DELIVERY COMPLICATIONS AND DETERMINANTS OF CAESAREAN SECTION RATES IN INDIA - AN ANALYSIS OF NATIONAL FAMILY HEALTH SURVEYS, 1992-'93

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ABSTRACT

Caesarean section rates have been increasing world-wide raising the question of the appropriateness of the selection of cases for the procedure. This paper examines the levels and correlates of delivery related complications and caesarean section deliveries in eighteen selected states of India in terms of specific maternal and institutional factors, using data from the National Family Health Surveys, 1992-93. Goa (15.3 per cent) and Kerala (13.7 per cent) were the two states with relatively higher caesarean section rates. There is reason to believe that the current caesarean section rates are part of a rising trend. This can not be attributed entirely to the rise in institutional deliveries alone because of the strong association between caesarean sections and private sector institutions. Apart from the fact that the states of Kerala and Goa are having relatively high caesarean section rates, in Andhra Pradesh, Bihar, Gujarat, Karnataka, Punjab and Uttar Pradesh the risk of undergoing caesarean section in the private sector institutions is four or more times that in the public sector. It is possible that this extremely useful surgical procedure is being misused for profit purposes in the private sector in several states. There is therefore a need to examine this phenomenon using dis-aggregated data by the nature of caesarean sections, i.e. whether it was an elective or an emergency c-section along with the reasons for the choice.

JEL Classification : I1, I18

Key Words: caesarean section, institutional deliveries, delivery complications, medical intervention

Introduction

Surgical interventions during pregnancy are usually performed to ensure safety of the mother and child under conditions of obstetric risk. They are justified under certain circumstances such as cephalo-pelvic disproportion and contracted pelvis, dystocia due to soft parts, inadequate uterine forces, antepartum haemorrhage, pre-eclamptic toxaemia, eclampsia, foetal distress and prolapse of the cord, malpresentation, maternal diseases such as heart problems, bad obstetric history, habitual intra-uterine death of the foetus and elderly primigravida (Cunningham, MacDonald and Gant, 1989).

Besides these medical reasons, certain factors related to institutions and physicians were also found to be associated with high CS rates. The availability of facilities and trained obstetricians was found to be associated with the performance of caesarean section (Kabra, et. al., 1994). The source of payment for the delivery (Stafford, 1990; Betrollini et.al., 1992 and Haas et.al., 1993) and the place of birth, i.e., whether it was a private or a public sector institution (Peterson, 1990) also influenced the performance of c-sections. The incidence of caesarean deliveries in Belo Horizonte, Brazil was found to be strongly associated with the occurrence of the delivery in a private hospital as opposed to a public facility (Chacham and Perpetuo, 1998).

The physician factors that affect c-section incidence include, physician practice styles (Goyert et. al., 1989), the obstetrician's clinical attitude and fear of litigation (Belizan, et. al., 1991), the physician's convenience (Gomes, et. al., 1999) and supervision by a private physician (De Regt, et. al., 1986).

Caesarean sections are however not entirely related to health facility or physician related factors alone. Patients' demand constituted the third commonest reason for an elective caesarean section in the UK in 1992 (Atiba et. al., 1993). Some of the reasons for such demands could be the need to avoid labour pain or the belief that vaginal delivery will spoil a woman's future sexual performance and her husband's pleasure (Mello e Souza, 1994). In India, the need for births to occur at a predetermined auspicious time on the astronomical calendar resulted in a patient demand for caesarean sections (Kabra, et. al., 1994).

Surgical interventions during childbirth are themselves not without associated risks. It has been established that maternal morbidity is higher following a c-section compared to vaginal delivery. The main causes for this higher morbidity are related to surgical or anaesthetic problems, puerperal infections, antibiotic therapy, blood transfusions, increased length of hospital stay, length of convalescence and possible psychological impacts (Baskett and McMillen, 1981; Sachs, et. al., 1983; Danforth, 1985). There is evidence to indicate that maternal mortality following c-sections is also higher than mortality following vaginal deliveries (Hall, 1994).

Caesarean section deliveries have other serious implications for the health of women undergoing them. The uterine scar thus caused may prove to be weaker in successive pregnancies resulting in increased maternal morbidity or infertility. Also in the case of an elective c-section, if not properly timed (that is before the onset of spontaneous labour),

neo-natal problems because of 'iatrogenic prematurity' and respiratory distress syndrome due to pulmonary immaturity (Bowers et. al., 1982) may ensue.

Therefore the performance of a c-section is justified only when obstetric risks outweigh the risks of the procedure itself. Given the increasing trend towards institutional deliveries and antenatal measures for early detection of potential obstetric problems, it is expected that the incidence of childbirth related problems as well as the need for c-section deliveries would decline. However, there has been an increasing incidence of c-section deliveries worldwide (Biggs, 1984, Nortzon, 1990). This increasing trend raises the question of the appropriateness in the selection of cases for c-section (Nortzon et.al., 1987; Pai, 2000).

Caesarean sections were the most common surgical procedure among women in the US. It was found to account for 24.4 per cent of all deliveries in the United States (Stafford, 1990). In Europe, high CS rates with a statistically increasing time trend over the period 1985-87 was reported from Italy (Bertollini, et. al., 1992). A study in England revealed a 14 per cent CS rate for a six month period between March to August 1992 (Atiba, et. al., 1993) and this is not a low CS rate either.

Caesarean section rates have been increasing in the developing countries with increasing institutional deliveries and growing access to gynaecological and obstetric care as well. Similar trends have been also reported from the Latin American region. In Brazil CS rates have increased from 30.3 per cent in 1978-79 to 50.8 per cent in 1994 (Gomes, et. al., 1999). In Chile CS rates have risen following a comprehensive privatisation programme during the 1980s when the private insurance sector of the market also rose. CS rates increased from 27.7 per cent in 1987 to 37.2 per cent in 1994 in Chile (Murray and Pradenas, 1997).

The Indian scenario

A study in Jaipur, India that the CS rates in a leading private hospital rose from 5 per cent in 1972 to 10 per cent in the late 70s to 9.7 per cent between 1980-'85. The CS rates were as high as 23 percent in 1989 (Kabra, et. al.1994). In Chennai City, India, the CS rate was reported to be 45 percent, a level that is considered unjustifiable (Pai, et. al., 1999).

A rising trend in CS rates, from 11.9 percent in 1987 to 21.4 per cent in 1996 has also been reported from Kerala, the state with the best demographic characteristics and access to health care within India (Thankappan, 1999). Another study on c-section delivery rates in Kerala, India has indicated that they are more likely to occur in private health institutions (Padmadas, et. al., 2000).

Objectives and Data

Objectives:

This paper proposes to analyse delivery related complications and caesarean sections in selected states of India and examine their correlates in terms of selected maternal and institutional factors. An analysis using data from the community would provide a clear picture of the existing situation and help to identify medial and non-medical factors associated with this phenomenon.

Data:

The National Family Health Survey, India 1992-93 (IIPS, 1995) provides information on reported delivery related complications[1] for

1 Delivery related complications referes to the pregnancy complications reported in the NFHS, 1992-'973 (HPS, 1995). We have chosen the label 'delivery related complications' instead of the label 'pregnancy complications' used in NFHS, 1992-'93 because the categories listed under title are more related to delivery than to pregnancy itself.

births which occurred during a four year reference period preceding the survey. Caesarean sections have been listed as one of the several delivery-related complications experienced by women. Use of the NFHS data limits this study to births that occurred during the past four years. As a consequence, the data has been biased in favour of younger women and lower order births. But on the other hand this gives a picture of the current scenario of maternity experience of Indian women. The survey also lists the nature of delivery related complications such as, long period of labour, use of forceps for delivery, excessive bleeding, delayed delivery of placenta and caesarean section for delivery.

Details regarding caesarean sections were available only for women who reported delivery related complications for those deliveries that occurred during the four-year reference period. These reports of delivery related complications are based on self-reports and not verified by alternative sources such as medical records. However, since the four-year recall period is short enough to prevent severe recall lapse, this analysis has been undertaken. It is also possible that such reporting by women regarding delivery related complications will be based on self perceptions and therefore women's perceptions of prolonged labour, excessive bleeding or delayed delivery of placenta may vary. But it is unlikely that women would misrepresent/misunderstand a surgical procedure such as caesarean section or a minor intervention like the use of forceps. In addition this data has been analysed with the underlying assumption that errors in reporting have been uniform over the different states. Two sets of factors have been considered, one set that concern the well being of mother viz. maternal factors and the other set consisting of institutional factors that concern the availability/utilisation of medical services.

Maternal risk factors for pregnancy complications and c-sections

Maternal age:

Women who deliver at ages below eighteen or in later ages, i.e. beyond thirty five years are said to be in high risk for delivery related complications, c-sections (Bottoms et.al, 1980) and pregnancy outcomes (Hobcraft et.al., 1984). Other individual characteristics like education, working status and income levels have not been considered because it has been found in the case of other countries that these variables operate through age and parity. For instance, highly educated women postpone first births and are thus more prone to have caesarean delivery (Hurst and Summy, 1984; Parazzine et.al., 1992). In general, both primiparae and older mothers are likely to have pregnancy complications that may lead to delivery by c-section. In addition older women tend to have more complications during pregnancy and delivery, and also tend to have bigger babies (Adasekh et.al., 1993). Caesarean sections are more common among older women because doctors tend to perform them for older women especially older primiparae even in the absence of complications (Peippert and Bracken, 1993).

Both younger and older women are at risk of having delivery complications and this has been captured using a categorisation as 'high-risk age' including those deliveries which occurred before 18 or after thirty-five and categorising deliveries at other ages as low risk.

Maternal parity:

Since primiparae are found to have greater risk for pregnancy complications, the variable birth order; classifying all births into two groups' first order births and others was constructed to include this feature.

Institutional correlates of pregnancy complications and c-sections

Apart from maternal factors, institutional factors such as the availability and utilisation of health care services have been considered for the analysis of the co-variates of pregnancy complications and c-sections. These include use of ante-natal care, the residential location of the woman, whether the delivery was in an institution or at home and if the birth occurred in an institution, whether the institution belonged to the private or the public sector.

Antenatal care:

When a higher proportion of women receive antenatal care, it is expected that more women will be brought within the ambit of the health services. Antenatal care is hypothesised as identifying women who are at risk of having pregnancy related complications and therefore results in higher incidence of elective caesarean sections. This variable has been constructed on the basis of the self-reports of the women as to whether or not the pregnancy under consideration received antenatal care.

Institutional deliveries:

Institutional deliveries would result in use of medical intervention in order to facilitate better outcomes. This would involve use of surgical procedures such as c-sections when necessary and therefore we would expect a higher proportion of institutional deliveries to be associated with higher proportion of reported pregnancy complications and also c-section deliveries.

Woman's residential status:

The women's residential status has been included as part of the analysis. This is because access to medical institutions is governed by rural urban residence. In most states of India, there are more medical institutions in urban areas where institutional deliveries are quite possible

along with a higher proportion of reported pregnancy complications and c-sections.

Public/private facility:

It has been earlier mentioned that there has been an increase in c-sections associated with the type of institution i.e. whether or not the institutions are in the private sector or public sector. Since private sector institutions have profit motives, sometimes it is possible that c-sections are performed even if medically not required. This is because a c-section delivery involves an extended stay in the hospital as opposed to vaginal delivery and this result in extra costs for the stay and other related services. Also, if there were differentials in the quality of services and legal mechanisms associated with public and private facilities, this would also influence the choice of surgical interventions like c-sections in the private sector.

Analysis

As a preliminary exercise the women reporting delivery related complications have been classified by type of complication (Table 1) and this is followed by a computation of c-section rates across the different states (Table 2).

For each of the covariates identified, the associations with delivery related complications and c-sections has been examined using simple bi-variate chi-square analysis and these results are presented in Tables 3 & 4 respectively.

Apart from the bi-variate analysis of c-sections by specific characteristics, a logistic regression model was used to study the link between the place where the birth occurred (public or a private facility) and delivery by c-section. This analysis was done to understand the relationships between the individual independent variable and the practice

of c-sections while controlling for the effects of other maternal and institutional factors. The result of this analysis is presented in table 5 for all the 18 states considered here.

Discussion

It must be remembered that c-section has been reported as one of the delivery related complications. More than half of the reported delivery related complications in Kerala and Goa were c-sections. Other states like Delhi, Gujarat, Punjab and Tamil Nadu had more than one third of the women who reporting c-section deliveries. The least proportion of c-section as a delivery complication was reported from Bihar, Uttar Pradesh, Rajasthan, Bihar and Orissa. Himachal Pradesh also had slightly above 10 per cent of the delivery related complications culminating in c-sections.

The most frequently reported delivery relatedcomplication was 'long period of labour'. However, it should be remembered that the duration of labour depends on maternal characteristics like gavidity and age. Women who are experiencing parturition for the first time may misinterpret the waiting time between commencement of labour and delivery. Further, even women with previous experience may not be aware of the possibility of reduction in waiting time with increasing gravidity (Cunningham, MacDonald and Gant, 1989). Consequently, reports of this particular complication may not be comparable between different women, leave alone different states of the country. The same could also be true for proportion of women reporting delayed delivery of placenta. This showed a variation between 0.75 per cent in Haryana to 21.03 per cent in Orissa.

Excessive bleeding was reported by more than a fifth of the women in the states of Madhya Pradesh, Rajasthan and Uttar Pradesh. As these percentages are based on self-reports, it is also dependent on women's

perceptions of what amount of bleeding is normal and what is abnormal. While a woman is in labour it may be possible to be confused as to these various delivery related complications including the one related to the use of forceps. What is reported as forceps may be a vacuum assisted delivery. It is therefore felt that most of the delivery related complications cannot be compared. However, a major surgical procedure like the c-section cannot be misunderstood and therefore reports of c-section have been taken to be reasonably accurate compared to reports of other delivery complications.

Among all the deliveries which occurred during a four-year period prior to 1992-93 the proportion of women experiencing delivery complications and c-section deliveries have been presented in Table 2. In a majority of the states analysed, the proportion of women who had delivery related complications, is less than 20 per cent. Only in two states, Goa and Kerala more than 20 per cent of deliveries were reported as having complications. These are the two states where the proportions of c-section deliveries are also relatively higher, 15.3 per cent for Goa and 13.7 per cent for Kerala.

In a majority of the states, the proportion of c-sections is less than five per cent. Only in Tamil Nadu is it higher than five per cent, about 8 per cent. However, at least for Kerala State, it is possible to determine if indeed this proportion is part of a trend of increasing c-section deliveries. A community-based survey found the c-section rate to be 11.9 per cent in 1987(Kannan et. al., 1991). The present analysis indicates that in 1988-92 it had increased to 13.74 per cent. Using a subset of the same data set as of the 1987 study, the c-section rate in 1996 had increased to 21.4 per cent (Thankappan, 1999). Even allowing for differences in measurement techniques and errors between these two data sets, there is reason to believe that the present rates of c-section are part of a rising trend for this state with a higher proportion of institutional deliveries.

Further analysis of the association between delivery complications and the selected variables was carried out. Delivery complications were associated with maternal age in two states, Andhra Pradesh and Karnataka. Deliveries that occurred for women in the lower risk ages of maternity (between 18-35) were associated with significantly lower delivery complications. Delivery complications were also significantly lower among higher order pregnancies (birth orders greater than one). This was noticed in all the states examined and this association was also statistically significant in all the eighteen states selected.

Delivery related complications were significantly higher among those who had accessed antenatal care and those who had institutional deliveries. However, these are in the expected direction. Antenatal care is expected to help identify high-risk pregnancies and it is likely that this leads to increase in institutional deliveries. With respect to the relationship between institutional deliveries and delivery related complications, it is possible that the identification of the risk for these complications resulted in moving the site of delivery from the home to the institution.

It was also noticed that the proportion of deliveries with delivery related complications was higher in urban areas than in rural areas and this difference was statistically significant in Andhra Pradesh, Assam, Delhi, Gujarat, Karnataka, and Rajasthan. Kerala was the lone exception to this pattern where rural areas had a significantly higher proportion of deliveries reported as having complications. This may be because Kerala has a better network of health care facilities, especially private health care facilities in the rural areas (Kannan, et.al., 1991).

Considering the variable as to whether the institutional deliveries occurred in public or private sector units, it was found that delivery-related complications were higher in private sector institutions in most

of the states. The proportion of reported deliveries with complications was significantly lower in the public sector in Delhi, Goa, Gujarat and West Bengal. In five states, Himachal Pradesh, Madhya Pradesh, Orissa, Punjab and Rajasthan, the proportion of deliveries with complications was higher in the public sector, but only in Rajasthan was this proportion statistically significant. In all of these five states, the public sector dominated the health sector in terms of both hospitals and beds available (Bhat, 1993). Since deliveries would take place in the public sector institutions more often than in private institutions in these states, this finding is not surprising.

The analysis of the proportion of c-section deliveries with selected variables also yielded mixed results. The proportion of c-section deliveries was higher among the group with maternal age (between 18 and 35) in 11 out of the 18 states examined. This difference in the proportion of c-section deliveries between the high risk and the low risk age groups was statistically significant only in Tamil Nadu. This proportion was more or less equal in the two states (Delhi and Himachal Pradesh) and lower in the low risk ages in Bihar, Kerala, Madhya Pradesh and Punjab. The proportion of c-section deliveries was found to be lower in case of higher order pregnancies (higher in lower order pregnancies). This difference in the proportion of c-sections between the first birth order and the higher order births was found to be statistically significant in Andhra Pradesh,, Assam, Delhi, Gujarat, Karnataka, Maharashtra, Orissa, Uttar Pradesh and West Bengal. This is expected as delivery related complications are higher among primiparae (Cunningham, MacDonald and Gant, 1989) and consequently a higher proportion of c-section deliveries is expected.

The relationship between antenatal care and proportion of c-section deliveries was the same in all the states examined. The proportion of c-section deliveries was higher among those who had used antenatal care

than those who had not, clearly indicating that antenatal care could have been useful in identifying high risk pregnancies and therefore opted for elective c-sections. However, this needs further examination with a data set that distinguishes between elective and emergency c-sections.

The proportion of c-section deliveries was higher in urban areas when compared to rural areas. The only exception was Delhi and the number of c-section deliveries reported in rural areas of Delhi was only 4. Therefore it is expected that the small sample size would have contributed to some degree of distortion. Referral hospitals are usually located in urban areas and they are more likely to deal with complications that are referred to them. Also in terms of distribution of health services, in most of the states, there are more facilities, both public and private, available in urban areas. These facilities would be utilised for both emergency c-sections as well as elective c-sections that are conducted for non-medical reasons, thus resulting in the relatively higher c-section rates in urban areas.

The proportion of c-section deliveries was higher in private sector institutions than in public sector institutions in most of the states. Haryana, Delhi and Punjab had more or less similar trends in private and the public sector institutions and in these three states the proportion of c-section deliveries in both the sectors were closer to or greater than 50 per cent. Tamil Nadu was another state where the proportion of c-sections was about 45 per cent and these rates were more or less equal for deliveries in the public as well as the private sector. In Orissa the rates were also almost equal but lower both in the public and private sectors institutions (about 25 per cent). In Andhra Pradesh, Bihar, Goa, Karnataka, Kerala, Maharashtra and West Bengal, the proportions of c-sections were significantly higher in the private sectors than in the public sector. One possible explanation could be the profit motive operating in private sector

institutions which results in the performance of a higher volume of elective c-sections.

To examine if this difference in the proportion of c-section deliveries after controlling for maternal as well as other institutional factors, logistic regression analysis was used. Taking the dependent variable as the occurrence or non-occurrence of a c-section delivery, and the independent variable as the type of institution, i.e., whether private or public sector. All other factors, maternal factors (age and parity) and institutional (utilisation of antenatal care, and rural/urban residence) were control variables in the model used. Barring Madhya Pradesh and Rajasthan, the association between the occurrence of a c-section delivery and the type of institution (whether private or public sector) was statistically significant in all the other 16 states examined. In Himachal Pradesh, c-sections were more likely to occur in public sector institutions and in all the other fifteen states the odds favoured the private sector institutions. (see Table 5)

Conclusions

The levels of caesarean section deliveries in the selected states of India are not very high. Except for the states of Goa and Kerala, the proportion of deliveries that result in c-sections were below 10 per cent. However, there is reason to believe that the current c-section rates are part of a rising trend in the proportion of c-section deliveries. If the level of c-section deliveries is rising due to the rise in the proportion of institutional deliveries, then the existing rates are within the accepted margin. But an analysis of the correlates of the occurrence of c-section indicates a strong association with private sector institutions.

The analysis of the levels of c-section in the community identified Goa and Kerala as states where the rates were relatively higher. However, the detailed analysis of the correlates of c-section indicated that for states

like Gujarat, Bihar, Andhra Pradesh, Karnataka, Uttar Pradesh and Punjab the problem was serious as well. In the latter states the risk of undergoing c-section for delivery in the private sector health services is four or more times that in the public sector services. Therefore the phenomenon of c-section deliveries needs to be examined for the levels and the correlates. Since c-section deliveries cost more than vaginal deliveries both in terms of the number of days of institutionalisation required as well as financial costs, it is possible that this extremely useful surgical procedure is being misused for profit purposes in the private sector in several states. This needs to be further examined using data dis-aggregated by the nature of c-section, that is whether it was elective or an emergency c-section and the reasons for the choice or the nature of the emergency.

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Table 1. The distribution of delivery complications in selected states, NFHS, India, 1992-'93.

States	%C-Section	%Use offorceps	% Excessive bleeding	% Long period of labour	% Delayed delivery of placenta	% Others	Total number of women
Andhra Pradesh	30.8	12.05	7.14	45.54	9.38	2.23	224
Assam	21.3	13.89	4.63	51.39	4.63	6.02	216
Bihar	9.67	3.04	10.5	72.65	6.91	1.93	362
Delhi	35.44	7.28	9.71	44.17	5.83	4.85	206
Goa	54.55	10.06	7.79	30.52	2.6	1.95	308
Gujarat	37.29	11.86	8.47	40.68	3.39	4.24	118
Haryana	24.81	4.51	4.51	63.16	0.75	3.76	133
Himachal Pradesh	10.65	6.02	9.26	69.44	2.78	6.02	216
Karnataka	30.2	7.84	5.88	45.88	8.63	3.92	255
Kerala	58.52	6.87	11.26	24.73	3.3	1.92	364
Madhya Pradesh	11.21	6.54	28.97	48.13	6.07	12.62	214
Maharashtra	25.99	7.58	11.91	42.6	7.94	13.36	277
Orissa	10.32	4.37	9.13	67.46	21.03	2.38	252
Punjab	38.76	5.43	4.65	46.51	5.43	3.1	129
Rajasthan	9.8	1.96	31.86	47.55	15.2	2.45	204
Tamil Nadu	39.64	23.64	2.91	28.73	4.36	4.36	275
Uttar Pradesh	6.41	2.97	28.28	65.16	6.25	10.63	640
West Bengal	22.22	5.39	9.76	55.89	7.07	4.38	297

Note: The percentages do not add up to 100 because one woman can experience more than one delivery-related complication.

Table 2. The proportion of delivery complications and c-sections among deliveries from 1988-89 to 1992-93, selected states, NFHS, India, 1992-'93.

States	Proportion of C-Sections	Proportion of delivery complications	No. of deliveries
Andhra Pradesh	4.33	14.05	1594
Assam	2.96	13.91	1553
Bihar	1.2	12.44	2909
Delhi	4.91	13.87	1485
Goa	15.29	28.03	1099
Gujarat	2.94	7.87	1499
Haryana	2.47	9.94	1338
Himachal Pr.	1.93	18.12	1192
Karnataka	3.95	13.07	1951
Kerala	13.74	23.48	1550
Madhya Pradesh	0.81	7.18	2980
Maharashtra	4.10	15.78	1755
Orissa	1.44	13.93	1809
Punjab	4.38	11.31	1141
Rajasthan	0.82	8.38	2433
Tamil Nadu	7.64	19.27	1427
Uttar Pradesh	0.64	10.01	6395
West Bengal	3.50	16.74	1887

Note: (1) The number of pregnancies relate to those that occurred during the four years preceding the date of survey. It also refers to the last order of birth that occurred during these four years. In so far as this restriction is applied, it does not refer to other pregnancies that may have also occurred during this four-year period to the same women.

(2) The above information pertains to the last order births and to women who delivered during last four years preceding the survey.

Table 3: Percentage of delivery related complications by maternal and institutional characteristics.

States	Age at Maternity =High risk/ low risk	Birth Order=1/ >1	Antenatal Care=Yes/No	Inst. Delivery= Yes/no	Residence= Rural/Urban	Inst.Delivery =Private/ Public
Andhra Pr	17.6(307) 13.2*(1287)	22.5(432) 10.9**(1162)	14.6(1389) 10.2(205)	25.3(538) 8.3**(1056)	12.8(1194) 17.8*(1194)	27.6(312) 22.1(226)
Assam	14.5(296) 13.8(1257)	27.3(326) 10.4**(1227)	17.5(914) 8.8**(639)	30.5(341) 9.2**(1212)	11.8(1068) 18.6**(485)	33.9(124) 28.6(217)
Bihar	12.7(545) 12.4(2364)	19.8(678) 10.2**(2231)	16.6(1106) 9.9**(1803)	25.0(408) 10.4**(2501)	12.0(2364) 14.5(545)	25.2(210) 24.7(198)
Delhi	14.1(1365) 11.7(120)	12.7(1516) 17.3**(369)	14.8(1253) 9.1*(232)	20.2(712) 8.0**(773)	3.2(125) 14.9**(1360)	23.8(340) 16.9*(372)
Goa	30.0(150) 27.7(949)	36.7(368) 23.7**(731)	28.9(1057) 4.8**(42)	30.9(975) 5.6** (124)	27.0(566) 29.1(533)	35.2(528) 25.7**(447)
Gujarat	8.7(126) 7.8(1373)	14.8(418) 5.2**(1081)	8.9(1152) 4.3**(347)	14.6(568) 3.8** (931)	6.0(1011) 11.7**(488)	19.0(326) 8.7**(242)
Haryana	9.6(177) 10.0(1161)	15.9(340) 7.9**(998)	12.1(1003) 3.6**(335)	24.5(265) 6.3** (1073)	9.5(920) 11.0(418)	26.9(130) 22.2(135)
Himachal Pr.	23.2(82) 17.7(1110)	29.0(300) 14.5**(892)	19.7(939) 12.3**(253)	28.6(304) 14.5**(888)	19.0(861) 15.7(331)	27.0(37) 28.8(267)

Cont'd

Karnataka	16.8(321) 12.3*(1630)	21.3(488) 10.3**(1463)	14.2(1654) 6.7**(297)	22.7(754) 7.0**(1197)	11.0(1359) 17.9**(592)	25.1(339) 20.7(415)
Kerala	22.2(135) 23.6(1415)	28.3(540) 20.9**(1010)	23.8(1518) 6.3*(32)	26.0(1378) 3.5**(172)	23.2(1157) 16.5**(393)	26.9(769) 24.8(609)
Madhya Pr	6.6(503) 7.3(2477)	9.8(697) 6.4**(2283)	8.7(1590) 5.5**(1390)	15.2(540) 5.4**(2440)	6.4(2328) 10.1(652)	12.9(116) 15.8(424)
Maharashtra	17.1(257) 15.6(1498)	22.1(452) 13.6**(1303)	17.5(1474) 6.8**(281)	22.7(802) 10.0**(953)	13.1(1062) 19.9(693)	25.4(421) 19.7(381)
Orissa	14.3(231) 13.9(1578)	20.4(446) 11.8**(1363)	15.9(1182) 10.2**(627)	25.9(336) 11.2**(1473)	13.6(1356) 15.0(453)	23.5(68) 26.5(268)
Punjab	11.8(1052) 5.6(89)	19.4(268) 8.8**(873)	12.2(1002) 5.0**(139)	24.9(301) 6.4**(840)	10.4(857) 14.1(284)	24.5(188) 25.7(113)
Rajasthan	8.2(388) 8.4(2045)	11.6(567) 7.4**(1866)	13.4(777) 6.0**(1656)	21.5(298) 6.6**(2135)	7.7(2035) 11.8**(398)	11.0(73) 24.9**(225)
Tamil Nadu	18.9((1272) 22.6(155)	27.4(456) 15.4**(971)	19.7(1349) 11.5(78)	26.0(912) 7.4**(515)	17.5(921) 21.7(506)	27.0(434) 25.1(478)
Uttar Pr.	10.9(1161) 9.8(5234)	13.0(1321) 9.2**(5074)	10.9(2905) 9.3*(3490)	21.9(758) 8.4**(5637)	9.9(5226) 10.4(1169)	22.4(299) 21.6(459)
West Bengal	16.4(365) 15.7(1512)	22.1(512) 13.5**(1365)	17.6(1386) 10.8**(491)	27.4(532) 11.2**(1345)	15.3(1571) 18.3(306)	36.3(91) 25.6*(441)

Note: ** denotes significance of difference at 1% level of significance and * denotes significance of difference at 5% level of significance. The numbers in brackets indicate the number of cases in that category.

Table 4. Percentage of c-section deliveries by maternal and institutional characteristics.

States	Age at Materity= High risk/ Low risk	Birth Order = 1/ >1	Antenatal Care=Yes/No	Residence= Rural/ Urban	Inst.Delivery= Private/Public
Andhra Pr	29.6(54) 31.2 (170)	39.2(97) 24.4*(127)	32.5(203) 14.3(21)	22.9(153) 47.9**(71)	55.8(86) 34.0*(50)
Assam	14.0(43) 22.5(173)	29.2(89) 15.0*(127)	26.9(160) 3.6** (56)	10.3(126) 35.6**(90)	50.0(42) 33.9(62)
Bihar	10.6(293) 5.8(69)	11.2(134) 8.8(228)	17.4(184) 1.7**(178)	4.6(283) 27.8**(79)	41.5(53) 22.4*(49)
Delhi	35.7(14) 35.4(192)	46.9(64) 30.3*(142)	37.0(185) 19.0(21)	50.0(4) 35.1**(202)	51.9(81) 47.6(63)
Goa	71.1(45) 51.7*(263)	57.0(135) 52.6(173)	54.9(306) 0.0(2)	47.7(153) 61.3**(155)	61.3(186) 47.0*(115)
Gujarat	36.4(11) 37.4(107)	51.6(62) 21.4**(56)	40.8(103) 13.3*(15)	27.9(61) 47.4*(57)	61.3(62) 23.8**(21)
Haryana	23.5(17) 25.0(116)	24.1(54) 25.3(79)	27.3(121) 0.0*(12)	13.8(87) 45.7**(46)	51.4(35) 50.0(30)
Himachal	10.5(19) 10.7(197)	12.6(87) 9.3(129)	11.9(185) 3.2(31)	6.1(164) 25.0**(52)	10.0(10) 28.6(77)
Karnataka	25.9(201) 31.3(54)	38.5(104) 24.5*(151)	31.9(235) 10.0*(20)	19.5(149) 45.3**(106)	56.5(85) 33.7**(86)

Cont'd

Kerala	60.0(30)	61.4(153)	58.8(362)	52.8(269)	69.6(207)
	58.4(334)	56.4(211)	0.0(2)	74.7**(95)	45.7**(151)
Madhya Pr	12.1(33)	13.2(68)	10.1(138)	11.5(148)	20.0(15)
	11.0(181)	10.3(146)	13.2(76)	10.6(66)	13.4(67)
Maharash-tra	18.2(44)	34.0(100)	27.9(258)	14.4(139)	46.7(107)
	27.5(233)	21.5*(177)	0.0**(19)	37.7**(138)	28.0*(75)
Orissa	3.0(33)	17.6(91)	12.2(188)	4.9(184)	25.0(16)
	10.5(219)	5.0**(161)	1.6**(64)	22.1**(68)	23.9(71)
Punjab	40.0(5)	46.2(52)	40.2(122)	32.6(89)	63.0(46)
	38.7(124)	33.8(77)	14.3(7)	52.5**(40)	65.5(29)
Rajasthan	6.3(32)	15.2(66)	11.5(104)	5.1(157)	37.5(8)
	10.5(172)	7.2(138)	8.0(100)	21.1**(47)	23.2(56)
Tamil Nadu	22.9(35)	44.8(125)	40.6(266)	33.3(165)	46.2(117)
	42.1*(240)	35.3(150)	11.1(9)	49.1(110)	45.0(120)
Uttar Pr.	0.8(127)	13.4(172)	11.7(317)	2.9(518)	26.9(67)
	7.8(513)	3.9** (468)	1.2** (323)	21.3**(122)	22.2(99)
West Bengal	15.0(60)	34.5(113)	28.5(244)	15.4(241)	60.6(33)
	24.1(237)	14.7**(184)	5.7**(53)	51.8**(56)	39.8* (113)

Note: ** denotes significance of difference at 1% level of significance and * denotes significance of difference at 5% level of significance. The numbers in brackets indicate the number of cases in that category.

Table 5. Logistic regression coefficients showing the effects of private institutional delivery on caesarean section for various states, NFHS, India, 1992-'93.

States	Regression Coefficient 'b'	Standard error of 'b'	Odds Ratios
Andhra Pradesh	1.6832	0.3421	5.3827**
Assam	1.0971	0.4194	2.9954*
Bihar	2.0313	0.4296	7.6243**
Delhi	1.0797	0.3115	2.9437*
Goa	0.6737	0.2499	1.9615*
Gujarat	2.3624	0.5469	10.6163**
Haryana	1.3434	0.4763	3.8321*
Himachal Pradesh	-0.6119	1.1227	0.5423*
Karnataka	1.6725	0.3180	5.3256**
Kerala	1.1374	0.2285	3.1188**
Madhya Pradesh	0.9273	0.7567	2.5276(ns)
Maharashtra	1.3548	0.3154	3.8761**
Orissa	0.3794	0.6874	1.4615**\
Punjab	0.4242	0.4087	4.1545*
Rajasthan	1.6435	0.8831	5.1731(ns)
Tamil Nadu	0.2526	0.2637	1.2873**
Uttar Pradesh	1.4713	0.3968	4.3549*
West Bengal	1.1513	0.4358	3.1622*

Note: (1)*- significance 95 per cent confidence interval; ** - significance at 99 per cent confidence interval; (ns)-not significant.

(2) The model used here controls for maternal age, birth order, residential status, and antenatal care as categorised in tables 3 and 4. The dependent variable was caesarean section delivery (no=0 and yes =1), and the independent variable was type of institution (public =0 and private = 1). The analysis is based on the last birth experience among those who gave birth during the four years prior to 1992-93 and among those who had an institutional delivery alone.

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