

# Prevalence of the Caesarean Section in India

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## Abstract

Caesarean Section is considered as a safe method of delivery. In context of Indian population where percentage of non-institutional births are still very high, preference for caesarean section delivery in association with socio-economic factors is yet to come up in the literatures. The present article assesses the gravity of the caesarean section deliveries in India, by correlating the preference for caesarean sections with the socio-economic factors. The study analyzes data on ever-married women from the NFHS-II (1998-1999) and NFHS-III (2005-2006). To assess the influence of socio-demographic factors towards the use of caesarean section, both bivariate and multivariate binary logistic regression models are constructed. The analysis confirmed that age of delivery, maternal education, choice of medical institution, place of residence and birth order were important predictors for the prevalence of caesarean sections during childbirth. A significant inclination in the caesarean delivery above the WHO recommended optimal range of 5-15% is found in almost all Indian states. This increase in caesarean rate will create a huge burden on the health system (WHO, 1985) and enhances the risk of manifestation of major health problems of mother and baby. Unwanted caesarean delivery also puts huge financial stress on family economical status.

**Keywords:** *Logistic regression, Odds ratio, Institutional delivery, Indicators*

## 1 INTRODUCTION

Caesarean section or C-section of child delivery, in both developed and developing countries (Taffel et.al., 1987, Ye et.al, 2014, Vogel et.al, 2015) including India (Ghosh and James, 2010, Radha et.al 2015), are reported as a most espoused method of delivery. In the surgical procedure of caesarean section, child delivery happens through an abdominal and uterine incision. Osterman et.al(2014) discussed that the caesarean delivery adoption rate is found comparatively high during the last decade. The important reasons for this escalation in caesarean delivery rate are suggested by Anderson(2004), McCourt et.al(2007) and Lauer et.al(2010) which states that the caesarean delivery reduces the risks occurred due to complications during childbirth to both mother and child health.

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Caesarean section is appropriate to be carried out during delivery by the medical institutions, in situations where vaginal (or normal) delivery is risky to both mother and baby. Understanding the consequences of caesarean delivery, World Health Organization (WHO) (WHO, 1985) suggest that although caesarean section is a safe method of delivery, but if the adoption rate is above 5-15%, the risk of manifestation of a major public health problem for mothers and children (Kolas et al.(2006), Tita et al.(2009), Scott and Porter(2008)) also increases. Whereas, caesarean rate less than 5% implies the deprivation of surgical obstetric care (WHO, 1993).

Although caesarean delivery is considered as a relatively safe method of delivery (Althabe et.al (2006)), but it has a higher risk of complications than does a vaginal birth or normal method of birth. Wagner(2000), Thomas and Paranjothy(2001), Villar et.al(2006), Hall and Bewley(2009) have discussed about the most frequent complications which may occurred during and after a caesarean delivery to the mother and also suggested by Medical Advisory Board\* are: infection, heavy blood loss, a blood clot in the legs or lungs, nausea, vomiting, and severe headache after the delivery, injury to another organ (such as the bladder) etc., and to child are: injury during the delivery, need for special care in the neonatal intensive care unit (NICU), immature lungs and breathing problems *etc.*. And secondly, high cost for operation and stay (Robson et.al(2013)) in any medical institution.

Usually the rate of caesarean section defines the fraction of women who adopted caesarean section procedure for delivery among total childbirths in a specific time period in a specific geographic area. And the prevailing models and estimates of the caesarean rate in a specific geographic area is appropriate under the assumption that in this selected area almost all deliveries took place in medical institutions. But in developing countries like India, where a significant proportion of child deliveries (NFHS-II (1998-1999) and NFHS-III (2005-2006)) are carried out in houses, women having non-institutional deliveries are completely free of risks and complications of caesarean deliveries. Earlier studies of Padmadas et.al (2000), Kambo et.al (2002), Mishra and Ramanathan, M. (2002), Group (2013) and Dhillon et.al (2017) highlighted the issues of mother-child healthcare because of the growing tendency for caesarean section, using the birth histories of hospitals in India. Some of Indian state specific studies on caesarean deliveries in hospitals, Pahari and Ghosh (1997) in West Bengal, Padmadas et.al (2000) in Kerala, Mehta et.al (2001) in Mumbai, Sreevidya and Sathiyasekaran (2003) in Madras, Mukherjee S N (2006) and The CORONIS Collaborative Group (2013) in Delhi and Bharadwaj and Modi (2017) in Central India, indicates the same growing tendency of adoption of caesarean procedure for delivery.

Keeping in the view of the fact that the procedure of caesarean delivery is possible if there is an institutional delivery of a woman. This study is an attempt to investigate the dynamics of prevalence of caesarean section in India and its states, which will provide a better understanding about the existing situation. This study also aims to explore the dependency and significance of the socio-economic factors on the preference of caesarean section for childbirth, which were performed in the last five years preceding the survey, in India.

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\*<http://www.webmd.com/baby/tc/caesarean-section-risks-and-complications>

## 2 METHODOLOGY

### DATA

The National Family Health Survey is part of the program Demographic and Health Surveys (DHS), which took place in households of the developing countries since 1984 (Vaessen and Thiam, 2005). DHSs are regarded as a series of surveys that provide good information on population, health and nutritional status of mother and child in India and its states. Out of three NFHSs for India, two *viz.*, NFHS-II and NFHS-III, which are conducted in 1998-1999 and 2005-2006, respectively, are considered for the present study. Since the objective of the present study is to investigate the prevalence of caesarean section among the married women, the portion of the Children's Data Recode File of NFHSs containing data on live births occurred five years preceding the survey is being used.

In the NFHS-II, 33,026 live births occurred to ever-married women from 26 states of India. Of the survey population, among the total births, the percentage of singleton births (78%) were reported to families lived in rural areas. The next edition of the NFHS (NFHS-III) included information about, 51,555 live births occurred to ever-married women from 29 states of India, while births to women of rural areas decreases to 75%. Additional three states *viz.*, Uttaranchal, Jharkhand, and Chhattisgarh were integral part of Uttar Pradesh, Bihar, and Madhya Pradesh, respectively, and are formed in 2001. To investigate the prevalence of caesarean delivery among women in India, all of the 29 states are considered.

### SOCIO-ECONOMIC FACTORS

To promote a safe and secure health of mother and born child, every health related program always encourage deliveries in presence of trained health professionals under proper hygienic conditions. Since, the procedure of caesarean delivery is only possible in any medical institution. Therefore, some of independent variables included for analyses were investigated: maternal age, place of residence, maternal educational qualification, birth order of the child, and type of medical institution opted for delivery, size of the baby and religion. Age as reported subjectively by the mother, and is grouped into 6 subgroups: 15-19,  $\dots$ , 40-44. Age interval 45-49 were not considered due to the lack of sufficient data. Type of place of residence was categorized as rural and urban. Educational qualification is categorized in four classes no education, primary, secondary and higher. Birth order of the born child, which was grouped into first, second, third, fourth, and fifth or above. Medical institution opted for delivery was grouped into Government and Private. Size of the born child is classified as smaller than average, average and more than average, and large. Religion of the family is classified into Hindu, Muslim, Christian and others. The primary outcome of interest is the prevalence of caesarean section during delivery in any medical institution. If a woman delivers her child at any medical institution then the variable of interest for the analysis is dichotomous, which indicates whether or not caesarean procedure is adapted to the woman during delivery.

## STATISTICAL ANALYSES

Corresponding to each of the identified covariates, the associations with prevalence of caesarean sections have been examined using binary logistic regression analyses, which thereafter used for examining the effect of socio-economic factor on the odds of caesarean birth and non-caesarean birth. A woman whose childbirth was performed following caesarean section was also coded as '1' and '0' if otherwise. Following the bivariate logistic regressions, multivariate logistic regression models were constructed separately for each of the dependent variables. The results of the regression analyses have been presented by odds ratios (ORs) with 95% confidence interval (CI). Statistical analyses were performed using the Statistical Analysis System (SAS) package, University edition and all other computation is carried out by using R package (version-3.0.3).

### 3 RESULTS

#### BACKGROUND CHARACTERISTICS OF PREVALENCE OF CAESAREAN SECTION

Based on NFHS-II and NFHS-III data, Table 1 presents the rate of caesarean section, which is the proportion of caesarean deliveries to the total births, in India and its states. Table 1 shows a substantial inter-state variation in caesarean rates in India. It clearly shows an inclination of the caesarean rates towards higher values in all Indian states. The caesarean delivery in India among all births is increased by 3%, from 7.2%(1998-99) to 10.62%(2005-06). Based on NFHS-III (2005-06) data, the rate of caesarean delivery is highest in women of Kerala (30.09%) followed by Goa(25.51%), Andhra Pradesh (27.49%), Tamil Nadu (23.00%), Punjab(16.45%) and Karnataka(15.27%), which have crossed the WHO recommended range of 5-15%. The variation in espouse of caesarean delivery among urban and rural women is quite conspicuous (Table 1). The rate of caesarean delivery found in urban part of India is 17.81%, which is three times of the rural part *i.e.*, 6.25%. Similar kind of disparity in rates of caesarean section among urban and rural women are also found in each of the selected states.

In general, accuracy of any estimate depends upon the proper selection of the study population and is *vice-versa*. In order to estimate the prevalence of caesarean deliveries corresponding to each NFHSs, the population is classified into two disjoint sub-population on the basis of the place of birth *viz.*, institutional and non-institutional. Deliveries occurred at any private or government medical institutions, are considered as institutional births, whereas births occurred other than any medical institutions, are considered as non-institutional births. In order to classify the exposed and non-exposed population from the prevalence of caesarean delivery, Table 2 presents the percentage of non-institutional births corresponding to each selected states of India which are completely free from the risk and complications of caesarean deliveries. Table 2 shows that the percentage of institutional delivery in India is raised from 34.92% (using NFHS-II) to 44.92% (using NFHS-III).

The performance of the institutional delivery as compared to non - institutional, towards saving the lives of children, is depicted in Figure 1. Overall, the data indicate that the percentage of child deaths in India are declined among children born in medical insti-

tutions over the period of time. Figure 1 also depicts one of the important reasons for shift in Indian population towards institutional deliveries as compared to the non-institutional. One can also observe role of caesarean procedure, adopted during institutional deliveries, in saving the lives of the children in India.

Since, the procedure of caesarean section is possible in any medical institution; therefore, those women whose deliveries are non-institutional are not exposed for caesarean selection and are not part of the population of concern. After omission of such women whose deliveries were non-institutional, the proportion of caesarean deliveries is calculated from the women whose deliveries were institutional and is given in Table 3. Based on the latest round of NFHS, Table 3 shows an overview of the behaviour of caesarian delivery in medical institutions experienced by married women in different states of India. The variation among the proportions of caesarian delivery corresponding to each of the selected states are quite high. As per caesarean section in institutional delivery, there are only 5 out of 29 selected states of India have WHO suggested optimal percentage of caesarean section *i.e.*, 5-15% whereas in 5 states this percentage ranges between 15-20%. Apart from these ten states, in remaining 19 states the percentage are very high and lies in the range of 20-37%. Andhra Pradesh, Punjab and Kerala are the top three states where caesarian adoption is above 30%. In order to discuss the variation in caesarean rates based on institutional births due to place of residence, rural and urban rates are also obtained. Caesarean deliveries, based on NFHS-II(1998-99), in urban parts of only three states (*viz.*, Nagaland, Orissa and Rajasthan) and rural parts of nine states, are within the WHO suggested optimal range of 5-15%. During NFHS-III(2005-06), this numbers reduces to two (*viz.*, Mizorum and Arunachal Pradesh) in urban and six (*viz.*, Arunachal Pradesh, Bihar, Delhi Gujrat, Haryana, Madhav Pardesh, Meghalaya, Mizorum, Nagaland Orissa and Rajasthan) in rural.

The percentage distribution of caesarean section among women by their socio-demographic characteristics is shown in Table 4. Corresponding to each socio-demographic characteristics, as compare to NFHS-II there is an increase in percentage of caesarean section in NFHS-III. Caesarean childbirth among the women aged 15-24 is comparatively less than those who are above it. Caesarean among urban women is very high as compare to those of rural women. Caesarean section is positively associated with women's education. The women with the higher level of education have higher chance for caesarean childbirth. Caesarean section is negatively associated with birth order of the child, *i.e.*, least the birth order highest is the chance to get caesarean section. Caesarean section among the women whose childbirth occurred to private medical institutions are very high comparatively to the childbirth occurred to government medical institutions. Children whose size is average or more than average are mostly delivered by caesarean section on contrary to those who are either very large or smaller than average in size. Caesarean among the children born in medical institutions corresponding to each religion are almost same.

## SOCIO-ECONOMIC DETERMINANTS OF PREVALENCE OF CAESAREAN SECTION

Table 5 and 6 shows the results of bivariate and multivariate logistic regression analyses. The bivariate analyses applied in the study showed that maternal age, education of mother, choice of medical institution for delivery (*viz.*, government and private) and birth

order were found to have significantly associated with caesarean delivery. When other socio-economic factors were considered as constant, the multivariate logistic regression analysis revealed that maternal age, education of mother, choice of medical institution for delivery (*viz.*, government and private), birth order and religion are found to have significant effect on caesarean delivery. The variable ‘size of the baby’ had found to be insignificant for NFHS-II whereas NFHS-III revealed that it had a significant effect on the prevalence of caesarean delivery.

The women with higher educational qualification are more likely to undergo caesarean delivery than others. The women opted private institutions for childbirth, compared to government medical institutions counterparts, are more likely to deliver through caesarean sections. Birth order showed a consistent decrease in caesarean section. The Muslim women are more likely to undergo caesarean delivery. Size of the baby and place of the residence are found to significant based on the information available during NFHS-III, which revealed that women whose baby’s size either larger than average or smaller than average with reference to average size, and the urban women, compared to their rural counterparts, are more likely to deliver through caesarean sections.

## 4 DISCUSSION

The present study investigates the prevalences of caesarean section in India, which is the second most populated country in the world. The result showed that the rate of caesarean section to the total births, has increased by 3% from 7.20%(1998-99) to 10.62%, and similar increment is also observed corresponding to each Indian states. A substantial proportion of population still resides in rural area. To depict the rural-urban difference, NFHS datasets are classified so that variation between various demographic and health related facilities and indicators with reference to their place of residence can be examined. A behavioural shift in both rural and urban areas towards adoption of caesarean procedure are also observed. But in urban areas the rates are found to be comparatively high as that of rural areas. Corresponding to each round of NFHS, the rates of caesarean in both rural and urban areas also increases significantly as compared to the rate of previous round. The result also showed that, there are 12 urban and 2 rural states out of 26 during 1998-99(NFHS-II) and 16 urban and 4 rural states out of 29 during 2005-06(NFHS-III), have already exceeded the optimal range of 5-15%(WHO, 1985) caesarean section to the total births.

The procedure of caesarean section is possible if the place of birth is any medical institution. Therefore, those women whose deliveries are non-institutional, cannot be considered as exposed for caesarean selection and are not part of the population of concern. Only ever-married women whose deliveries were institutional, is considered as a population of interest. Corresponding to each selected states, the findings revealed a shift towards the institutional deliveries from the non-institutional deliveries over the concerned time period. The percentage of non-institutional deliveries in India decreases from 65.08% (NFHS-II) to 55.08%(NFHS-III), which signifies the effectiveness of the health programs and awareness among mothers. Even though there is a decrease in rates of non-institutional deliveries, but out of 29 selected states, the percentage of non-institutional deliveries in 8 states ranges between 35-50%, not only that in 13 states *viz.*, Arunachal

Pradesh, Assam, Bihar, Chhattisgar, Haryana, Jharkhand, Madhya Pradesh, Meghalaya, Nagaland, Orissa, Rajasthan, Uttar Pradesh and Uttarakhand, it is above 60%. It is to be emphasized regarding the state Kerala and Goa where the rate of institutional deliveries is 99.4% and 92.25% , respectively, which is because of high literacy rates.

Based on the fact that only those women whose deliveries were institutional, can be considered as an exposed population for the prevalence of caesarean section. The obtained result reveal the same inconsistency among rural and urban women, as those found using the information of total births occurred in the selected state. Findings showed that, although there is a disparity in the prevalence of caesarean section among rural and urban women but the institutional births based percentages are found to be completely different and are very high to those obtained using the information of total births. Based on the institutional births histories of NFHS-II, there were only four states *viz.*, Madhya Pradesh, Maharashtra, Manipur, Nagaland and Rajasthan, where prevalence lies within the optimal range (WHO, 1985) of 5-15%. If rate is classified on the basis of the place of residence, then urban region of only three states (Nagaland, Orissa and Rajasthan) and rural region of ten states lie within optimal range. In the latest round of NFHS (NFHS-III), the number of states whose rates of caesarean section is within the optimal range, in urban region were only two (Mizoram and Arunachal Pradesh) and eleven in rural parts.

It is also to be noted regarding Kerala, where the third highest caesarean deliveries took place and the percentage of prevalence of caesarean section based on total births were found to be 30.09%, is quite close to prevalence based on institutional births, 30.07%. The reason for this closeness of the estimates is due to the fact that in Kerala 99.4% births are institutional. In case of the state Goa, where only 92.25% births are institutional, the prevalence based on total births is 25.51% and based on institutional births is 27.72%. It demonstrates that if the births are institutional then obtained the prevalence of caesarean section will provide an exact scenario and estimate.

Our findings suggest that women with higher education are more likely to undergo caesarian as compared to uneducated women with approximately four times more in comparison to uneducated women based on NFHS-III survey. This trend found to be positively associated between NFHS-II and NFHS-III surveys. The age of women found to have weak impact (the odds are slightly higher than one) on risk of caesarian (*i.e.*, every one year increment on women's age, the risk of caesarian is approximately 1.1 times in women as compared to women with normal delivery. There are positive trends found for caesarian delivery in private hospitals between NFHS-III survey and NFHS-II survey. Our results indicate that women are getting 2 times more caesarian delivery in private hospitals as compared to government hospitals. The odds for delivering fourth baby through caesarian are significantly high in NFHS-III survey in comparison to NFHS-II survey.

## 5 CONCLUSIONS

A significant inclination in the institutional deliveries is found in 1998-99 (NFHS-II) and 2005-06 (NFHS-III) in all Indian states, which signifies the effectiveness of the schemes

and programmes towards awareness of women. The main reason for this transition is that it reduces the risks and complications occurred during deliveries. The obtained results also shows that in saving the lives of the children in India, caesarean procedure performs better than non-caesarean based deliveries. This increase in institutional delivery may be an important reason for the inclination of caesarean delivery in all Indian states (except Arunachal Pradesh, Meghalaya, Mizorum and Rajasthan) above the WHO recommended optimal range of 5-15%. The prevalence of caesarean section delivery is also examined for different labels of the socio-economic covariates. The analysis shows that maternal age, education of mother and birth order, are significantly associated with caesarean delivery in India. Among all other determinants for the prevalence of the caesarean delivery at any medical institution, perhaps choice of the place for delivery (*viz.*, government and private) strongly influences the caesarean section.

Since, the increase in caesarean rate above the optimal range creates a huge burden on the health system (WHO, 1985) and enhances the risk of manifestation of major health problems of both mother and baby, and unwanted caesarean delivery also puts huge financial stress on family economical status. Therefore, the government should develop better health care infrastructure along with more antenatal care related schemes for reducing the risks that occur due to increase in caesarean deliveries.

For further investigation and better understanding of the reasons behind the prevalence of caesarean section in India by any medical institution corresponding to each childbirth, more relevant data on women and doctors' decision-making process for the safe child delivery and related risks, is needed.

## 6 DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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Table 1: Rate of caesarean births occurred based on both institutional and non-institutional births in different states of **India** during the five years preceding the survey

State	NFHS-II			NFHS-III		
	Urban	Rural	All	Urban	Rural	All
Andhra Pradesh	22.26	11.94	14.69	32.25	19.41	27.49
Arunachal Pradesh	9.30	4.92	5.36	4.26	2.45	2.99
Assam	13.81	3.15	4.96	17.35	3.70	6.53
Bihar	9.39	2.37	2.95	7.56	2.49	4.05
Chhattisgarh	-	-	-	18.56	1.26	5.65
Delhi	14.29	5.06	13.40	12.60	5.00	11.99
Goa	25.62	16.75	20.00	27.31	23.67	25.51
Gujarat	15.95	4.21	8.55	14.69	5.51	8.85
Haryana	9.50	2.69	4.25	12.12	3.13	5.02
Himachal Pradesh	14.62	4.33	6.80	15.42	12.26	13.07
Jammu and Kashmir	27.43	5.84	10.59	31.05	9.17	14.11
Jharkhand	-	-	-	12.58	1.85	4.89
Karnataka	19.85	7.09	11.00	22.18	11.64	15.27
Kerala	37.65	27.32	29.84	33.54	28.45	30.09
Madhya Pradesh	8.31	1.47	3.00	13.59	1.88	6.76
Maharashtra	14.00	4.69	9.94	19.89	7.69	15.60
Manipur	9.84	3.72	5.40	16.28	6.21	10.09
Meghalaya	15.12	0.94	2.92	11.80	2.59	5.31
Mizoram	16.60	5.53	11.34	10.05	2.77	6.01
Nagaland	1.33	1.83	1.75	6.34	0.73	3.04
Orissa	7.04	4.80	5.21	12.84	3.87	6.06
Punjab	10.08	7.60	8.27	19.60	14.77	16.45
Rajasthan	6.68	2.12	3.01	9.86	2.24	4.15
Sikkim	16.28	6.05	7.02	24.87	10.09	14.55
Tamil Nadu	24.12	12.17	17.47	26.00	19.76	23.00
Tripura	25.71	5.20	7.57	23.31	11.07	13.62
Uttar Pradesh	8.21	1.60	2.66	12.68	2.42	5.89
Uttaranchal	-	-	-	17.46	5.26	8.39
West Bengal	25.29	6.97	13.48	29.23	5.83	14.99
<b>India</b>	14.92	4.52	7.20	17.81	6.25	10.62

Table 2: Percent of non-institutional births occurred in different states of **India** during the five years preceding the survey

State	Non-Institutional Live Births			
	NFHS-II		NFHS-III	
	Total n (%)	Birth(%)	Total n (%)	Birth(%)
Andhra Pradesh	1130(3.42)	49.20	2292(4.45)	24.35
Arunachal Pradesh	429 (1.30)	69.46	870(1.69)	69.54
Assam	1069(3.24)	77.36	1532(2.97)	73.76
Bihar	2948(8.93)	85.52	2320(4.50)	74.74
Chhattisgarh	-	-	1592(3.09)	81.47
Delhi	821(2.49)	40.68	1251(2.43)	47.32
Goa	330(1.00)	9.09	988(1.92)	7.79
Gujarat	1321(4.00)	53.44	1571(3.05)	47.29
Haryana	1060(3.21)	77.74	1256(2.44)	65.45
Himachal Pradesh	882(2.67)	63.15	995(1.93)	50.95
Jammu and Kashmir	1076(3.26)	61.15	1226(2.38)	48.86
Jharkhand	-	-	1657(3.21)	77.37
Karnataka	1282(3.88)	49.14	2188(4.24)	35.74
Kerala	697(2.11)	6.60	1017(1.97)	0.59
Madhya Pradesh	2896(8.77)	78.90	3016(5.85)	61.54
Maharashtra	1761(5.33)	37.82	3038(5.89)	28.74
Manipur	667(2.02)	65.82	1912(3.71)	50.52
Meghalaya	617(1.87)	82.17	1093(2.12)	64.14
Mizoram	494(1.50)	39.68	848(1.64)	41.27
Nagaland	458(1.39)	87.77	2108(4.09)	83.92
Orissa	1498(4.54)	74.23	1781(3.45)	60.47
Punjab	883(2.67)	61.61	1307(2.54)	48.74
Rajasthan	3054(9.25)	77.90	2023(3.92)	68.36
Sikkim	456(1.38)	69.08	653(1.27)	45.79
Tamil Nadu	1345(4.07)	17.40	1735(3.37)	9.80
Tripura	304(0.92)	55.92	639(1.24)	51.49
Uttar Pradesh	4324(13.09)	84.30	7051(13.68)	75.18
Uttaranchal	-	-	1228(2.38)	66.45
West Bengal	1224(3.71)	49.92	2368(4.59)	47.89
<b>India</b>	33026	65.08	51555	55.08

Table 3: Percentage of caesarean births occurred in medical institutions of different states of **India** during the five years preceding the survey

State	NFHS-II			NFHS-III		
	Urban	Rural	All	Urban	Rural	All
Andhra Pradesh	28.27	27.68	27.92	37.02	34.66	36.37
Arunachal Pradesh	18.18	16.51	16.79	7.19	13.51	9.85
Assam	22.22	21.05	21.58	29.89	20.64	24.88
Bihar	22.45	18.24	19.2	17.14	14.76	16.04
Chhattisgarh	-	-	-	34.09	20.00	30.51
Delhi	22.88	14.81	22.43	23.69	10.64	22.76
Goa	28.18	18.42	22	29.57	25.84	27.72
Gujarat	22.65	12.36	18.05	19.40	13.92	16.79
Haryana	19.30	18.03	18.64	18.93	11.70	14.52
Himachal Pradesh	20.26	16.86	18.46	20.31	30.74	26.64
Jammu and Kashmir	36.16	20.33	27.03	41.75	20.71	27.64
Jharkhand	-	-	-	23.51	17.74	21.60
Karnataka	25.24	18.13	21.51	27.07	21.07	23.70
Kerala	37.87	29.88	31.95	33.54	28.70	30.27
Madhya Pradesh	16.36	10.36	13.61	20.00	10.82	17.59
Maharashtra	16.67	13.11	15.8	23.87	15.68	21.89
Manipur	18.95	12.03	14.91	23.53	16.74	20.40
Meghalaya	19.12	11.9	16.36	16.03	12.90	14.80
Mizoram	19.53	13.25	17.79	11.52	7.74	10.24
Nagaland	4.55	20.59	14.29	21.65	10.59	18.88
Orissa	12.84	22.69	18.91	20.22	12.18	15.34
Punjab	18.05	21.84	20.35	33.84	30.96	32.09
Rajasthan	12.50	10.59	11.41	15.48	10.73	13.13
Sikkim	28.00	21.55	22.7	29.17	24.73	26.84
Tamil Nadu	25.40	16.09	20.81	27.11	23.50	25.50
Tripura	32.14	12.26	16.42	33.33	25.81	28.06
Uttar Pradesh	20.93	13.06	16.05	30.08	15.19	23.74
Uttaranchal	-	-	-	30.56	20.52	24.94
West Bengal	30.11	21.29	26.51	35.42	17.91	28.77
<b>India</b>	22.19	17.98	20.05	26.36	20.04	23.63

Table 4: Percent of non-institutional births occurred in different states of **India** during the five years preceding the survey

<b>Factor</b>	<b>NFHS-II</b>		<b>NFHS-III</b>	
	Total n (%)	occurrence(%)	Total n (%)	occurrence(%)
<b>Age-interval</b>				
15-19	1044(9.06)	17.15	1035(4.47)	19.23
20-24	4508(39.11)	18.06	7504(32.42)	19.95
25-29	3816(33.11)	21.65	8494(36.69)	23.93
30-34	1534(13.31)	23.14	4362(18.84)	27.85
35-39	526(4.56)	22.43	1430(6.18)	30.56
40-44	98(0.85)	19.39	323(1.40)	27.86
<b>Residence</b>				
Urban	5659(49.10)	22.19	13160(56.85)	26.36
Rural	5867(50.90)	17.98	9988(43.15)	20.04
<b>Maternal Education</b>				
No education	2739(23.76)	13.40	4351(18.80)	14.66
Primary	1885(16.35)	16.02	2843(12.28)	18.22
Secondary	4528(39.29)	20.36	12324(53.24)	23.79
Higher	2374(20.60)	30.33	3630(15.68)	38.10
<b>Birth Order</b>				
1	4216(36.58)	26.14	7021(30.33)	30.37
2	3880(33.66)	20.31	9297(40.16)	25.22
3	1805(15.66)	14.96	3791(16.38)	18.07
4	781(6.78)	8.71	1619(6.99)	10.56
5+	844(7.32)	9.83	1420(6.13)	9.72
<b>Type of Institution</b>				
Government	6258(54.29)	16.32	12058(52.09)	18.06
Private	5268(45.71)	24.49	11090(47.91)	29.69
<b>Size of the baby</b>				
Large	–	–	971(4.19)	30.69
Average or more than average	8878(77.03)	20.38	17592(76.00)	23.55
Smaller than average	2648(22.97)	18.96	4585(19.81)	22.46
<b>Religion</b>				
Hindu	8371(72.63)	19.84	16476(71.18)	23.99
Muslim	1645(14.27)	19.64	3618(15.63)	22.53
Christian	913(7.92)	21.58	1888(8.16)	22.19
Others	597(5.18)	21.78	1166(5.04)	24.44
<b>Total</b>	11526	20.05	23148	23.63

Table 5: Adjusted odds ratio (OR) and 95% confidence interval (CI) for the risk of caesarean section corresponding to the associated factors in **India** based on NFHS-II and NFHS-III

Factor	NFHS-II		NFHS-III	
	OR	95% CI	OR	95% CI
<b>Age</b>	1.075*	(1.063,1.088)	1.072*	(1.064,1.08)
<b>Maternal Education</b>	$p < .0001$		$p < .0001$	
No education <sup>R</sup>	1		1	
Higher	1.474*	(1.253,1.735)	1.581*	(1.397,1.789)
Primary	1.136	(0.959,1.346)	1.202	(1.054,1.37)
Secondary	1.251	(1.088,1.439)	1.287	(1.164,1.423)
<b>Type of Institution</b>	$p < .0001$		$p < .0001$	
Government <sup>R</sup>	1		1	
Private	1.454*	(1.32,1.601)	1.656*	(1.551,1.768)
<b>Birth order</b>	$p < .0001$		$p < .0001$	
1	5.611*	(4.236,7.432)	6.01*	(4.896,7.377)
2	3.413*	(2.603,4.474)	4.084*	(3.352,4.976)
3	2.181	(1.651,2.882)	2.628	(2.142,3.223)
4	1.102*	(0.781,1.555)	1.29*	(1.013,1.642)
5+ <sup>R</sup>	1			
<b>Residence</b>	$p = 0.1761$		$p < .0001$	
Urban	1.07	(0.97,1.181)	1.158*	(1.083,1.239)
Rural <sup>R</sup>	1		1	
<b>Size of the baby</b>	$p = 0.7814$		$p < .0001$	
Large			1.474*	(1.272,1.707)
Average or more than average <sup>R</sup>	1		1	
Smaller than average	1.016	(0.907,1.139)	1.063*	(0.981,1.153)
<b>Religion</b>	$p = 0.0398$		$p < .0001$	
Hindu	0.992	(0.806,1.221)	1.013	(0.877,1.169)
Muslim	1.211*	(0.955,1.537)	1.191*	(1.013,1.4)
Christian	0.968	(0.747,1.254)	0.864*	(0.722,1.033)
Others <sup>R</sup>	1		1	

**Note:**

<sup>R</sup>indicates reference category.

\*Statistically significant CI

Table 6: Unadjusted odds ratio (OR) and 95% confidence interval (CI) for the risk of caesarean section corresponding to the associated factors in **India** based on NFHS-II and NFHS-III

Factor	NFHS-2		NFHS-3	
	OR	95% CI	OR	95% CI
<b>Age</b>	1.078*	(1.065, 1.09)	1.071*	(1.063, 1.079)
<b>Maternal Education</b>	$p < .0001$		$p < .0001$	
No education <sup>R</sup>	1			
Higher	2.813*	(2.445, 3.238)	3.582*	(3.217, 3.988)
Primary	1.233*	(1.045, 1.454)	1.279*	(1.142, 1.472)
Secondary	1.653*	(1.449, 1.885)	1.817*	(1.654, 1.995)
<b>Type of Institution</b>	$p < .0001$		$p < .0001$	
Government <sup>R</sup>	1			
Private	1.633*	(1.517, 1.823)	1.916*	(1.801, 2.038)
<b>Birth order</b>	$p < .0001$		$p < .0001$	
1	3.244*	(2.56, 4.111)	4.05*	(3.373, 4.862)
2	2.366*	(1.839, 2.969)	3.133*	(2.612, 3.757)
3	1.613	(1.242, 2.093)	2.048	(1.687, 2.487)
4	0.875*	(0.625, 1.224)	1.097*	(0.866, 1.39)
5+ <sup>R</sup>	1			
<b>Residence</b>	$p < .0001$		$p < .0001$	
Urban	1.301*	(1.187, 1.426)	1.428*	(1.341, 1.52)
Rural <sup>R</sup>	1			
<b>Size of the baby</b>	$p = 0.1097$		$p < .0001$	
Large			1.438*	(1.249, 1.655)
Average or or more than average <sup>R</sup>	1		1	
Smaller than average	0.914	(0.819, 1.02)	0.941*	(0.87, 1.016)
<b>Religion</b>	$p = 0.4175$		$p = 0.1029$	
Hindu	0.889	(0.727, 1.088)	0.975	(1.12, 1.117)
Muslim	0.878	(0.698, 1.104)	0.899	(1.049, 1.044)
Christian	0.988	(0.77, 1.269)	0.882	(1.047, 1.044)
Others <sup>R</sup>	1		1	

**Note:**

<sup>R</sup>indicates reference category.

\*Statistically significant CI



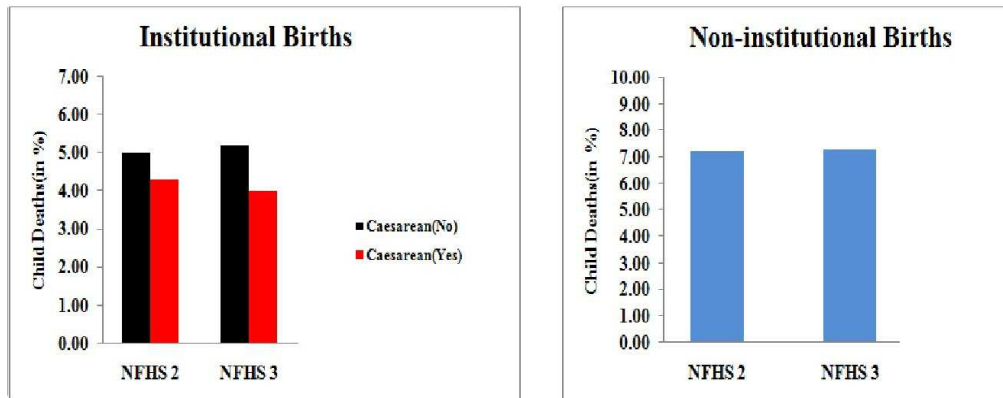


Figure 1: Percentage of child death in **India** during NFHS-II and NFHS-III among institutional and non-institutional births.