

Caesarean Section Delivery in India: A Comparative Assessment of Geographical Variability Using Nationally Representative Survey Factsheet Data

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ABSTRACT

Background: In line with global trends, India has witnessed a sharp rise in C-section (CS) deliveries, especially in the private sector.

Methodology: Study attempts to explore change in CS delivery in India at national, regional and State/UT levels. We have used factsheet data from the most recent nationally representative survey data i.e., NFHS to examine changes in private and public healthcare facilities, and to determine a difference in rural and urban in CS deliveries.

Results: The CS rate has increased from 17.2% to 21.5% in 2019-21. CS was more than twice (40.9%) amongst the private healthcare facilities during the fourth round of NFHS which has shown a considerable increase during the fifth round of NFHS (47.4%). There is equal distribution (12.8% during 2015-16 to 17.6% in 2019-21 in rural areas v/s 28.2% during 2015-16 to 32.3% in 2019-21 in urban areas) of CS deliveries amongst the rural and urban areas to the total deliveries.

Conclusion: Study found that with every one in five deliveries being caesarean, the figure is significantly high as per the recommended cut off by WHO. Thus, it is essential to explore factors regarding emergency or elective caesarean section and to understand if the health facilities are following the recommended protocols for performing CS deliveries.

Keywords: Caesarean section, C-section, Geographic variation, emergency/elective c-section

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INTRODUCTION

Caesarean section, also termed as C-section, or caesarean delivery, refers to the surgical procedure for delivery of babies by making an incision in the mother's abdomen, usually performed due to pregnancy complications.¹ This surgical intervention is a major life-saving obstetric procedure to prevent both, mother and baby, from unwanted gestational and delivery related complication.^{2,3} It has also been reported that C-sections are highly effectual in saving lives of mother and infant, only when they are needed for medically indicated causes.⁴

Over a decade there is a rapid increase in C - section delivery rates across the globe, and this rise in numbers shows a varied prevalence across different regions.⁵⁻⁷ The number of caesarean births recorded each year globally are more than 18 million, accounting for approximately 19.1% of total births which is very high than that of the cut-off recommended by World Health Organization (WHO).⁸ The caesarean delivery is relatively lower in the low- and middle-income countries (LMIC): 5% in Nepal⁶, 23% in Bangladesh⁹ and 20% in Pakistan¹⁰ whereas the situation in Indian context is slightly different as the rates of caesarean deliveries have dramatically increased to 17% in 2015-16 and 21.5% in 2019-21 from just 3% in 1992-93¹¹. This rise in caesarean deliveries is now a matter of concern amongst the policy makers as WHO has recommended that the C-section rates higher than 10% do not show associations with reduction in maternal and newborn mortality rates.⁴

India has undoubtedly shown remarkable progress in institutional delivery i.e., from 26% in 1992-93 to 78.9% in 2015-16 to 88.6% in 2019-21.¹¹ The Government of India (GoI) is continuously running various schemes and programs to improve maternal health and access to healthcare facilities in India at a central level. To mitigate the challenges of maternal and infant health, programs i.e., Surakshit Matritva Aashwasan (SUMAN), Pradhan Mantri Surakshit Matritva Abhiyan, Janani Shishu Suraksha Karyakaram (JSSK), Pradhan Mantri Matru Vandana Yojana (PMMVY) etc. are being run to provide comprehensive financial and medical support for both pre and postnatal care along with the elimination of high out of pocket expenditure (OOPE).¹²

Despite these safe motherhood programs and schemes being run, some of the states show a dismal maternal mortality rate, making it a matter of concern. Although the SRS reports a dramatic decline in the maternal mortality from 130 per 100,000 live births in 2014-16 to 113 in 2016-18 but the same in some states are relatively higher than the national average.¹³ A maternal mortality assessment study in poorer and richer states aiming to highlight the cause and uptake of emergency obstetric care reported that 82% of maternal deaths occurred due to direct obstetric cause.¹⁴ Thus, it is noteworthy to highlight that maternal mortality could possibly be

prevented by increasing caesarean section.

In the same context WHO has recommended that Caesarean sections are effective only if they are needed for obstetric complications and thus the Robson categorization system is proposed by WHO as a global standard for assessing, monitoring, and comparing caesarean section rates across time in healthcare facilities.⁴

Despite several studies investigating factors contributing to caesarean section^{2,3,9,12}, The socio-economic lop-sidedness of Caesarean-section deliveries in India towards urban and wealthier population is well entrenched.¹⁶⁻¹⁹ Another study based upon large scale national level sample surveys highlighted the skewed distribution of caesarean deliveries towards private hospitals and have reported that C-section births accounted for 13.7 % of births in public hospitals and 37.9% of births in private institutions.¹⁶ A study based on NFHS data in India claimed that from 2005-06 to 2015-16, the percentage of C-section deliveries in public hospitals decreased from 15.2 percent to 11.9 percent, wherein the prevalence has risen significantly; from roughly 25% to around 40%, among private healthcare practitioners.¹⁸

In spite of all the findings there are still studies unavailable which provides a recent update on the geographical variability of caesarean section delivery. With this backdrop, this study is planned which attempts to explore State/ UT wise change in caesarean section delivery, to examine changes in the private and public healthcare facilities, to determine difference in rural and urban changes in caesarean section deliveries at national, regional and at States/ UT level using the factsheet data from most recent nationally representative survey.

METHODOLOGY

The National Family Health Survey (NFHS) is a multi-round, large-scale survey that is undertaken in a representative sample of Indian households. Since the first survey in 1992-93, there have been five rounds of the survey. The NFHS delivers a consistent and sequential database with each round and its two main objectives are to offer crucial statistics on health and family welfare to the Ministry of Health and Family Welfare and other agencies for policy and programme reasons, as well as to provide information on key developing health and family welfare concerns.²⁰

For this study, data available in NFHS factsheets were used which provides data related various health and non-health parameters. These factsheet reports which are publicly available were downloaded for NFHS round- 3(2005-06), 4 (2015-16) and 5(2019-21).²⁰ The data on all the parameters were compiled from these reports up to the State/ UT level for analysis.

The available data were analyzed to find out the percentage change for the two recent rounds of NFHS, which will provide a trend change for a decade i.e., from 2015 to 2021. In India, the change in coverage from NFHS round 4 to 5 as per geographical regions, and as per each State/UTs were being accounted. According to the SRS categorization, India is divided into six geographical areas.²¹ MS Excel was used to carry out all the analyses. 365. Dadar and Nagar Haveli, Daman, and Diu, Ladakh, were excluded from the analysis due to unavailability of some data in the Factsheet.

RESULTS

The National Family Health Surveys round (NFHS) of 2015 (NFHS-4) and 2019-21 (NFHS-5) have reported 25% increase in C-section rate in India from 17.2% to 21.5% over the two recent rounds which is high as per WHO recommended limit. The findings states that the caesarean section was more than twice (40.9%) amongst the private healthcare facilities during the fourth round of NFHS which has shown a considerable increase during the fifth round of NFHS (47.4%). As per the recent findings, less than 15% of the deliveries in the public hospitals are undergoing Caesarean section which is lower as per the recommended limits by WHO.

As per the **Table 1** which is showing a geographic regional variation in the caesarean section deliveries which states that the Southern part of the country have the highest caesarean section (~43.7%) deliveries in the country whereas with 12.6% caesarean section deliveries states under the central regions are performing comparatively better as that of the other regions in the country.

It was reported that more than 71% (23 out of 32) states and UTs have caesarean section rate more than 15% which is the recommended cut-off for caesarean section deliveries by WHO. It is interesting to note that that 34.4% (11 out of 32 included) States/UTs has caesarean section deliveries more than 30% i.e., ranging between 31.3% in Chandigarh to 60.7% in Telangana. (**Table- 1**)

Looking at the State/ UT wise changes, three States namely Nagaland (-10.3%), Delhi (-11.6%) and Mizoram (-15%) have shown a negative change in the caesarean section deliveries. a considerable change has been noted in the Arunachal Pradesh (66.3%) and Haryana (66.7%) over the two rounds of NFHS. Over the two rounds of NFHS, eight states namely Haryana, Arunachal Pradesh, Sikkim, Odisha, Punjab, Bihar, Uttarakhand, Chhattisgarh have shown a highest rise in c-section rates.

Figure 2 represent that with more than 40% increase in the central and the eastern parts of the country, States under these regions have shown a highest increase. Despite the increase, States under the central parts are performing caesarean section under the recommended limits as given by WHO.

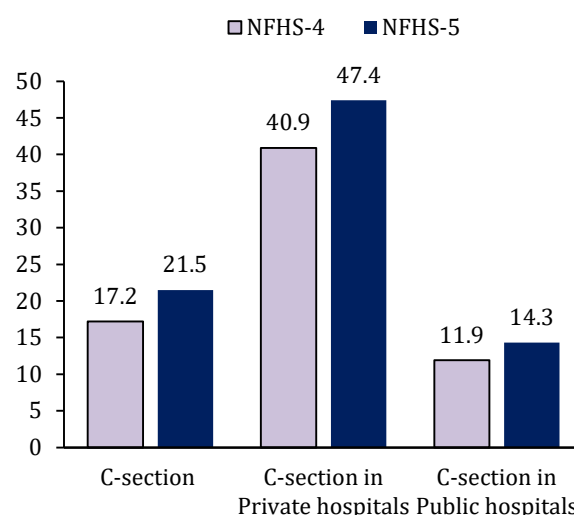


Figure 1: Status of Caesarean section at National level over the two rounds of NFHS

Table:1 Changes in Caesarean section over NFHS-4 and NFHS-5

Geographic region state	NFHS-4 (%)	NFHS-5 (%)	% Change (NFHS-4 to 5)
India	17.2	21.5	25.0
Central	9.1	12.9	40.8
Chattisgarh	9.9	15.2	53.5
Madhya Pradesh	8.6	12.1	40.7
Rajasthan	8.6	10.4	20.9
Uttar Pradesh	9.4	13.7	45.7
East	13.4	19.2	42.8
Bihar	6.2	9.7	56.5
Jharkhand	9.9	12.8	29.3
Odisha	13.8	21.6	56.5
West Bengal	23.8	32.6	37.0
Northeast	13.9	17.6	26.8
Arunachal Pradesh	8.9	14.8	66.3
Assam	13.4	18.1	35.1
Manipur	21.1	25.6	21.3
Meghalaya	7.6	8.2	7.9
Mizoram	12.7	10.8	-15.0
Nagaland	5.8	5.2	-10.3
Sikkim	20.9	32.8	56.9
Tripura	20.5	25.1	22.4
North	21.3	28.0	31.7
Delhi	26.7	23.6	-11.6
Chandigarh	22.6	31.3	38.5
Haryana	11.7	19.5	66.7
Himachal Pradesh	16.7	21.0	25.7
Jammu Kashmir	33.4	41.7	24.9
Punjab	24.6	38.5	56.5
Uttarakand	13.1	20.4	55.7
South	38.3	43.7	14.2
Andhra Pradesh	40.1	42.4	5.7
Karnataka	23.6	31.5	33.5
Kerela	35.8	38.9	8.7
Tamil Nadu	34.1	44.9	31.7
Telangana	57.7	60.7	5.2
West	23.3	28.6	22.9
Goa	31.4	39.5	25.8
Gujrat	18.4	21.0	14.1
Maharastra	20.1	25.4	26.4

*A&N Island, Lakshadweep, Puducherry, D&N Haveli, and D& Diu excluded from the table

Figure 3 gives a glimpse of the State/ UT wise caesarean section and contribution of C-section deliveries in the rural and urban areas to the total deliveries registered in the State. Findings suggests that in majority of the States, rural and urban areas are having equal c-section deliveries against the total deliveries that are getting registered in the State/ UT. Telangana is recording highest caesarean section with equal

percentage share amongst the rural and urban areas.

Similarly, **Figure 4** provides an overview of the caesarean section deliveries at the public and private health care institutions. The findings suggest that there is a skewness in the caesarean section deliveries to the total deliveries in the private health care facilities. Appendix-1 provides Rural/urban and Private/public split for each State/UTs.

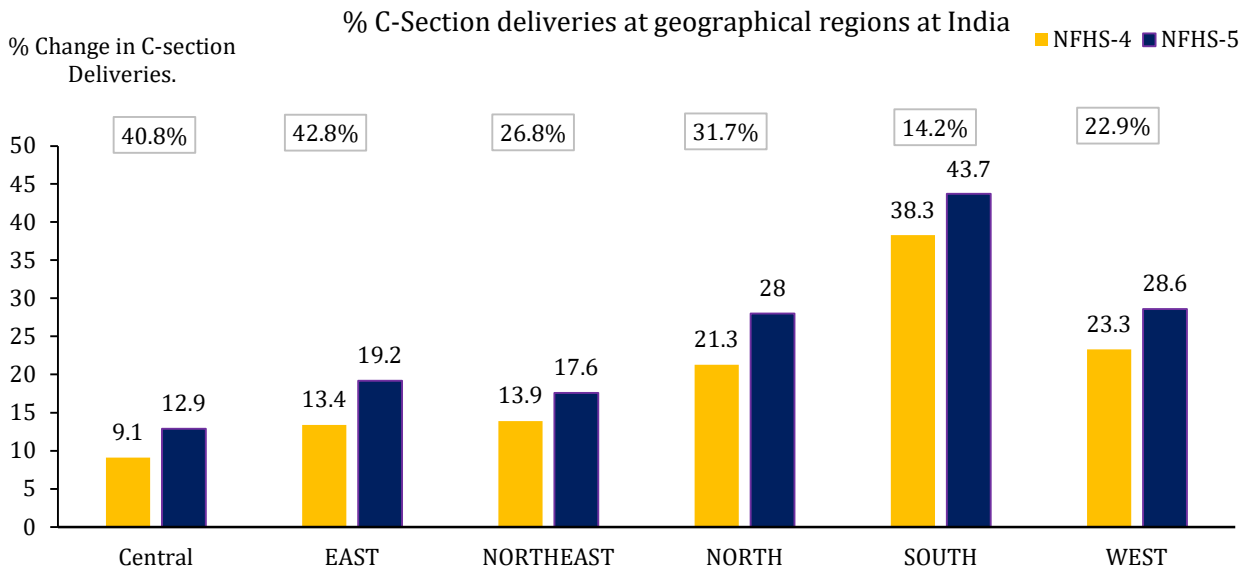


Figure 2: Region wise status of caesarean section deliveries in India

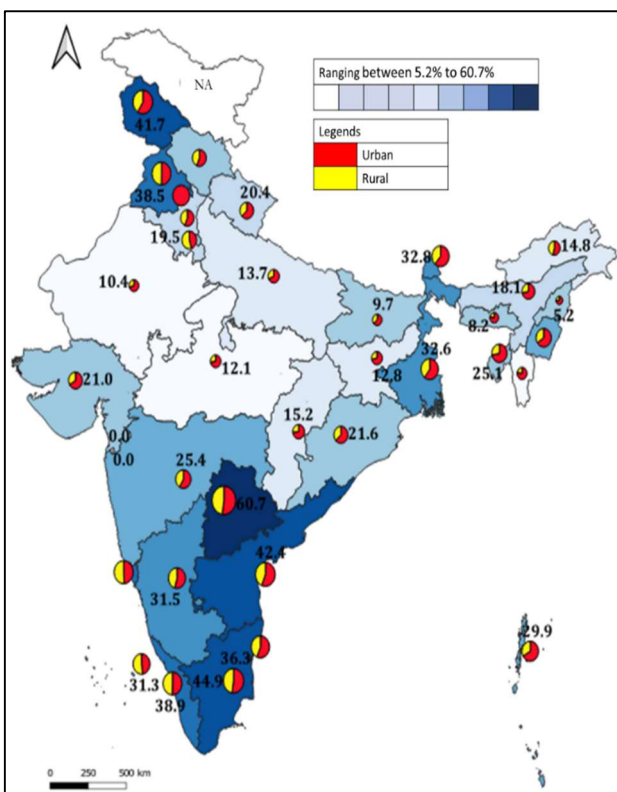


Figure 3: Showing c section status in the Rural and Urban areas in Respective states/UTs.

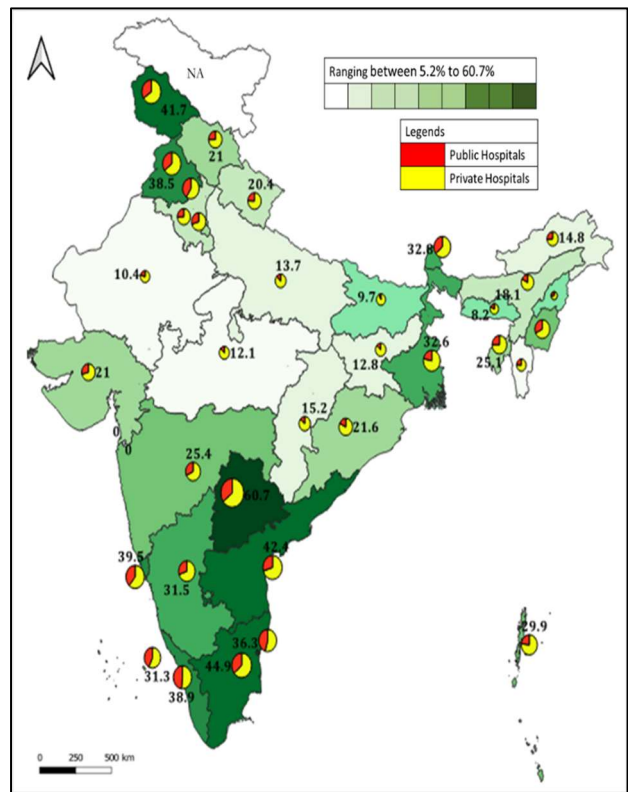


Figure 4: Showing c section status in Public and private hospitals in respective states/UTs.

DISCUSSION

The study aimed to map the prevailing geographic variability of the C section deliveries occurring across the country and further assess the changing figures of the same in the private and public healthcare facilities. To evaluate the picture depicting the difference in number of Caesarean Deliveries in Rural and Urban parts of the country, figures at the national, regional and at the level of State/UTs was analyzed.

The study found a significant increase of C section deliveries across the country over the last 5 years, with currently 21.5% pregnant women at national level are undergoing caesarean section for delivering the newborn. Though c-section deliveries are a major life saving procedure, it also has underlying long term adversities on the health of the mother and child. The high increase in number of CS procedures strengthens the fact about mothers adopting it for a less worrisome process avoiding labor. It is also associated to preference of auspicious timings for giving the birth.²²

Our study reports that the number of CS interventions in private healthcare facilities is almost double as compared to that of the public facilities. Analysis marks an increase by 15 percent in the number of CS deliveries in the private facilities between the 4th and 5th round of NFHS. Literature states that there is no substantial association between caesarean deliveries in the private facilities and underlying complications associated with pregnancy, delivery or decision to undergo the procedure before the onset of labor.²³ Experts also suggest that possible reasons for this disparity in private and public sectors include high risk deliveries occurring in the private facilities due to better facilities, shortage of specialists in public hospitals and the increase in Ayushman Bharat health insurance coverage for caesarean deliveries stated as “moral hazard” procedures in the insurance parlance.^{24,25}

The geographical variation across the country, as per our analysis highlights the maximum and minimum CS procedures in southern India and central parts of the country respectively. Our study aligns with the findings that state that reproductive health factors associated with CS, including pregnancy complications, prevalence of obesity and pregnancy termination are substantially greater higher in the southern India than the rest of the country.²⁶

However, it is also observed by our study that the states under eastern and central parts of the country show an increase of 40 percent in the number of CS deliveries between NFHS 4&5. Along the northeast, states like Assam, Tripura and Sikkim show significantly higher percentage of CS compared to the rest. But most of the states in these belts tend to show lesser number of CS as compared to the WHO figure. Our results are in lines with the pre-existing findings suggesting that under developed states from North,

central, east and north east region, having areas covered with patches of mountains and forests have lesser preference for CS.²⁷ Most of these states have less than 10 percent CS deliveries and states like Uttar Pradesh and Bihar and other such populous states across such regions have shown to register around 30 percent home deliveries.²⁸

Upon the number of deliveries taking place in the Urban and Rural parts of various states, it is noticed that the Urban areas account for higher number of CS deliveries over the Rural. The rural urban gap in the southern parts of the country seem to be narrowed as than the rest of the country, wherein CS deliveries in Urban women is two times higher.²⁹

Our study reports excess number of CS deliveries across the country making it a matter of concern. Unnecessary caesarean deliveries increase the burden of out-of-pocket expenditure because of their higher cost and are a hinderance in achieving Universal Health coverage.³⁰ Training and awareness of healthcare community workers and the population about the obstetric dangers and post-partum complications of Caesarean deliveries over normal deliveries along with strategical implementation of Govt initiatives can help reducing the numbers of unnecessary C section deliveries.

CONCLUSION

The study found that with every one in five deliveries being caesarean, the figure is significantly high over the WHO and the International Healthcare Community's ideal rate, ascertaining no strengthening evidence for improvement in the maternal and infant mortality rates. Hence, it is essential to explore factors regarding emergency or elective caesarean section and to understand if the health care facilities are following the recommended protocols for performing caesarean section deliveries.

APPENDIX

The table 2 shows the % of birth delivery by C section in urban, rural, private, and public facility in the year 2019–21 according to NFHS 5 data.

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Appendix 1:**Table 2:** The % of birth delivery by C section in urban, rural, private, and public facility in the year 2019 – 21 according to NFHS 5 data.

State/UT	Urban	Rural	Private	Public	NFHS 5 Total c section
A&N Islands	40.8	20.2	79.2	23.6	29.9
Andhra Pradesh	50.5	39.3	63.0	26.6	42.4
Arunachal Pradesh	17.1	14.4	47.3	17.0	14.8
Assam	39.2	15.6	70.6	15.2	18.1
Bihar	15.7	8.8	39.6	3.6	9.7
Chandigarh	31.7		44.3	30.4	31.3
Chhattisgarh	31.2	11.3	57.0	8.9	15.2
Goa	39.1	40.1	50.0	31.5	39.5
Gujarat	30.7	15.3	30.8	12.4	21.0
Haryana	23.5	17.8	33.9	11.7	19.5
Himachal Pradesh	26.2	20.3	51.4	17.4	21.0
India	32.3	17.6	47.4	14.3	21.5
Jammu Kashmir	54.7	37.8	82.1	42.7	41.7
Jharkhand	25.8	10.2	46.7	7.0	12.8
Karnataka	35.2	29.4	52.5	22.6	31.5
Kerala	39.1	38.7	39.9	37.2	38.9
Lakshadweep	30.7	33.2	37.7	28.2	31.3
Madhya Pradesh	23.3	8.8	52.3	8.2	12.1
Maharashtra	30.6	21.5	39.1	18.3	25.4
Manipur	38.0	19.7	53.2	24.7	25.6
Meghalaya	21.6	6.1	40.8	9.2	8.2
Mizoram	16.8	4.8	30.4	9.8	10.8
Nagaland	9.8	3.6	23.6	8.0	5.2
Delhi	23.4	28.2	42.8	17.7	23.6
Odisha	34.1	19.5	70.7	15.3	21.6
Puducherry	38.9	29.9	42.0	34.8	36.3
Punjab	38.8	38.4	55.5	29.9	38.5
Rajasthan	19.7	8.1	26.9	7.2	10.4
Sikkim	43.1	26.9	55.4	30.4	32.8
Tamil Nadu	47.5	42.9	63.8	36.0	44.9
Telangana	64.3	58.4	81.5	44.5	60.7
Tripura	47.5	18.6	69.3	22.7	25.1
Uttarakhand	28.6	16.7	43.3	14.0	20.4
Uttar Pradesh	24.2	11.0	39.4	6.2	13.7
West Bengal	43.5	28.6	82.7	22.9	32.6