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Increasing trend in Caesarean Section Delivery in India: Role of Medicalisation of Maternal Health

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INCREASING TREND IN CAESAREAN SECTION DELIVERY IN INDIA: ROLE OF MEDICALISATION OF MATERNAL HEALTH

Sancheeta Ghosh*

Abstract

The paper tries to throw light on the current trends in c-section delivery in India. In developed and developing countries, including India, increasing use of medical technologies during childbirth is a matter of concern. It is evident that the development and application of reproductive technologies is creating contradictory possibilities for women. With the increasing numbers of institutionalised births in India, the trend of c-section delivery is also sharply rising. The objectives of the present study are to explore the situation in caesarean delivery in India and analyse the determinants for the preference of caesarean delivery. The paper will explore the relationship between the factors influencing the decision for csection delivery and the demand for it. An attempt has also been made to emphasise the ongoing debates emerging in the field of medical sociology and population health, regarding the increasing trend. For the study, data has been analysed based on NFHS-I to NFHS-III (1992-93 to 2005-06). Both bivariate and multivariate analyses have been carried out. It is clear from the data that caesarean delivery is more than 10 per cent in many states. This is indication of an impending public health problem. In some states like Kerala, Goa, Andhra Pradesh, West Bengal and Tamil Nadu, the rate is alarmingly high. States with demographic transition as well as high institutionalised births show a higher trend in c-section delivery. The bi-variate and multivariate analyses show that non-medical factors are important determinants for the performance of this medical procedure.

Introduction

Medicalisation of human body has received much attention both theoretically and empirically in the last few decades. Medicalisation refers to a social phenomenon that makes for approaching disease and the course of treatment in terms of a medical model and individualised aetiology (Bury and Gabe, 2004). It is a process by which health or behaviour problems come to be defined and treated as medical issues (en.wikipedia.org/wiki/Medicalisation). The term refers to the process by which certain events or characteristics of everyday life become medical issues, and thus fall within the purview of doctors and other health professionals. Moreover, medicalisation has been defined as a 'process whereby more and more of everyday life have come under medical dominion, influence and supervision' (Zola, 1983, cited in Ballard and Elston).

This growing reliance on medicine also appeared to be occurring in other aspects of life such as childbirth, menopause, and ageing (Zola, 1972, Friedson, 1970). A number of studies in this context elucidate that over the past few years, dependence on medical intervention during childbirth has gone up to combat maternal and child death. Hence, a growing number of deliveries are taking place through surgical intervention, resulting in a high rate of c-section deliveries in both developed as well as developing countries. It is well known fact that maternal and neonatal deaths have significantly reduced in the last century, in large part as a result of increased application of technology during labour and

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childbirth (Sen, 1994). What is now a matter of concern is the possibility of abusing this medical technology for profit, or for avoiding risk in health care facilities.

Caesarean delivery: An example of medicalisation of women's health

One example of the medicalisation of the human body is caesarean-section delivery. The rising trend in c-section rates, in both developed as well as developing countries, the higher preference accorded to this mode of delivery points to the growing medicalisation of women's health.

Studies have shown how, over the past few decades, childbirth has come under the influence of medical technology. According to Johanson et al (2002), birth has become too 'medicalised' and the higher rates of unnecessary obstetrical intervention raise concern for the mother's health. Bruekens (2001) in this context, argues that over- medicalisation of maternal care has become a worldwide epidemic. In fact, medicalisation, in general, has taken control over human life and maternal health comes also under its ambit.

It is often argued that with thriving private practice in many countries, obstetricians increasingly prefer c-section birth over normal childbirth. In addition, there is evidence from Western countries that women too often prefer to deliver the child through the c-section. The rates of caesarean section in many countries have increased beyond the WHO-recommended level of 5-15 %, almost doubling in the last decade. In high-income countries like Australia, US, Germany, Italy and France, the rates have gone up phenomenally in the last few decades (Sufang et al 2007). Similar trends have also been documented in low-income countries, particularly in Latin America and some countries in Asia. (Potter *et al* 2001; Cai *et al* 1998; Mishra and Ramanathan, 2002).

Although studies have shown an increasing trend in c-section delivery, the reasons remain unknown. There is a debate among social scientists and medical sociologists on what might be the possible causes for the greater preference for c-section delivery. While some studies focus purely on medical explanations, (Baskett and McMillen, 1998; Cai *et al* 1998), there are others that indicate that the trend is determined by the preferences of the women, many of whom take informed decisions. (Ash and Okah, 1997; Potter *et al* 2001). But the relative importance of these two sets of factors towards preference for c-section delivery is somewhat unclear.

The current paper therefore, will be an attempt to frame the possible linkages between increasing technological intervention during childbirth (more specifically the caesarean section delivery) and the determinants for the increasing trend, considering both institutional aspects as well as socio-economic causes. What we lack is a proper framework for the analysis of the correlation between increasing medical intervention and the greater popularity of the c-section delivery. This paper will explore the current trends in caesarean section delivery in India within a coherent framework.

Objectives of the paper

- To explore the current trend and level in caesarean section delivery in India and
- To explain the factors that determine such medical intervention

Determinants of c-section: A review

There are medical explanations for the performance of c-section delivery. Surgical intervention during pregnancy is usually performed to ensure safety of the mother and child under conditions of obstetric risks (Mishra and Ramanathan, 2002). This medical intervention is more or less justified under certain circumstances such as breech presentation, dystocia, previous caesarean section and suspected fetal compromise (Baskett and McMillen, 1998). A study by Cai *et al* (1998) revealed that the performance of c-section was mainly associated with self-reported complications during pregnancy, higher birth weight and maternal age. A report by Parliamentary Office of Science and Technology in UK shows that the increasing use of IVF (in vitro fertilisation) has led to an increase in the number of multiple births and these babies are usually delivered by c-section (Parliamentary Office of Science and Technology, 2002). Keeler and Brodie (1993) argued that, ignoring the financial costs, a c-section is best if the price in terms of morbidity and risk to mother of the operation is less than the discomfort and risk to mother and child of prolonged normal delivery.

Non-medical factors: There is, however, a parallel argument among social scientists, that the decision to perform a caesarean section is often strongly influenced by non-medical factors, which act alongside the medical determinants. Researchers have found a strong correlation between increasing c-section delivery and socio-economic and cultural factors. Studies show that in case of developed countries, doctors' preference for this surgical procedure, coupled with women's demands are responsible for the increasing trend. Different rates of c-section in public and private hospitals suggest that non-medical factors, such as economic gain and pressures of private practice, may motivate doctors to perform surgical deliveries (Potter *et al* 2001). It is also believed that the increasing trend of the caesarean delivery in the developed countries could be attributed to the increasing demand from patients and informed decision making. Women's requests for caesarean section is considered to be an important determinant of birth outcome, particularly in countries with growing privatization and options for patient choice (Ash and Okah, 1997). It is often argued that the power of decision-making in the home and seeking medicalised health care were associated with higher maternal education and family incomes (Potter *et al* 2001). And women's request for c-section is an important determinant of birth outcome, particularly in countries with growing privatization and options for patient's choice. Most research focuses on women's fear of the physiological consequences of a normal delivery (Behague, 2002). But on the other hand, Taffel *et al* (1989) argued that the decision to perform a c-section is prompted by the physician's concern for the life and health of the mother or the child.

In the case of developing countries like India, it is still unclear that what could be motivating the increasing preference for c-section. In general, it is argued that beside the medical factors, the physician's interests determine the choice of c-section (Mishra and Ramanathan, 2002). There are, for instance, practice styles among physicians, or attitudes among obstetricians that favour c-section. Fear of litigation, the physician's convenience, and most importantly, economic incentives may determine the choice of c-section delivery (Belizan *et al* 1999).

Economic motives may include both doctors' fear of malpractice as well as economic gain (Tussing *et al* 1992). At the same time, the source of payment for the delivery and the place of birth, i.e. whether it was a private or public sector institution also influence the performance of c-sections

(Peterson, 1990). All these arguments put forth by several social scientists point to the growing medicalisation of maternal health in developed as well as developing countries.

Framework for the analysis

Studies carried out to understand c-section deliveries have often adopted different frameworks. The issue treats elements of ethics in the medical profession, gender issues, choices of women, the quality of institutional services etc. Emphasis is often laid on one set of factors---either the demand from women, or the motivation from health institutions. As against this, the approach of this study is to understand equally the demand factors and as well as the institutional ones that lead to the preference for the c-section.

Following is the diagrammatic presentation of the framework for the present analysis taking into consideration all the risk factors, socio-economic factors and institutional factors leading to the conduct of c-section delivery.

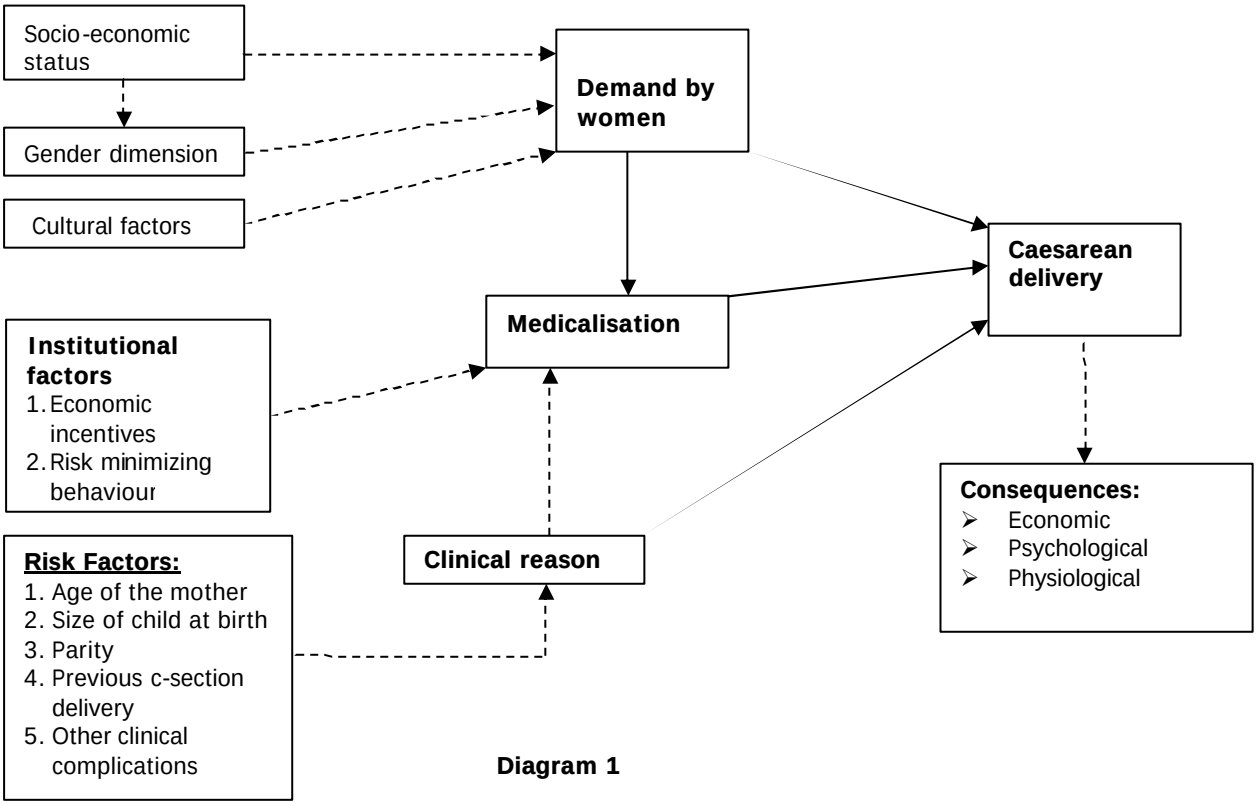

Diagram 1

A number of factors play significant roles in deciding the type of delivery. For most women, normal delivery is spontaneous; in some cases, however, with pregnancy-related complications, c-section delivery is preferred. A number of medical factors such as mother's age, breech presentation of the baby and the size of the child at birth are considered possible risk factors leading to c-section delivery. It has already been pointed out that the performance of c-section delivery is also influenced by non-medical factors. The request from women and other socio-cultural factors can influence the

decision of c-section delivery. Maternal request, the doctor's preference, and other socio-cultural factors play important roles in determining the type of delivery. The present analysis was done after taking into consideration non-medical factors too that serves as variables. Another important variable is whether the birth occurs in a private or public health facility. Some studies suggest a strong relation between the place of delivery, whether public or private, and c-section delivery. It has already pointed out that there is a higher prevalence of c-section in private health facilities rather than public ones.

Data and method

The data for the analysis is taken from the National Family Health Survey (NFHS) of three consecutive periods (1992-1993, 1998-1999 and 2005-2006). The National Family Health Survey is a series of surveys providing information on population, health and nutritional status of mother and child in India and its 29 states. In NFHS, mothers were asked whether they had caesarean delivery during three years preceding the survey. The data was analyzed for three surveys to study trends in c-section delivery in India and its states. Both bivariate and multivariate techniques have been employed to test the effect of selected socio-economic characteristics on dependent variable c-section delivery. The dependent variable is dichotomous coded: 1 for mothers who had caesarean section delivery; and 0 for those who had normal delivery. A set of independent variables that were included in the study are discussed in the following section, along with the framework.

Results and discussion

Increasing trend in c-section delivery in India:

With the increase in institutional deliveries and growing access to gynaecological and obstetric care, c-section deliveries too have shown an increasing trend. A study by the Indian Council of Medical Research (ICMR) in 33 tertiary care institutions noted that the average caesarean section rate increased from 21.8 per cent in 1993-'94 to 25.4 per cent in 1998-'99 (Kambo *et al* 2002). According to the National Family Health Survey, 1992-'93, two states, Kerala and Goa, have shown the highest percentage of c-section deliveries (Mishra and Ramanathan, 2002). A rising trend in c-section rates, from 11.9 per cent in 1987 to 21.4 per cent in 1996 has been reported from Kerala (Thankappan, 1999). Another study in Jaipur showed that c-section rates in a leading private hospital rose from 5 per cent in 1972 to 10 percent in late 1970s and to 19.7 per cent between 1980-'85 (Kabra *et al* 1994). Studies show that in India, the rate of c-section delivery is relatively much higher in private hospitals rather than in public health facilities. For instance, Padmadas *et al* (2000) observed in the case of India the caesarean deliveries are mostly occurring in private rather than public institutions.

This paper explores trends in c-section delivery in India over the past twelve years, based on the NFHS data sets for three consecutive years. Figure 1 presents the trends in c-section deliveries in India for the periods 1992-93 to 2005-06. At the all-India level, the rate has increased from 2.9 per cent of the childbirth in 1992-93 to 7.1 in 1998-99 and further to 10.2 per cent in 2005-06.

Figure 1 Percentage of C-section delivery from 1992-93, 1998-99 and 2005-06, India

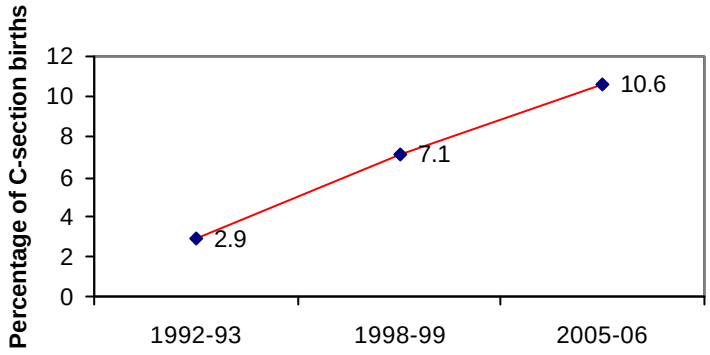

Table 1: Trends in caesarean section delivery

Percentage of women who had undergone caesarean section delivery by states*, from NFHS-1, NFHS-2 and NFHS-3.

States	Percentage of women who have caesarean delivery			
	NFHS-1 (1992-'93)	**NFHS-2** (1998-'99)	**NFHS-3** (2005-'06)	**Diff from NFHS-1**
Uttar Pradesh	0.6	2.7	5.9	5.3
Haryana	2.3	4.2	5.0	2.7
Himachal Pradesh	1.6	6.8	13.1	11.5
J&K	5.7	10.6	14.1	8.4
Punjab	4.2	8.3	14.4	10.2
Delhi	4.6	13.4	12.0	7.4
Gujarat	2.7	8.6	8.8	6.1
Rajasthan	0.7	3.0	4.2	3.5
Madhya Pradesh	0.7	3.0	6.8	6.1
Maharashtra	3.4	9.9	15.6	12.2
Goa	13.7	20.0	25.5	11.8
Orissa	1.5	5.2	6.1	4.6
West Bengal	3.3	13.5	15.0	11.7
Assam	2.3	5.0.	6.5	4.2
Bihar	1.1	3.0	4.1	3.0
Andhra Pradesh	4.4	14.7	27.5	23.1
Tamil Nadu	7.1	17.5	23.0	15.9
Karnataka	3.7	11.0	15.3	11.6
Kerala	13.2	29.8	30.1	16.9
India	**2.9**	**7.1**	**10.6**	**7.7**

** Percentages given for major states only.*

The trend in caesarean section delivery is shown in Table 1. There is a significant increase in the percentage of birth by c-section in many states in India. At the all-India level, only 2.9 per cent of birth was by c-section in NFHS-1 and it has increased to 7.1 in NFHS-2 and 10.2 in NFHS-3. The

difference in c-section delivery from NFHS-1 to NFHS-3 is relatively high in states like Andhra Pradesh, Goa, Kerala, Tamil Nadu, West Bengal and Punjab. A rapid increase in c-section rates has occurred in these states from 1992 to 2006. The rate is highest (27 per cent) in the state of Andhra Pradesh in 2005-06 (although the rate was as low as 4.4 per cent during 1992-93 in the state). It is important to consider that states with rapid demographic transition show high incidence of caesarean childbirth in comparison to other states.

Rural-urban differential

Table 2: Percentage of births in rural and urban areas by caesarean section delivery, NFHS-3, India and States.

States	Percentage of women who have caesarean delivery		
	Total	Rural	Urban
Andhra Pradesh	27.5	19.4	32.2
Arunachal Pradesh	3.0	2.5	4.3
Assam	6.5	3.7	17.4
Bihar	4.1	2.5	7.6
Chhattisgarh	5.7	1.3	18.6
Delhi	12.0	5.0	12.6
Goa	25.5	23.7	27.3
Gujarat	8.8	5.5	14.7
Haryana	5.0	3.1	12.1
Himachal Pradesh	13.1	12.3	15.4
Jammu & Kashmir	14.1	9.2	29.0
Jharkhand	4.9	1.9	12.6
Karnataka	15.3	11.6	22.2
Kerala	30.1	28.4	33.5
Madhya Pradesh	6.8	1.9	13.6
Maharashtra	15.6	7.7	19.9
Manipur	10.1	6.2	16.3
Meghalaya	5.3	2.6	11.8
Mizoram	6.0	2.8	10.1
Nagaland	3.0	0.7	6.3
Orissa	6.1	3.9	12.8
Punjab	16.4	14.8	19.6
Rajasthan	4.2	2.2	9.9
Sikkim	14.5	10.1	24.9
Tamil Nadu	23.0	19.8	26.0
Tripura	13.6	11.1	23.3
Uttar Pradesh	5.9	2.4	12.7
Uttaranchal	8.4	5.3	17.5
West Bengal	15.0	5.8	30.1
India	**10.6 (N=51,555)**	**6.2**	**17.8**

Noteworthy to mention that in India, is that there is a large rural-urban difference in the occurrence of c-section deliveries. The proportion of c-section deliveries is higher in urban areas, elucidating also the inequality in health services. In the present paper, the analysis of NFHS data explains the rural-urban disparity in c-section deliveries in India and all states. Table 2 shows that the percentage of birth by c-section is much higher in urban areas than in rural areas, and in states like Andhra Pradesh, Kerala and West Bengal over 30 per cent of the delivery in urban areas takes place through c-section. Interestingly, there is a large difference between rural and urban c-section rates in West Bengal, with rural areas accounting for only 5.8 per cent of deliveries by c-section, as against the urban rate of above 30 per cent. Higher rates in urban areas may be a reflection of combination of factors: advanced health facilities to take care of risk factors, higher levels of women's choice, and wide prevalence of the private sector in healthcare, with the focus on profit.

Increasing medical intervention and rate of c-section delivery in India:

Table 3: Trends in Institutional births in India and major states:
Percentage distribution of live birth in health institution and birth by states, from NFHS-2 and NFHS-3.

	NFHS-2			NFHS-3		
	Inst_Del*	**Public**	**Private**	**Inst_Del**	**Public**	**Private**
Uttar Pradesh	15.5	7.2	8.0	24.7	6.4	18.3
Haryana	22.4	6.0	16.4	34.6	13.2	21.2
Himachal Pradesh	28.9	23.2	5.7	49.1	42.3	6.7
J&K	35.6	35.6	5.9	51.1	41.7	9.5
Punjab	37.5	7.6	29.8	51.2	12.3	38.8
Delhi	59.1	29.1	29.7	52.7	27.5	25.1
Gujarat	46.3	11.2	35	52.5	13.9	38.7
Rajasthan	21.5	15.7	5.6	31.6	20.0	11.6
Madhya Pradesh	20.1	13.1	7.0	38.3	20.8	17.5
Maharashtra	52.6	24.3	28.3	71.2	34.3	37.1
Goa	90.8	38.5	51.4	92.2	44.0	48.4
Orissa	22.6	19.1	3.4	39.1	30.6	8.7
West Bengal	40.1	31.6	8.5	51.9	37.8	14.2
Assam	17.6	11.7	5.9	26.2	14.7	11.4
Bihar	14.6	3.8	10.8	25.1	4.8	20.4
Andhra Pradesh	49.8	12.3	37.3	75.6	27.7	48.1
Tamil Nadu	79.3	37.4	41.1	90.1	53.8	36.5
Karnataka	51.1	27.6	23.3	64.1	34.8	29.5
Kerala	93.0	36.3	56.7	99.3	35.6	63.8
India	**33.6**	**16.2**	**16.7**	**44.8**	**23.4**	**21.4**

* Institutional delivery (Delivery in health facilities, such as, public which includes govt. hospital, dispensary, primary health centres etc and private health facilities and NGOs or trust hospitals).

This study shows that there is a positive relation between increasingly institutionalized birth and percentage of c-section delivery. Only institutional deliveries would result in use of a medical intervention in order to facilitate better outcomes. It is a well known fact that institutional delivery

provides an opportunity to deal with delivery complications. More importantly, it also helps the doctor to decide on the type of delivery to be performed, normal or cesarean, based on the intensity of the complication. In safe motherhood strategies it is universally accepted that provision of essential obstetric care and ensuring institutional delivery are the best options to reduce maternal mortality in all contexts. Unfortunately, in the current scenario, this useful medical intervention which improved the outcomes of various complications of pregnancy, has now led to overuse or inappropriate use of caesarean delivery in many countries.

Role of health facilities:

Table 3 shows that the rates of institutionalised births have increased in most of the Indian states from 1998-99 to 2005-06. Rapid increase is seen in states like Andhra Pradesh, Kerala, Tamil Nadu, and Goa. The birth rates by c-section in health institutions have been presented in the next table. It is evident from the analysis (Table 4) that the rate of caesarean childbirth is more in the states with higher institutional birth. More interestingly, the proportion of caesarean birth is higher in private health facilities than in public ones, which may be a reflection of the increasing privatisation and greater role of the profit motive in the provision of health care facilities in recent times.

Table 4: Percentage of women undergoing caesarean section delivery among institutionalised birth by states, NFHS-3.

States	Institutional births	Delivery by c-section	Birth in public health facilities	Delivery by c-section public health facilities	Birth in private health facilities	Delivery by c-section
Uttar Pradesh	24.7	23.9	6.4	12.4	18.3	27.9
Haryana	34.6	14.5	13.2	14.4	21.2	14.7
Himachal Pradesh	49.1	26.9	42.3	24.2	6.7	43.9
J&K	51.1	27.6	41.7	25.5	9.5	37.1
Punjab	51.2	32.3	12.3	34.4	38.8	31.6
Delhi	52.7	22.9	27.5	18.1	25.1	28.1
Gujarat	52.5	16.9	13.9	13.8	38.7	18.0
Rajasthan	31.6	13.1	20.0	12.1	11.6	15.0
Madhya Pradesh	38.3	17.7	20.8	9.7	17.5	27.1
Maharashtra	71.2	22.0	34.3	16.6	37.1	26.9
Goa	92.2	27.8	44.0	18.1	48.4	36.6
Orissa	39.1	15.5	30.6	10.5	8.7	33.1
West Bengal	51.9	28.9	37.8	20.8	14.2	50.3
Assam	26.2	25.1	14.7	20.9	11.4	30.5
Bihar	25.1	16.2	4.8	8.2	20.4	18.0
Andhra Pradesh	75.6	36.4	27.7	25.3	48.1	42.8
Tamil Nadu	90.1	25.5	53.8	19.3	36.5	34.7
Karnataka	64.1	23.9	34.8	17.2	29.5	31.8
Kerala	99.3	30.3	35.6	26.0	63.8	32.7
India	**44.8**	**23.7**	**23.4**	**18.1**	**21.4**	**29.9**

It is clear from the above table that c-section deliveries are more in private health facilities than in public health facilities in many states. West Bengal, Andhra Pradesh, and Goa show alarmingly high rates of deliveries by c-section. The difference in c-section births between public and private health facilities is much high in some states like West Bengal, Orissa and Goa. However, it is difficult to conclusively establish the exact reason for such a scenario. The high proportion of caesarean birth in private health facilities could indicate better access to health care facilities; it could also be a reflection of the increasing privatization and the play of profit motive in providing health care facilities in recent times.

C-section deliveries: Influence of different factors

Risk factors: It has already been pointed out that the performance of c-section delivery depends on different medical emergencies: high maternal age, obesity of mother, breech presentation of foetus, foetal distress, and failure to progress to labour. These factors are considered as risk factors, inducing a preference for caesarean delivery. However, due to lack of information on these aspects in secondary data sets, factors such as mother's age at birth, size of child at birth, birth weight, BMI (body mass index) of mother and complications during pregnancy are considered as risk factors for present analysis. The influence of these factors on caesarean section deliveries in India is shown in Table 5. Mother's age plays an important role in performance of c-section. Mothers aged 30 or more have greater chances of c-section delivery than younger counter parts. Women today embark on pregnancy at a late age, therefore, their chances of undergoing caesarean delivery are high. Studies suggest that women are more prone to complications as the age of pregnancy and delivery increases (Taffel *et al* 1985). Another important factor for the performance of c-section is large size of baby at birth. Larger size babies are at higher risk of being delivered by c-section. Moreover, babies with birth weight more than 3 kg are also at high risk. Interestingly, even babies born later are more prone to being delivered by c-section than first-borns. According to Mishra and Ramanathan (2002), delivery complications are significantly lower among higher-order pregnancies.

Socio-economic (demand) factors: As already pointed out, non-medical factors are important for the preference for c-section delivery. In the present paper, a set of socio-economic factors have been considered as non-medical factors or demand factors for the performance of caesarean delivery. In India, the relationship between socio-economic factors and birth by c-section delivery has been presented in table 5. The most important socio-economic factors for the performance of c-section are mother's education and place of residence. The analysis shows that, proportion of c-section is much higher among mothers having secondary and higher education than without education or primary education. In India, the proportion of c-section delivery is very high among mothers with high educational background, which perhaps illustrates that women with higher educational attainment are able to make decisions about their their own health care.

Another major aspect of c-section delivery in India is the urban-rural disparity. It is evident from the analysis that the urban caesarean birth rates are much higher than rural rates in India. This is because access to medical institutions and standards of living make the urban mother more likely to

have a c-section. Furthermore, women from middle or high standard of living are more likely to go for a caesarean delivery.

Institutional factors: Institutionalised birth is seen as an effective way to combat maternal morbidity and mortality. Institutional delivery provides an opportunity to deal with delivery-related complications within a specialised scenario. At the same time, institutional births are also conducive to higher rates of c-section deliveries. For the present paper, proportions of deliveries in public or private hospitals have been analysed. It is evident from three consecutive years' NFHS data that the proportion of c-section deliveries increased with the increase in institutionalized births from 1989 to 2006. More importantly, caesarean childbirths are more in private health facilities than public. The analysis on the association between birth in private and public health institution shows that in India, nearly 39 per cent of births take place in health institutions, among which, births in private health facilities are more than public health facilities.

Table 5: Caesarean section delivery in India and its determinant factors (NFHS III)

Background characteristics	India	Total births
Risk factors		
Age of mother at birth		
< 25	9.1	27,981
25-29	12.4	14,442
30>	12.5	9,066
Size of child at birth		
Very large	15.6	1,913
Larger than average	12.3	9,607
Average	10.3	28,711
Smaller than average	9.2	7,273
Very small	10.1	3,098
Birth weight		
< 3 kg	22.1	2,305
> 3 kg	23.2	2,486
Birth order		
1	17.5	16,543
2	12.6	14,399
3+	3.7	20,556
Complications during pregnancy		
Yes	9.0	31,078
No	13.2	20,433
BMI of mother®		
Thin	5.7	19,512
Moderate	10.5	25,077
Overweight	27.6	3,929
Obese	40.8	824

Contd...

Demand factors		
Mother's education		
No education	3.0	21,048
Incomplete Primary	6.1	3,984
Complete Primary	7.9	3,491
Incomplete Secondary	14.5	16,481
Complete Secondary	21.0	2,595
Higher	35.4	3,911
Wealth index		
Lowest	1.4	9,198
Second	3.4	9,569
Middle	6.6	10,649
Fourth	13.1	11,288
Highest	26.2	10,807
Religion		
Hindu	11.1	35,469
Muslim	9.5	8,591
Christian	8.3	5,059
Others	12.0	2,392
Place of residence		
Rural	6.3	32,050
Urban	17.8	19,461
Caste / tribe #		
Scheduled caste	8.0	9,160
Scheduled tribe	4.0	8,379
Other backward class	9.8	16,735
Other	16.3	15,055
Working status of mother		
Currently not working	11.8	36,489
Currently working	7.8	14,910
Institutional factors		
Place of delivery		
Public	18.1	12,041
Private	30.2	10,664
Total	**10.6**	**51,511**

Furthermore, to examine the statistical significance of independent variables such as demographic and socio-economic characteristics on the preference of c-section delivery, a logistic regression model has been applied. The dependent variable is women who had caesarean delivery in the last three years preceding the survey and is dichotomous in nature (0- No – mother who had normal delivery, 1- Yes – mother who had c-section delivery).

The general logistic regression model can be stated as:

$$Y = a + ß_1X_1 + ß_2X_2 + ß_3X_3 + \ldots \mu$$

This indicates that the log odds of caesarean delivery are linear function of the independent variables. In order to understand the risk factors, socio-economic and institutional factors associated with c-section deliveries, a set of variables have been selected from the NFHS data sets for the period of 2005-06 based on the framework adopted for the study. For the purpose of multivariate analysis, different categories of the variables like size of the child at birth, mother's education and wealth status were recoded into smaller categories.

The influence of background variables on c-section deliveries in India are shown in Table 6. For the purpose of the study, three models have been considered. In the first model, only risk factors are considered for the analysis. In the second model, the demand factors are considered along with the risk factors; and in the third model, the institutional factors are added to the earlier model. In the first model, all the risk factors show significant impact on c-section. Caesarean deliveries are significantly more likely to occur among mothers of high age, those aged over 30 years. Factors such as size of the child at birth, complications during pregnancy and BMI are significant. However, in the second model, when demand factors are taken into consideration, the importance of risk factors has reduced significantly. It is evident from Table 6 that, mother's age, size of the child at birth, and pregnancy complication and BMI of mother are all playing a significant role in opting for c-section. C-section delivery is more likely to occur among mothers aged 30 or more. The occurrence of c-section is negatively related to the size of child at birth and order of birth. Children with smaller sizes are less likely to be delivered by c-section. Similarly, higher order births are also less likely to deliver by c-section. Also in mothers who had complications during pregnancy, chances of caesarean delivery are high. Similarly, demand factors are also playing an important role in performance of c-section delivery. Among the socio-economic factors, women's education, wealth status and place of residence are important determinants for preference of caesarean delivery. Chances of caesarean delivery are more among mothers with a high educational background and from high-income families. Similarly, c-section deliveries are more likely to occur in urban areas compared to rural areas. In the third model, delivery in health institutions has been considered. Deliveries in private health institutions are more likely to be performed by c-section.

Table 6: Logistic regression model showing the effects of selected determinant factors on c-section deliveries in India, NFHS 3.

Independent variables	Model I(N=51,511)		Model II(N=51,511)		Model III (N=23,093)	
	Regression coefficient 'b'	Odds ratios	Regression coefficient 'b'	Odds ratios	Regression coefficient 'b'	Odds ratios
Risk Factors						
Age of mother at birth	–	–	–	–	–	–
<25 ®	–	–	–	–	–	–
25-29	0.79	2.115***	0.452	1.571***	0.324	1.383***
30>	1.123	3.075***	0.826	2.377***	0.696	2.005***
Size of child at birth						
Large ®	–	–	–	–	–	–
Average	-0.216	0.806***	0.221	0.802	-0.142	0.867
Small	-0.242	0.785***	0.120	0.887**	-0.072	0.930

Contd...

Birth order						
1	–	–	–	–	–	–
2	-0.641	0.527	-0.512	0.599	-0.337	0.714***
3+	-2.236	0.107**	-1.540	0.214*	-1.055	0.348***
Complication during pregnancy						
No®	–	–	–	–	–	–
Yes	0.400	1.493***	0.332***	1.394***	0.232	1.261***
BMI of mother®						
Thin	–	–	–	–	–	–
Moderate	0.546	1.726***	0.341	1.407***	0.271	1.311***
Overweight	1.492	4.448***	0.928	2.528***	0.723	2.060***
Obese	2.080	8.003***	1.401	4.058***	1.113	3.044***
Socio-economic factors						
Mother's education	–	–	–	–	–	–
No education ®	–	–	–	–	–	–
Primary	–	–	0.483	1.621***	0.172	1.188*
Secondary	–	–	0.778	2.176***	0.187	1.205**
Higher	–	–	1.124	3.076***	0.361	1.435***
Wealth index						
Low ®	–	–	–	–	–	–
Middle	–	–	0.596	1.815***	0.119	1.126*
High	–	–	1.017	2.766***	0.240	1.271***
Place of residence						
Rural ®	–	–	–	–	–	–
Urban	–	–	0.298	1.347***	0.056	1.057
Religion						
Hindu	–	–	–	–	–	–
Muslim	–	–	0.017	1.017	0.015	1.016
Christian	–	–	0.502	0.605***	-0.205	0.815**
Others	–	–	-0.167	0.846*	-0.131	.877*
Working status of mother						
Currently not working®	–	–	–	–	–	–
Currently working	–	–	-0.045	0.956	0.007	1.007
Institutional factor						
Place of delivery						
Public®	–	–	–	–	–	–
Private	–	–	–	–	0.440	1.553***

* p<=0.05, **p<= 0.01 and ***p<=0.001
Dependent variable: Delivery by caesarean section (0- No, 1- Yes).

Conclusion

The impact of caesarean section delivery on maternal and child health, and the high cost of this technique compared with normal delivery, is a serious public health issue. Developing countries, as other regions of the world, are faced with the challenge of making the best use of limited resources to improve the health of women and children. Obstetrical interventions should be evidence-based, and the intervention should strictly be applied to women with complications (Bruekens, 2001). Morbidity and

mortality caused by unnecessary interventions is a serious problem, and a worldwide epidemic of obstetrical interventions could have a negative health impact on both women and children.

Though determinants for such increasing trend of c-section deliveries in India are not clear, the most possible causes for this phenomenon could be increasing access to health care technologies, higher women's education and decision-making powers and the preference for this method not only by doctors but also, sometimes, by patients. Data shows that there is a significant increase in the c-section rates in some states like Andhra Pradesh, Goa, Kerala, Tamil Nadu and West Bengal. It is noteworthy to mention that states with high pace of demographic transition and high institutionalised births and low fertility have considerably higher rates of c-section delivery. The bivariate analysis helps to understand the relations between the c-section delivery and its effect on different risk factors and demand factors for the preference of c-section delivery. Analysis shows that factors like mother's high age, size of the child at birth influence the decision to perform c-section. In addition, a number of demand factors or socio-economic characteristics are significantly related with caesarean delivery. Women's education and wealth status are important deciding factors. Mothers with high educational status may have decision-making power for their own health care and autonomy to decide on the need for institutional delivery. The multivariate analysis shows that a number of socio-economic factors are responsible for the performance of c-section delivery.

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