Yes" or "No."

Independent variable

Women and household characteristics such as mother education, age, body mass index, antenatal visit, birth order, and ultrasound test, place of residence, wealth index, religion, caste, place of delivery, and financial assistance to delivery were included as predictor variables. The analysis was confined to the state of Maharashtra.

RESULTS

Figure 1 presents the trend of C-section delivery in India and Maharashtra over three decades.

According to the National Family Health Survey (NFHS), prevalence of C-section delivery in India rose from 2.9% during 1992-93 to 10.6% in 2005-06 and to 21.5% during 2019-21. Similarly, C-section deliveries increased from 5.4% during 1992-93 to 15.6% in 2005-06, and finally it rose to 25.4% during 2019-21.

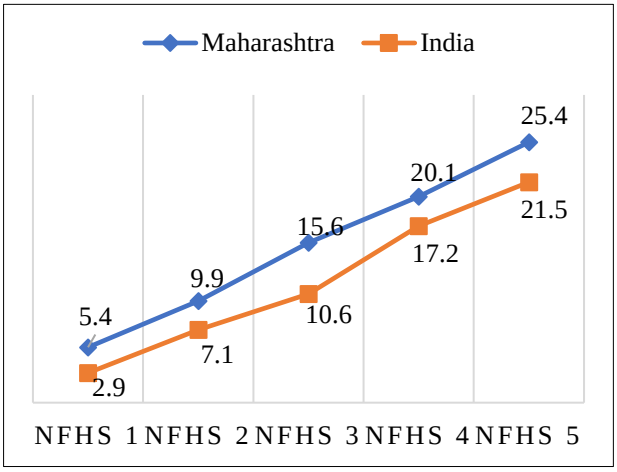

Figure 1: Trend of C-section deliveries in India and Maharashtra between 1992 to 2021, NFHS-5.

Prevalence of C-section deliveries in the state of Maharashtra is observed to be 25.4%, wherein the Western region (32%) have the highest rate of C-section deliveries while the Marathwada regions has the lowest percentage (16%). 30.6% urban women opted for C-section deliveries compared to 21.5% women residing in rural areas. Percentage of caesarean deliveries are found to be highest among mothers with higher educational attainment (39.9%), women belonging to other religion (47.8%) and from the other backward class (OBC) (29.1%). Similarly, only 7.3% of women from the poorest wealth asset quintile underwent deliveries through C-section compared to 38.8% mothers from the wealthiest economic quintile. The

place of delivery is one of the significant determinants of C-section delivery (Table 1).

Age of the mother is another crucial determinant of C-section delivery. Women above 35 years of age reported highest prevalence (33.6%) of C-section deliveries with 33.6% compared to women below 35 years.

Prevalence of C-section deliveries is also seen to be higher among mothers with four or more antenatal visits and amongst women who had an ultrasound test. Association of C-section deliveries with different socio-demographic and economic characteristics of mothers during 2019-2021 is represented in Table 2.

The Western and Vidarbha region have 25% higher odds of women undergoing C-section deliveries compared to the Konkan region. Women residing in urban areas, belonging to richer wealth asset index and having higher educational qualification are found to have greater chance of caesarean deliveries compared to mothers from rural areas, from poorer wealth quintile and having no education. Additionally, women from the other backward caste have a 12% higher chance of undertaking C-section delivery compared to mothers belonging to the scheduled caste (SC).

Similarly, mothers above 35 years of age, having a high body mass index, having more than 4 antenatal visit and going through ultrasound have a higher association with C-section deliveries. Additionally, private health care facilities are seen to have a 2-fold greater probability of C-section deliveries as compared to public health care settings.

Table 1: Percent distribution of C-section deliveries by different background characteristics in Maharashtra 2019-21.

Background characteristics	Prevalence % (χ^2***)
Region	
Konkan	28.2
Western	32.0
Marathwada	16.2
North	20.6
Vidarbha	25.0
Place of residence	
Urban	30.6
Rural	21.5
Wealth index	
Poorest	7.3
Poorer	16.8
Middle	23.3
Richer	27.1
Richest	38.8
Religion	
Hindu	26.0
Muslim	19.5
Buddhist	26.5
Other	47.8
Caste	
Scheduled caste	24.6
Scheduled tribe	14.1
OBC	29.1
Other	27.1
Age of mother	
≤19	21.7
20-24	21.2
25-34	26.8
≥35	33.6
Mother education	
No education	10.2
Primary	14.6
Secondary	24.1
Higher	39.9

Continued.

Background characteristics	Prevalence % (χ^2***)
Body mass index	
<18.5	20.2
18.5-24.9	22.4
25.0>	38.6
Antenatal visit	
0-3	22.7
≥4	29.3
Birth order	
1	31.1
2	25.7
≥3	12.7
Place of delivery	
Public	18.3
Private	38.9
Financial assistance for delivery	
No	29.7
Yes	22.7
Ultrasound test	
No	10.4
Yes	26.2
Maharashtra	25.4

Significant value 95% CI***p<0.001, **<0.01, *p<0.05

Table 2: Logistic regression analysis of C-section deliveries by different background characteristics in Maharashtra.

Background characteristics	Odds ratio % (χ^2***)
Region	
Konkan®	
Western	1.254**
Marathwada	0.862
North	1.148
Vidarbha	1.246**
Place of residence	
Urban®	
Rural	0.820***
Wealth index	
Poorest®	
Poorer	1.466**
Middle	1.635***
Richer	1.730***
Richest	1.635***
Religion	
Hindu®	
Muslim	0.701***
Buddhist	0.980
Other	1.106
Caste	
Scheduled caste®	
Scheduled tribe	0.716
OBC	1.119
Other	1.113
Age of mother	
≤19®	
20-24	0.985

Continued.

Background characteristics	Odds ratio % (χ^2***)
25-34	1.302
≥35	2.028***
Mother education	
No education®	
Primary	1.096
Secondary	1.302
Higher	1.471**
Body mass index	
<18.5®	
18.5-24.9	1.134
25.0>	2.139***
Antenatal visit	
0-3®	
≥4	1.122*
Birth order	
1®	
2	0.744***
≥3	0.37***
Place of delivery	
Public®	
Private	2.195***
Financial assistance for delivery	
No®	
Yes	0.923
Ultrasound test	
No®	
Yes	1.455**

Note: Significant value 95% CI***p<0.001, **<0.01, *p<0.05, ®- Reference.

DISCUSSION

According to the study, C-section births are more common in private hospitals than in public ones. The main determinants of C-section births include location, household affluence, mother's education, and body mass index. Mothers with greater levels of education, mothers with multiple children, mothers who had at least one prenatal ultrasound, and mothers who resided in metropolitan areas had slightly higher C-section rates. In the past three decades, there has been a growth in the C-section rate in Maharashtra, going from 5.4% in 1992-1993 to 25.4% in 2019-21. Similar research was out in Rajasthan also noted this upward trend.[10]

The primary causes of caesareans are urban dwellers, mothers who have their first child beyond the age of 35, pregnant women with hypertension, and mothers whose babies are born breech.[7] If the infants' weight is normal and this is a first pregnancy, the risk is reduced of caesarean. Low or high weight and multiple births are two obstetric factors that increase the possibility of a C-section.[11]

Among pregnant patients who had issues, C-sections were more common in private healthcare settings. In addition, the study found a direct connection between pregnancy problems and C-sections.[12] The prevalence of C-section deliveries was found to be continuously increasing in both public and commercial health facilities in the state of Maharashtra. Compared to public healthcare facilities, private healthcare institutions had an adjusted odds ratio for caesarean births that was three times greater. Rural, undereducated, and poorer populations are experiencing an increase in C-section birth rates that is more rapid and consistent.

Additionally, there are important factors that contribute to this, such as mother education, an increase in new born and nulliparity, the lack of maternal anaemia, and a decrease in premature births.[13] First-time pregnancy, those with higher education, those who live in cities, and statistically significant mothers from wealthy homes give birth through C-section more frequently in private hospitals.[14]

The Mumbai cohort study found that both the initial and subsequent rates of caesarean deliveries were rising. The percentage of first-time C-section deliveries doubled during the previous ten years. Additionally, it was shown that one of the main reasons for caesarean deliveries was foetal distress.[15]

It was discovered that substantial correlations between C-sections and age, religion, place of residence, tribe, BMI, and place of habitation for delivery (public/private) existed in each of these categories. Strong relationships exist between higher levels of education, household wealth,

numerous prenatal visits, and out-of-pocket expenses for C-sections.[16]

The current study also discovered a negative correlation between birth order and C-section, with women having a greater C-section rate for their first child than for children born in higher birth orders. One theory is that because women had multiple pregnancies, there was less possibility of complications developing during pregnancy and childbirth than there would have been for their first kid, who was born in the lower birth order.[17]

CONCLUSION

The study reveals that C-sections have increased dramatically in Maharashtra, India, over the previous three decades, with the biggest increase in the Amravati district. A distinct private-public discrepancy in C-section rate is reported in Maharashtra, necessitating the development of a monitoring method to monitor totally unnecessary C-section delivery at various health care institutions. The hospital administration is encouraged to take effective actions to reduce the likelihood of needless C-sections while retaining medical justification for C-section births.

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REFERENCES

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: Global and regional estimates. BMJ Glob Heal. 2021;6(6):1-8.
2. Sarngadharan RC, Vandana KR, Nandu KT. Rising Trend Of Caesarean Section : Review On The Determinants Of Cesarean Section Deliveries. Eur J Mol Clin Med. 2020;07(07):5904-9.
3. Mukherjee SN. Rising cesarean section rate. 2006;56(4):298-300.
4. Bhatia M, Dwivedi LK, Banerjee K, Dixit P. An epidemic of avoidable caesarean deliveries in the private sector in India: Is physician-induced demand at play? Soc Sci Med. 2020;265:113511.
5. Sahoo H, Jeermison RK. Repeated Caesarean Section delivery in India. Child Youth Serv Rev. 2020;116.
6. Vora KS, Koblinsky SA, Koblinsky MA. Predictors of maternal health services utilization by poor, rural women: a comparative study in Indian States of Gujarat and Tamil Nadu. J Health Popul Nutr. 2015;33:9.
7. Singh P, Hashmi G, Swain PK. High prevalence of cesarean section births in private sector health facilities- analysis of district level household survey-4 (DLHS-4) of India. BMC Public Health. 2018;18(1):613.
8. Bansod DW, Paswan B, Lhungdim H. Increasing trends of caesarean deliveries in india: does private sector contributes it? SSRN. 2018;1-19.
9. International Institute for Population Sciences. National Family Health Survey - 5 2019-21. Minist Heal Fam Welf Natl. 2020;361:2.
10. Verma V, Vishwakarma RK, Nath DC, Khan HTA, Prakash R, Abid O. Prevalence and determinants of caesarean section in South and South-East Asian women. PLoS One. 2020;15(3):1-15.
11. Yaya S, Uthman OA, Amouzou A, Bishwajit G. Disparities in caesarean section prevalence and determinants across sub-Saharan Africa countries. Glob Heal Res Policy. 2018;3(1):1-9.
12. Karim F, Ali NB, Khan ANS, Hassan A, Hasan MM, Hoque DME, et al. Prevalence and factors associated with caesarean section in four hard-to-reach areas of Bangladesh: Findings from a cross-sectional survey. PLoS One. 2020;15(6):1-16.
13. Simmons E, Lane K, Rao SR, Kurhe K, Patel A, Hibberd PL. Trends in cesarean section rates in private and public facilities in rural eastern Maharashtra, India from 2010-2017. PLoS One. 2021;16(8):1-12.
14. Singh SK, Vishwakarma D, Sharma SK. Prevalence and determinants of voluntary caesarean deliveries and socioeconomic inequalities in India: Evidence from National Family Health Survey (2015-16). Clin Epidemiol Glob Heal. 2020;8(2):335-42.
15. Mittal S, Pardeshi S, Mayadeo N, Mane J. Trends in Cesarean Delivery: Rate and Indications. J Obstet Gynecol India. 2014;64(4):251-4.
16. Srivastava S, Chaurasia H, Kumar Singh KJ, Chaudhary P. Exploring the spatial patterns of cesarean section delivery in India: Evidence from National Family Health Survey-4. Clin Epidemiol Glob Heal. 2020;8(2):414-22.
17. Meless MB, Geremew AB, Abebe SM. High prevalence of caesarean birth among mothers delivered at health facilities in Bahir Dar city, Amhara region, Ethiopia. A comparative study. PLoS One. 2020;15(4):1-15.

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