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Caesarean Births in India: A Preliminary Analysis of Associated Factors

Charu Yadav
Parveen Nangia

Abstract

The proportion of caesarean births has increased in India from less than 3 per cent in 1992-93 to more than 21 per cent in 2019-21. In the urban areas, nearly one-third births are caesarean births while this proportion is nearly 50 per cent in private health facilities. A high proportion of caesarean births seems unnecessary and motivated by non-medical interests. This paper uses data from the latest National Family Health Survey, 2019-2021 to analyse factor associated with inter-state variation in the proportion of caesarean births. The analysis reveals that inter-state variation in the proportion of caesarean births is significantly positively associated with inter-state variation in the proportion of women with high sugar level and the proportion of women with elevated blood pressure in case of births in private and public facilities and in the urban areas whereas inter-state variation in the proportion of women with at least 10 years of schooling is significantly but negatively associated with inter-state variance in the proportion of caesarean births in private facilities and in urban areas. In rural areas, education of the woman and prevalence of female sterilisation has a positive impact on the proportion of caesarean deliveries. For the total population (rural + urban), female sterilization and obesity in women show a significant positive association. The paper recommends monitoring of counselling practices advocating caesarean deliveries to curtail unnecessary caesarean births which may have negative health consequences for both women and children.

Introduction

Globally, births delivered by caesarean section (C-section) are on the rise, accounting for 21 per cent of all childbirths (WHO, 2021). Caesarean section is a life-saving surgery to deal with pregnancy-related complications so that a woman can give birth to a healthy child. It is used for saving the life of the baby and/or the mother. Caesarean procedure may be necessary in many delivery complications including breach presentation, rupture of the uterus, cord prolapses, foetus distress, and when the woman suffers from gestational diabetes or high blood pressure (American Pregnancy Association, 2021). It is estimated that, usually, a C-section prevalence of 10-15 per cent is necessary to prevent premature maternal and neonatal death (WHO, 2015). It is also estimated that a C-section rate of less than 5 per cent indicates that a considerable proportion of women do not have access to emergency obstetric care services, whereas a C-section rate of more than 15 per

cent indicates overuse of the procedure that does not have medical justification (Bhatia et al, 2020). When this method is overused, it becomes a matter of concern.

The existing evidence suggests that the prevalence of C-section is increasing (Al Rifai, 2014; Khawaja et al, 2004; Radha et al, 2015; Radhakrishnan et al, 2017; Subedi, 2011; Stavrou et al, 2011). It is estimated that more than one out of every five deliveries in the world are C-section deliveries (Betran et al, 2021). Although, delivery through surgical procedure is beneficial in case of medical emergency, yet it needs to be opted with caution and must be avoided when not necessary as there are known complications for both the woman and the neonate (Gayathry et al, 2017; Betran et al, 2016). The current trend, however, shows that many C-sections are unnecessary. A high prevalence of C-section deliveries puts women and children at risk of short- and long-term health concerns. It is projected that by the year 2030, almost 29 per cent of the deliveries in the world would be C-section deliveries (Betran et al, 2021) which is medically unacceptable.

The fourth round of the National Family Health Survey (NFHS 2015-16) in India had reported that out of a total of 195,366 institutional births, 35,671 births - 15,165 in public facilities and 20,506 births in private facilities – were delivered through C-section or were caesarean births (Bhatia et al, 2020). This means that caesarean births accounted for 17.2 per cent of total births - 11.9 per cent in public facilities and 40.9 per cent in private facilities. Between NFHS -1 (1992-93) and NFHS-4 (2015-16), the proportion of caesarean births increased from 2.9 per cent to 17.2 per cent. In public facilities, this proportion increased from 7.2 per cent to 11.9 per cent, while in private facilities from 12.3 per cent to 40.9 per cent. A high proportion of caesarean births in private health facilities and the rapid increase in this proportion raises some questions about the motivation behind the rapid increase in adopting this surgical procedure to conducting delivery. This concern has also been felt at the global level because the global C-section rate is estimated to have increased from 6.7 per cent in 1990 to 19.1 per cent in 2014 (Betran et al, 2016) and 21 per cent in 2021 (WHO, 2021). Several reasons have been put forward to explain the global rise in caesarean births. These include women preferences, practice of defensive medicine, socio-cultural factors, financial incentives (Gibbons et al, 2010), and changes in obstetric practices (MacDorman et al, 2008). Research carried out in India suggests that the C-section birth rate in India is significantly associated with age, educational attainment, wealth quintile, obesity, or high Body Mass Index (BMI) of woman, pregnancy complications, and previous caesarean births (Roy et al, 2021; Mohanty et al, 2019).

An increase in the proportion of caesarean births is also associated with the preference for C-section by some women. Women with secondary infertility fear normal delivery when they become pregnant again as it may reduce their chances to have a live birth (Kirchengast and Hartmann, 2019; Chavarro et al, 2020). The level of education of a woman has also been found to be linked to enhanced apprehension toward normal delivery which can cause prolonged and excruciating pain (Hofberg and Ward, 2003). Due to the anxiety related to prolonged labour during normal vaginal delivery, some women prefer C-section delivery (Suwanrath et al, 2021) even though it costs more (Bhatia et al, 2020). From the perspective of the health facility, a C-section delivery usually takes less time in the sense that it overcomes the uncertainty of the duration of labour and pays more than a normal delivery (Johnson and Rehavi, 2016; Dongre and Surana, 2018). It is in the interest of private

health facilities to promote C-section deliveries for their financial gains (Bhatia et al, 2020). Studies have also shown that C-section delivery is recommended more for those women who have health insurance coverage (Hoxha et al, 2017).

In India, the results of the NFHS-5 show that 32.3 per cent of the births in urban areas and 47.4 per cent in private health facilities are cesarean births. Does it mean that C-section was necessary for all of them? In the absence of the necessary data to answer this question, the present study attempts to investigate the factors that may have led to a high proportion of caesarean births. The individual level data from NFHS-5 are not yet available, although state level fact sheets based on NFHS-5 data are available. The present study, therefore, analyses spatial variation in the prevalence of caesarean births in the country, in its rural and urban areas, and in the private and public health facilities. It also investigates correlates of caesarean births and attempts to determine some of the factors that may predict the spatial variation in the proportion of caesarean births in India.

Methodology

Data Source. This study uses data from the fifth round of the National Family Health Survey (NFHS)-5 (2019-2021). The NFHS is a multi-stage, stratified survey conducted in a representative sample of households throughout India. The survey provides national and state-level estimates of selected indicators related to fertility, infant and child mortality, practice of family planning, maternal and child health, reproductive health, nutrition, anaemia, and utilisation and quality of health and family planning services. The present study uses state level estimates of the proportion of caesarean births available from NFHS-5 (Government of India, n.d.). The NFHS-5 factsheets also provide estimates of the proportion of caesarean births based on the data from NFHS-4 (2015-2016) which also permit analysing the trend in the proportion of caesarean deliveries in different states; in rural and urban areas of different states; and in public and private health facilities. Details about the size of the sample, sample design, data processing and quality aspects of the data collected during fourth and fifth rounds are documented in the country report (Government of India, 2017).

Variables Considered. In NFHS-5, currently married women in the age group 15-49 years were asked about the place of their last delivery which was classified as public health facility – government hospital, dispensary, health centre or other government health institutions – and private health facility - private hospital, maternity home, or private health institutions. For each reported birth, it was also asked whether the delivery was normal, or it was a C-section delivery. Based on this information, the proportion of caesarean births have been calculated for 28 states of the country as they existed at the time of NFHS-5. The proportion of caesarean births to total births is taken as the dependent or the study variable for the present analysis. On the other hand, seven independent or the explanatory variables have been used in the analysis: 1) proportion of women aged 15-49 years having 10 or more years of schooling; 2) proportion of women aged 15-49 years who were sterilised; 3) proportion of women aged 15-49 years using Intrauterine Contraceptive Device/Postpartum Intrauterine Contraceptive Device (IUD/PPIUD); 4) Proportion of women aged 15-49 years

who had at least 4 antenatal care visits during their last pregnancy; 5) proportion of women who were having high or very high blood sugar level (>140 mg/dl) or women were taking medicine to control blood sugar; 6) proportion of women with elevated blood pressure (systolic >=140 mm of Hg and/or diastolic >=90 mm of Hg) or women taking medicine to control blood pressure; and 7) proportion of women who were overweight or obese (BMI >=25.0 kg/m^2).

Data Analysis. This study has investigated state-level changes in the proportion of caesarean births in recent years in the rural and urban areas in public and private health facilities. State level maps have been used to depict the spatial variation in the proportion of caesarean births in the country. Finally, the state-level data have been analysed to examine the association between the proportion of caesarean births and selected independent variables. The simple zero order correlation coefficient of the proportion of caesarean births with all the independent variables is found to be statistically significant in the combined (rural and urban) population as well as separately in rural and urban populations. Therefore, stepwise regression analysis was carried out to analyse the effect of each of the seven independent variables on the proportion of caesarean births. The analysis has also been carried out separately for caesarean births in public facilities and caesarean births in private facilities.

Results

The proportion of caesarean births in India has increased from 17.2 per cent in 2015-2016 to 21.5 per cent in 2019-2021. This proportion is substantially higher in the urban areas, but the increase in this proportion has been different in rural and urban areas. The proportion of caesarean births increased from 28.2 per cent to 32.3 per cent in the urban areas but from 12.8 per cent to 17.6 per cent in the rural areas (Figure 1). In the private health facilities, the proportion of caesarean births increased from 40.9 per cent in 2015-2016 to 47.4 per cent in 2019-2021 whereas this proportion increased from 11.9 per cent to 14.3 per cent in the public health facilities (Figure 2). In the rural areas, the proportion of caesarean births is within the range recommended by WHO, but in the urban areas, this proportion is not only well above the recommended WHO norm, but the increase is also quite alarming. The trend in this proportion in the rural areas, however, indicates, that the proportion of caesarean births has also crossed the upper limit recommended by the WHO.

Figure 3 shows the variation in the proportion of caesarean births across the states of the country during 2019-2021 as revealed through NFHS-5. There are only eight states where the proportion of caesarean births to total births is within the range recommended by the WHO (10-15 per cent) and most of these states are located in the central part of the country. In 18 states of the country, the proportion of caesarean births exceed 15 per cent. These states include all northern and southern states and some states in the north-eastern part of the country. There are only two states - Nagaland and Mizoram – where the proportion of caesarean births is less than 10 per cent. The very low proportion of caesarean births in these states raises questions about the availability and use of health services.

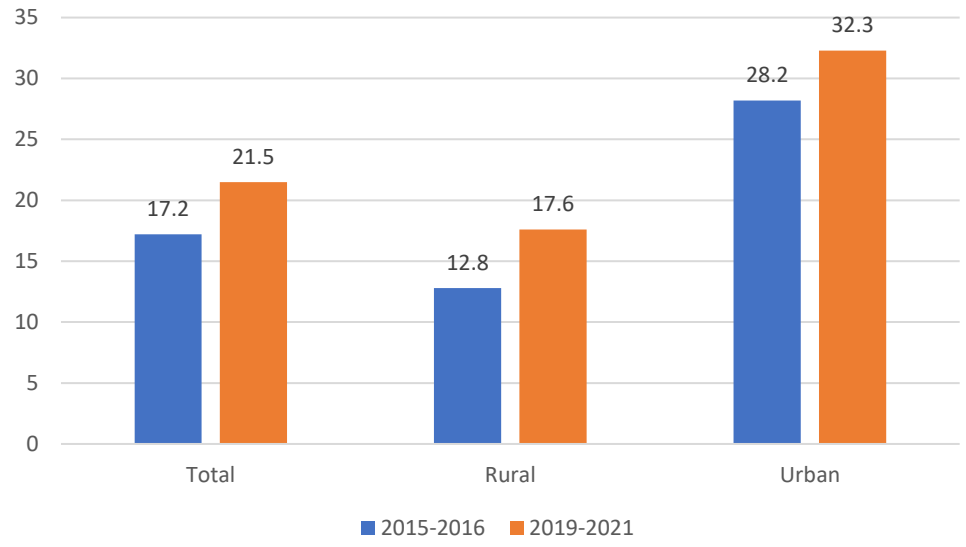

Figure 1: Proportion (per cent) of caesarean births in India, 2015-2106 and 2019-2021
Source: Authors

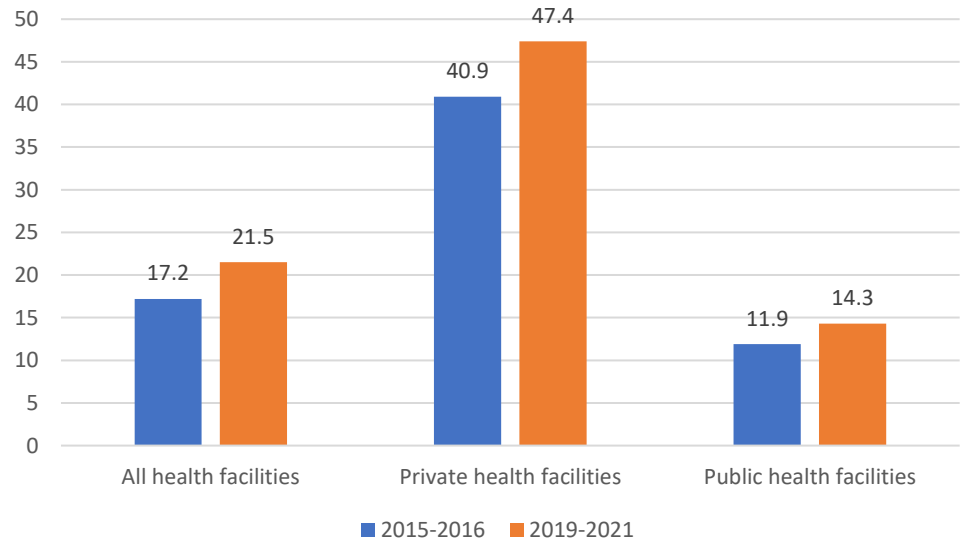

Figure 2: Proportion (per cent) of caesarean births in public and private health facilities, 2015-2016 and 2019-2021
Source: Authors

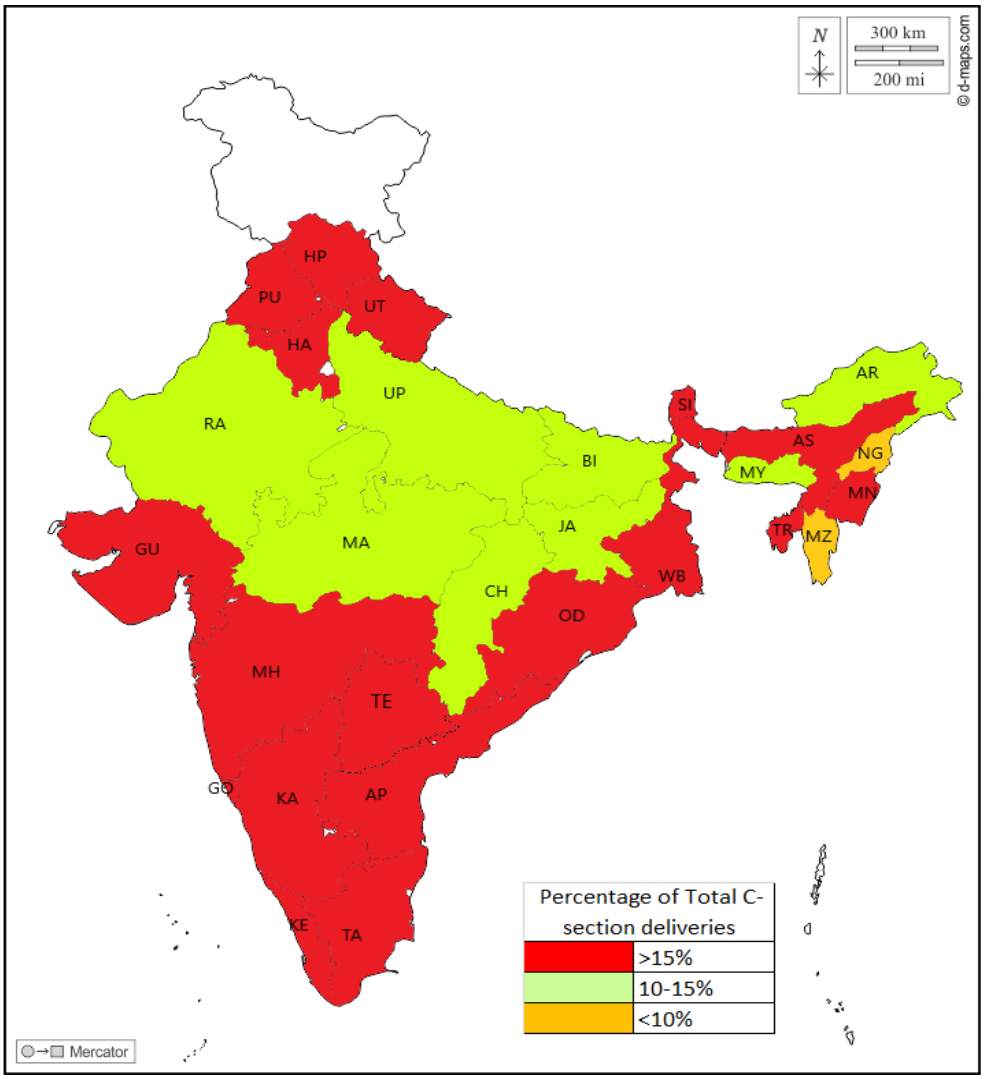

Figure 3: Inter-state variation in the proportion (per cent) of caesarean births in India 2019-2021
Source: Authors

Figure 4 shows the inter-state variation in the proportion of caesarean births in the rural population. The pattern is very similar to that in the combined population (Figure 3). There are, however, some differences. There are only five states where the proportion of caesarean births ranges between 10-15 per cent in the rural areas. There are 17 states where this proportion is more than 15 per cent whereas in six states, it is less than 10 per cent. In Andhra Pradesh and Telangana, more than half of the births are reported to be caesarean births. Figure 5 illustrates that in all states, the proportion of caesarean births in urban areas is higher than that in rural areas, although the gap varies.

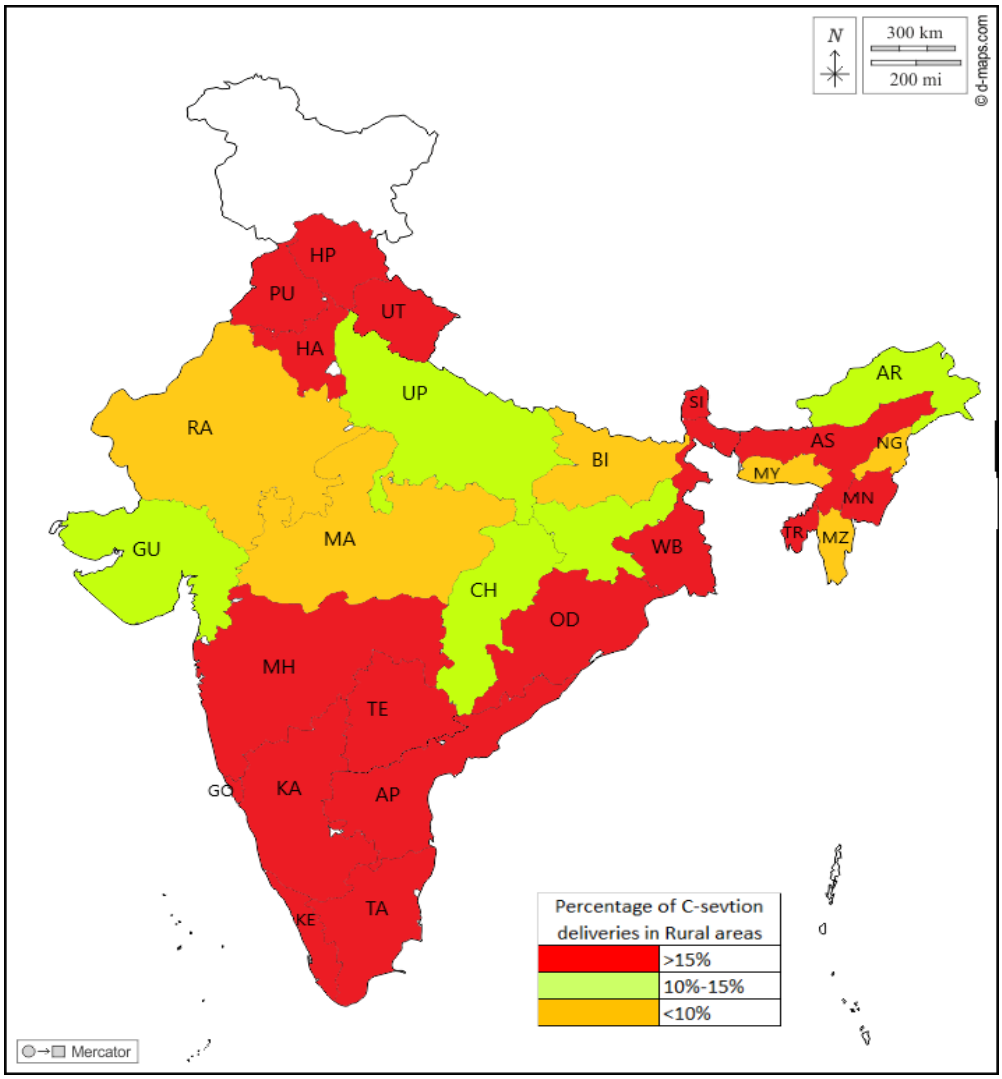

Figure 4: Inter-state variation in the proportion (per cent) of caesarean births in the rural population, 2019-2021
Source: Authors

Figure 6 depicts inter-state variation in the proportion of caesarean births in the private health facilities while Figure 7 depicts inter-state variation in the public health facilities. Telangana and West Bengal are the only two states where the proportion of caesarean births is more than 75 per cent of all births in private health facilities. There are 12 states where more than half of all births in private health facilities are caesarean births. Nagaland is the only state where this proportion is less than 25 per cent. In all states, the proportion of caesarean births in the private health facilities is alarmingly high.

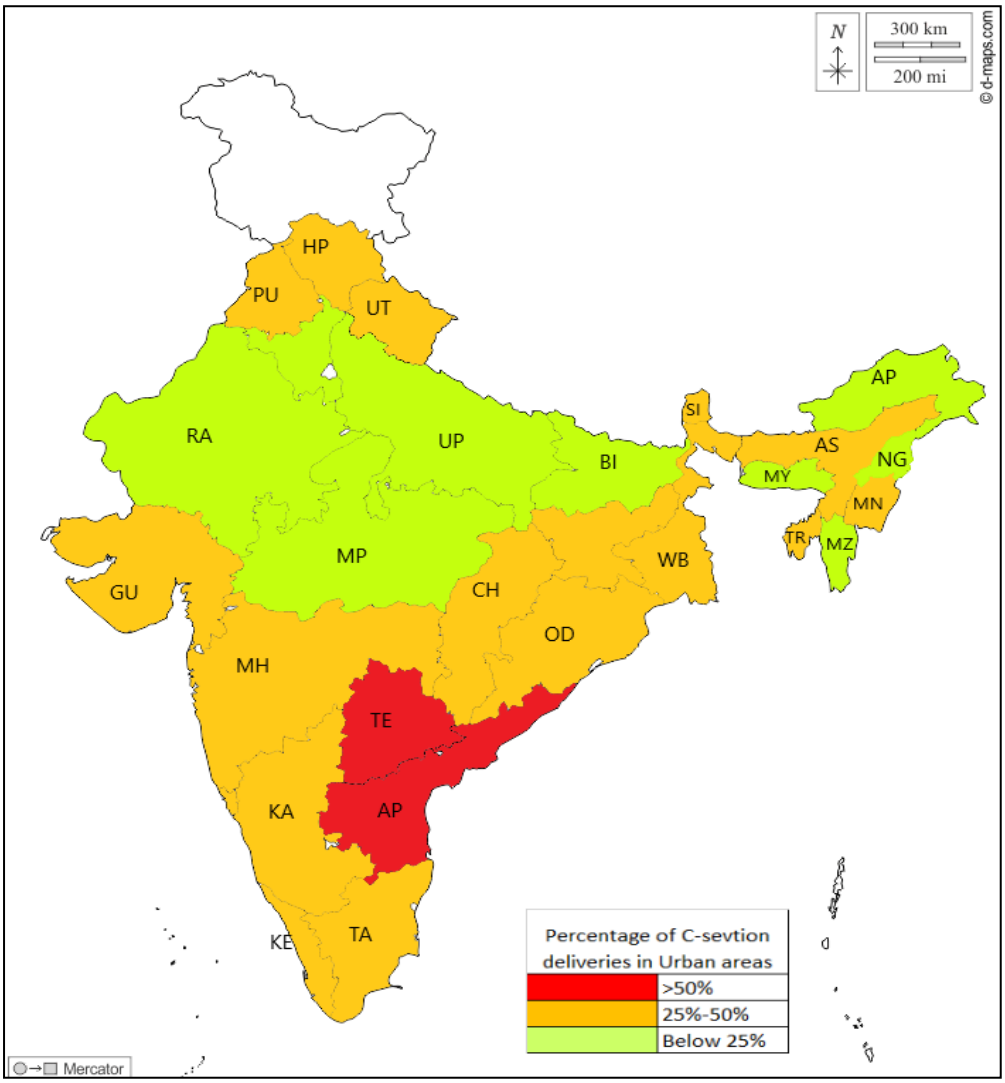

Figure 5: Inter-state variation in the proportion (per cent) of caesarean births in the urban population 2019-2021
Source: Authors

On the other hand, there are nine states where caesarean births account for less than 10 per cent of all births in public health facilities. In five states, this proportion ranges between 10-15 per cent. This leaves fourteen states where caesarean births are more than 15 per cent of all births in public health facilities. It may be noticed from Figure 7 that in Rajasthan, Uttar Pradesh, Bihar, Madhya Pradesh, Chhattisgarh, and Jharkhand, the proportion of caesarean births is in the range recommended by WHO, but the proportion of caesarean births is less than 10 per cent of all deliveries in the public health facilities.

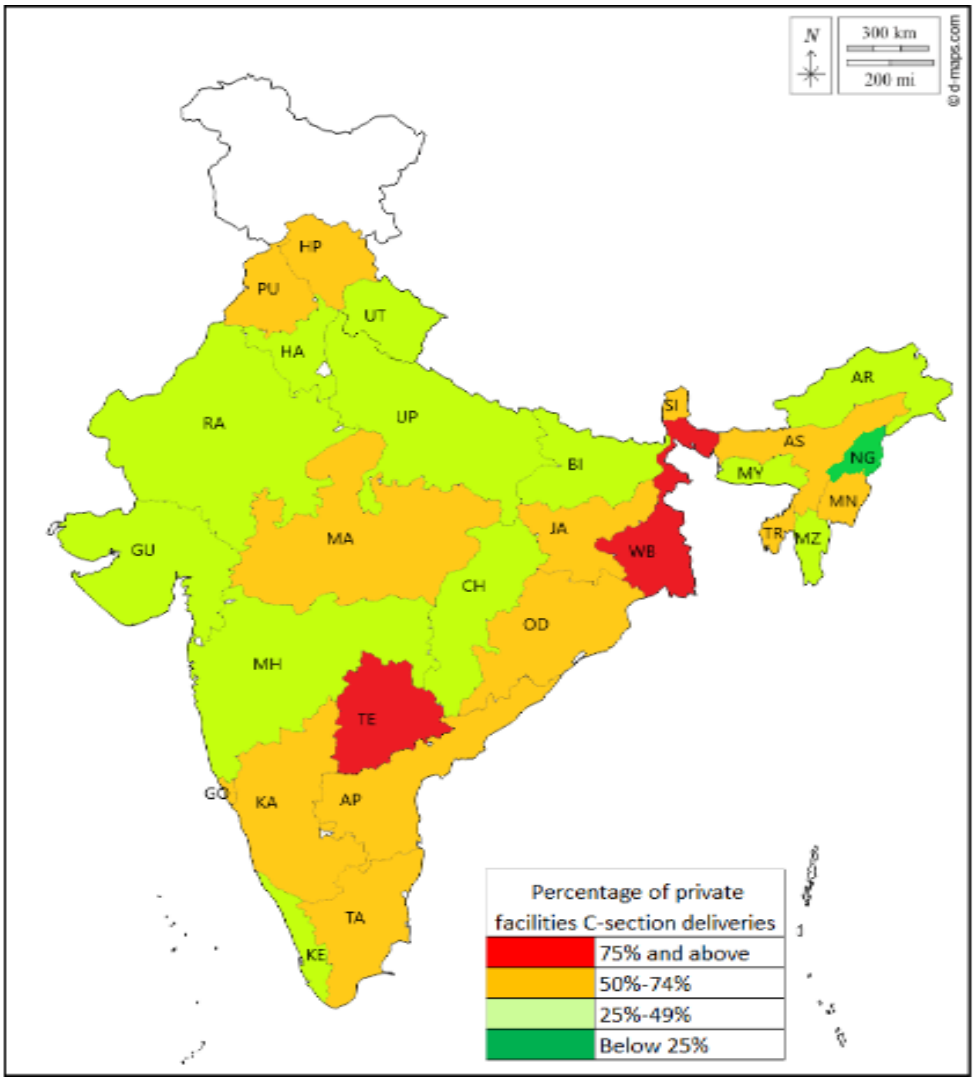

Figure 6: Inter-state variation in the proportion (per cent) of caesarean births in the private health care facilities 2019-2021
Source: Authors

Table 1 provides detailed information about caesarean births in rural and urban areas and in private and public health facilities. Telangana has the highest proportion of caesarean births (60.7 per cent) whereas Nagaland has the lowest (5.2 per cent). In Tamil Nadu and Andhra Pradesh, caesarean births account for more than two-fifths of all births. In Nagaland, Mizoram, and Bihar, less than 10 per cent of all births are caesarean births. There are only seven states - Arunachal Pradesh, Jharkhand, Madhya Pradesh, Meghalaya, Rajasthan, and Uttar Pradesh – where the proportion of caesarean births ranges between 10-15 per cent.

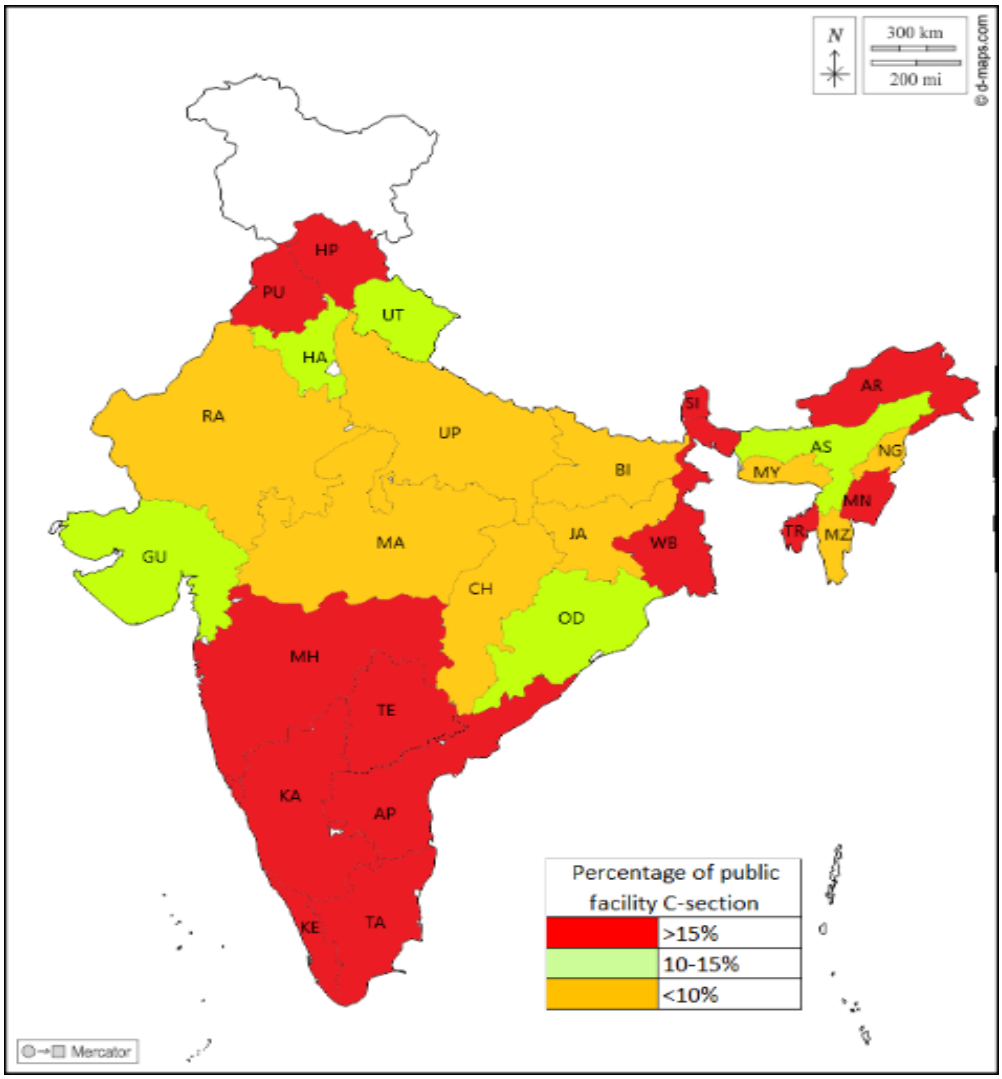

Figure 7: Inter-state variation in the proportion (per cent) of caesarean births in private health facilities, 2019-2021
Source: Authors

In the urban areas, on the other hand, nearly two-third (64.3 per cent) of all births in Telangana and more than half (50.5 per cent) of all births in Andhra Pradesh are reported to be caesarean births. By comparison, Nagaland is the only state in the country where caesarean births account for less than 10 per cent of all births in the urban areas. Besides Nagaland, there is no other state in the country where caesarean births accounted for less than 15 per cent of all births in the urban areas according to the data available from NFHS-5 as recommended by the WHO. Very high proportion of caesarean births in the urban areas of all but one states is a matter of public health concern.

Table 1: Proportion (per cent) of caesarean births to all births in India and states, 2019-2021.

State	All health facilities			Private health facilities			Public health facilities		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
India	21.5	17.6	32.3	47.4	46.0	49.3	14.3	11.9	22.7
Andhra Pradesh	42.4	39.3	50.5	63.0	61.4	66.1	26.6	25.2	30.9
Arunachal Pradesh	14.8	14.4	17.1	47.3	43.8	56.3	17.0	17.4	15.0
Assam	18.1	15.6	39.2	70.6	66.9	78.8	15.2	13.9	26.7
Bihar	9.7	8.8	15.7	39.6	40.6	36.7	3.6	3.5	4.7
Chhattisgarh	15.2	11.3	31.2	57.0	54.5	60.4	8.9	7.1	17.8
Goa	39.5	40.1	39.1	50.0	56.6	46.6	31.5	29.6	32.9
Gujrat	21.0	15.3	30.7	30.8	25.0	38.0	12.4	8.8	20.3
Haryana	19.5	17.8	23.5	33.9	33.4	34.9	11.7	10.9	14.4
Himachal Pradesh	21.0	20.3	26.2	51.4	52.6	46.7	17.4	17.2	19.8
Jharkhand	12.8	10.2	25.8	46.7	46.1	47.7	7.0	6.1	12.4
Karnataka	31.5	29.4	35.2	52.5	52.8	52.3	22.6	22.2	23.3
Kerala	38.9	38.7	39.1	39.9	40.4	39.4	37.2	36.1	38.8
Madhya Pradesh	12.1	8.8	23.3	52.3	53.2	51.4	8.2	6.5	15.3
Maharashtra	25.4	21.5	30.6	39.1	37.3	40.9	18.3	15.1	23.2
Manipur	25.6	19.7	38.0	53.2	49.6	57.8	24.7	19.7	33.9
Meghalaya	10.8	6.1	21.6	40.8	34.6	51.0	9.2	8.1	15.2
Mizoram	8.2	4.8	16.8	30.4	29.4	30.7	9.8	5.0	13.7
Nagaland	5.2	3.6	9.8	23.6	30.1	19.7	8.0	6.1	12.5
Odisha	21.6	19.5	34.1	70.7	71.5	68.6	15.3	14.2	22.3
Punjab	38.5	38.4	38.8	55.5	57.0	53.4	29.9	29.1	31.4
Rajasthan	10.4	8.1	19.7	26.9	24.4	33.0	7.2	5.5	15.3
Sikkim	32.8	26.9	43.1	55.4	44.0	*	30.4	25.9	40.4
Tamil Nadu	44.9	42.9	47.5	63.8	66.7	61.5	36.0	35.1	37.5

State	All health facilities			Private health facilities			Public health facilities		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Telangana	60.7	58.4	64.3	81.5	80.6	82.7	44.5	44.3	44.8
Tripura	25.1	18.6	47.5	69.3	54.7	95.7	22.7	17.6	40.4
Uttar Pradesh	13.7	11.0	24.2	39.4	37.8	42.6	6.2	4.7	14.4
Uttarakhand	20.4	16.7	28.6	43.3	40.9	47.0	14.0	10.7	21.4
West Bengal	32.6	28.6	43.5	82.7	84.4	80.2	22.9	20.3	31.7

*Percentage not shown; based on fewer than 25 unweighted cases.
Source: Authors

It is astonishing to observe from table 1 that more than four out of every five births in the private health facilities in West Bengal and Telangana are caesarean births. In the north-eastern states of Assam and Tripura, and in the eastern state of Odisha, nearly 70 per cent, and in the southern states of Tamil Nadu and Andhra Pradesh, more than 60 per cent of births in private health facilities are caesarean births. Almost all births in private health care facilities (95.7 per cent) in the urban areas of Tripura are reported to be caesarean births. This unbelievable proportion needs further investigation and is a matter of serious concern from the perspective of the health of the mother and the child.

In the public health facilities, proportion of caesarean births is substantially lower than that in private health facilities in all states. However, in many states, the proportion of caesarean births is higher than 15 per cent in public health facilities. The proportion of caesarean births in the public health facilities is the highest in Telangana (44.5 per cent), followed by Kerala (37.2 per cent), and Tamil Nadu (36.0 per cent). In the urban areas, more than two-fifth of births in public health facilities are reported to be caesarean births in Telangana, Tripura, and Sikkim.

Table 2 shows how inter-state variation in the proportion of caesarean births is related to the inter-state variation in explanatory variables included in the analysis. In the combined (rural and urban) population, inter-state variation in indicators of maternity care is found to be more strongly correlated with the inter-state variation in the proportion of caesarean births compared to indicators of family planning use and educational status of women. The inter-state variation in the proportion of caesarean births is however statistically significantly correlated with the inter-state variation in all independent variables except the proportion of currently married women using IUD/PPIUD. Results are quite similar for the rural population. In the urban population, however, inter-state variation in the proportion of women with at least 10 years of education is not found to be statistically significantly correlated with the inter-state variation in the proportion of caesarean births.

It may also be seen from table 2 that, in case of private health facilities, inter-state variation in none of the independent variables is statistically significantly associated with the inter-state variation in the proportion of caesarean births. In case of public health facilities, however, inter-state variation in indicators of maternity care and educational status of women is found to be statistically significantly associated with inter-state variation in the proportion of caesarean births, but variation in indicators of family planning use is not found to be statistically significantly associated with variation in the proportion of caesarean births.

Stepwise regression analysis has been carried out to explore how inter-state variation in the proportion of caesarean births is influenced by the inter-state variation in the seven independent or explanatory variables described above. The results of the stepwise regression analysis are presented in table 3. The stepwise regression analysis has been carried out for the total (rural and urban) population and separately for rural and urban populations. The stepwise regression analysis has also been carried out separately for births in public health facilities and births in private health facilities to explore how inter-state variation in the independent variables influence inter-state variation in the proportion of caesarean births in private health facilities and inter-state variation in the proportion of caesarean births in public health facilities.

Table 2: Simple zero order correlation coefficient of the proportion of caesarean births with selected independent variables.

Factor	Indicator	Total	Rural	Urban	Private facility	Public facility
Education of women	1. Proportion of women (15-49 years) with at least 10 years of schooling	0.449*	0.528**	-0.023	-0.164	0.540**
Family planning	2. Proportion of currently married women (15–49 years) using female sterilization	0.492**	0.471*	0.434*	0.165	0.315
	3. Proportion of currently married women (15–49 years) using IUD/PPIUD	-0.298	-0.266	-0.395*	-0.349	-0.156
Maternity care	4. Proportion of mothers who had at least 4 antenatal care visits	0.624***	0.683***	0.500**	0.334	0.584**
	5. Proportion of women with high or very high blood sugar level (>140 mg/dl) or taking medicine to control blood sugar level	0.706***	0.573***	0.734***	0.355	0.712***
	6. Proportion of women with elevated blood pressure (systolic >=140 mm of Hg and/or diastolic >=90 mm of Hg) or taking medicine to control blood pressure	0.637***	0.622***	0.681***	0.283	0.727***
	7. Proportion of women (age 15-49) who are overweight or obese (BMI >=25.0 kg/m^2)	0.760***	0.739***	0.633***	0.218	0.773***

* $p < 0.05$; ** $p < 0.01$; *** $p < .001$
Source: Authors

Table3: Results of the stepwise regression analysis of the proportion of caesarean births on independent variables.

Indicator	Total		Rural		Urban		Private facility		Public facility	
	b	β	b	β	b	β	b	β	b	β
1. Proportion of women with 10 or more years of schooling			0.457**	0.461	-0.364*	-0.284	-0.852**	-0.714		
2. Proportion of women using female sterilization as family planning method	0.227*	0.316	0.300*	0.409						
3. Proportion of women using IUD/PPIUD as family planning method										
4. Proportion of mothers who had at least 4 antenatal care visits										
5. Proportion of women who are overweight or obese as reflected through BMI	1.013**	0.678								
6. Proportion of women having high or very high level of blood sugar					1.426**	0.510	1.837*	0.488	1.264**	0.497
7. Proportion of women having elevated blood pressure, either systolic or diastolic					1.671**	0.533	1.736*	0.516	1.185**	0.523
R^2 / Adjusted R^2	R^2	R^2_{Ajd}	R^2	R^2_{Ajd}	R^2	R^2_{Ajd}	R^2	R^2_{Ajd}	R^2	R^2_{Ajd}
	0.670	0.644	0.442	0.397	0.743	0.711	0.436	0.366	0.734	0.713
N	28	28	28	28	28	28	28	28	28	28

*p< .05; **p < .01

b – unstandardized coefficient; β - standardized coefficient

Source: Authors

The results of the stepwise regression analysis suggest that inter-state variation in the selected independent variables used in the analysis has a statistically significant influence on the inter-state variation in the proportion of caesarean births and these variables are different for different population groups. In case of combined population, inter-state variation in the proportion of women who are obese or overweight and the proportion of women who are sterilized have a significant impact on inter-state variation in the proportion of caesarean births. In the rural population, inter-state variation in the proportion of women who are sterilized and the proportion of women who have 10 or more years of schooling are found to be statistically significantly associated with the inter-state variation in the proportion of caesarean births.

In the urban areas, however, the inter-state variation in the proportion of caesarean births is found to be statistically significantly associated with the inter-state variation in the proportion of women with elevated blood pressure, proportion of women with high or very high level of blood sugar, and proportion of women with at least 10 years of schooling. Among the three predictor variables, the regression coefficient of the proportion of women having elevated blood pressure and higher level of blood sugar are positive but that of the proportion of women with at least 10 years of schooling is negative which implies that, other things being equal, the higher the proportion of women with at least 10 years of schooling in the urban areas of a state, the lower is the proportion of caesarean births in the urban part of that state. However, out of these three predictors, the association of the variation in the proportion of caesarean births with the elevated blood pressure is the strongest while it is weakest for women with 10 or more years of schooling.

In case of births in private health facilities, the pattern is the same as in the urban population. The variables that have a statistically significant impact on the variation in the proportion of caesarean births are the proportion of women with elevated blood pressure, the proportion of women with high or very high blood sugar level, and the proportion of women with 10 or more years of schooling. The regression coefficient of the proportion of women with at least 10 years of schooling is negative in this case also while that of the proportion of women having elevated blood pressure and high level of blood sugar are positive. However, the association of the proportion of women with at least 10 years of schooling is stronger than that of the proportion of women having elevated blood pressure or high blood sugar. On the other hand, in case of births in public health facilities, the independent variables that affect the proportion of caesarean births statistically significantly are the proportion of women with elevated blood pressure and the proportion of women with high or very high level of blood sugar.

Table 3 suggests that after controlling the effect of other variables, the proportion of women using IUD/PPIUD and the proportion of women who had at least four antenatal care visits, do not impact the variation in the proportion of caesarean births in any population group. On the other hand, in the private and public health facilities and in the urban population, main factors behind a caesarean birth are elevated blood pressure and high blood sugar level of women during pregnancy. The educational level of women, 10 years or beyond, influences the variation in caesarean births in rural as well as in urban areas and also in private health care facilities. In rural areas, it has a positive impact but a negative impact in the urban areas on the proportion of caesarean births.

Discussion

Caesarean births are increasing at an alarming rate in India and the proportion of caesarean births is found to be exceptionally high in private health facilities in the urban areas. According to WHO, caesarean births should range between 10-15 per cent of all births to protect women and children from the consequences of complications of pregnancy and delivery. Caesarean births more than 15 per cent of all births is generally deemed unnecessary and may drain resources and may also have an adverse impact on the health of women and children. Viewed from this perspective, the data available through NFHS-5 suggest that the proportion of caesarean births in India and in most of its states is unacceptably high and is a major public health concern. The situation appears to be alarming in the urban areas of the country where majority of the births in private health facilities are caesarean births. At the same time, there are states where caesarean births account for less than 10 per cent of all births in public health facilities which suggests that a substantial proportion of those women who are in need emergency care at the time of delivery are devoid of such care.

The proportion of caesarean births is found to be relatively high in the southern states and in some northern and north-eastern states of the country. By contrast, the proportion of caesarean births is within the range recommended by the World Health Organization in the central region of the country, extending from Rajasthan to Bihar and Jharkhand and in two north-eastern states. It is generally argued that there is a positive association between the level of socio-economic development and the proportion of caesarean births. However, the present study, based on the latest state level data, suggests that the higher the proportion of women having at least 10 years of schooling the lower the proportion of caesarean births in the urban areas but the higher the proportion of women with 10 or more years of schooling the higher the proportion of caesarean births in the rural areas. Given the different natura of the relationship between the proportion of caesarean births and the proportion of women with at least 10 years of schooling, there is a need to further examine the role of the level of education of the woman in deciding the type of delivery using the micro-level data. Such data, however, are not currently available through NFHS-5.

The high proportion of caesarean births in private health facilities in India is not surprising as, in many low and middle-income countries, a high proportion of caesarean births in private health care institutions is reported (Guilmoto and Dumont, 2019; Beogo et al., 2017). In India also, many studies have reported an abnormally high proportion of caesarean births in private health facilities (Bhartia et al, 2020; Johnson and Rehavi, 2016). The big difference in the proportion of caesarean births in private health facilities as compared to that in the public health facilities can be ascribed to the quality of services in the private health care institutions. In any case, the exceptionally high proportion of caesarean births in private health facilities raises questions about the motives of private health care services providers. It is argued that private health care services providers motivate and convince and even force women to go for a C-section delivery either on one pretext or the other as a C-section delivery is financially lucrative for private health institutions, even though this practice is entirely unethical.

It has also been argued that a high proportion of caesarean births in private health facilities is due to an increase in the health insurance coverage. A study in the United States of America has concluded that the probability of a caesarean birth is less in women having public health insurance as compared to women having private health insurance (Hoxha et al, 2017). In India, health insurance coverage, combined with the lack of oversight of the private health sector, is argued to be creating an ideal environment for private health facilities to provide biased information to women and engage in physician-induced demand, resulting in a high proportion of caesarean births even when they are medically not necessary (Bhatia et al, 2020).

There are also studies that suggest that caesarean births are more common among urban dwellers, wealthier women, and those with a higher level of education (Singh et al, 2018; Mishra and Ramanathan, 2002). A high proportion of caesarean births in the urban areas may also be explained by the higher prevalence of obesity due in the urban areas to the lack of physical activities and hypertension due to hectic life (Aroor et al, 2013). On the other hand, the proportion of caesarean births is found to be directly related to the proportion of women with elevated blood pressure and high blood sugar level. This is expected as elevated blood pressure at the time of delivery and gestational diabetes are medical emergencies and, therefore, contra-indication for normal delivery (American Pregnancy Association, 2021). The data available from NFHS-5 suggest that the proportion of women with elevated blood pressure and high blood sugar varies widely across the states of the country. Reasons for the variation in the proportion of women having elevated blood pressure and diabetes need to be examined in the context of the variation in the proportion of caesarean births. It appears that there are state-specific factors that contribute to the variation in the proportion of women with elevated blood pressure and gestational diabetes.

Another contraindication for normal delivery is obesity which is more prevalent in middle- and upper-class women (Srivastava et al, 2020). This means that a higher proportion of obese women is directly related to a higher proportion of caesarean births as is revealed in the present study. On the other hand, check-up during the antenatal period has not been found to be associated with the proportion of caesarean births even in private health care institutions. Other studies, however, suggest that antenatal care check-ups at private health care facilities increase the likelihood of the caesarean births that could otherwise be avoided (Kathuria and Raj, 2020; Singh et al, 2018; Mishra and Ramanathan, 2002).

The proportion of women who are sterilized is associated with the proportion of C-section deliveries. It might be due to the convenience of performing sterilization right after the caesarean birth as it prevents another surgery and hospital stay if the woman does not want any more children.

There is also evidence that suggests that some women prefer C-section delivery over normal vaginal delivery for fear of natural birth, health risks, negative previous experiences with childbirth, biased information about C-section delivery, and superstitious beliefs about auspicious birth dates (Suwanrath et al, 2021). Some of these reasons might be applicable to women in India also but NFHS-5 did not collect data on maternal preference for delivery. The maternal preference for C-section births is also associated with the level of education of woman and household income (Kathuria and Raj, 2020). The present study

indicates that the increase in the level of education of the woman leads to a decrease in the probability of a caesarean birth in the urban areas. It seems that with the increase in the level of education, concerns about negative consequences of C-section delivery (risk of infection, injury, scar) also increase leading to the preference for normal delivery. On the other hand, in the rural areas, with increase in the educational level of women chances of caesarean births also go up. The plausible explanation could be that it is easier to convince rural women compared to urban women about the need and benefits of caesarean delivery.

The very high proportion of caesarean births, particularly in private health care institutions in India, as revealed through the preliminary data from the latest NFHS-5, calls for institutionalising a monitoring system to investigate the reasons and factors behind the high and increasing proportion of caesarean births in the country. Such a monitoring system is also necessary for an appropriate policy response and necessary programme interventions to ensure that the proportion of caesarean births is neither more than 15 per cent of all births nor less than 10 per cent of all births as recommended by the World Health Organization. There is also a need to come up with appropriate programme strategies that include unbiased maternal counselling about normal versus C-section delivery.

Conclusions

The data available from the latest National Family Health Survey in India suggest that caesarean births in the country have emerged as a major public health challenge and the situation appears to be precarious in states like West Bengal and Telangana where private health care facilities appear to be conducting C-section deliveries indiscriminately. C-section delivery must be opted only when the life of the woman and/or the child is at risk. Unnecessary C-section deliveries may cause maternal and foetal injuries, infections, and additional costs related to childbirth.

The present study has found that the elevated blood pressure of the woman and high level of blood sugar are the most important predictors of the caesarean births with elevated blood pressure being a stronger predictor of the two. This is expected as elevated blood pressure at the time of delivery is a medical emergency and normal delivery is not recommended in such a situation. The proportion of women with elevated blood pressure at the time of delivery is found to vary widely across the states of the country. Identification of the factors behind the elevated blood pressure at the time of delivery may provide the information that may be helpful in reducing the proportion of caesarean births.

The present study uses state level aggregate data which has several limitations for an in-depth analysis of the determinants of caesarean births in India. The individual level data from NFHS-5 are not yet available. It is recommended that more in-depth analysis should be carried out using the individual-level data to understand more about the factors associated with caesarean births.

Based on the findings of the present analysis, there is a need of monitoring the data from health care facilities – public and private - for checking unnecessary C-section deliveries and for providing counselling about the benefits of the normal delivery during the antenatal period.

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