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BURDEN, CAUSE AND COST OF CAESAREAN SECTIONS

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A Community based Study in the three City Corporations of Thiruvananthapuram, Kochi and Kozhikode, Kerala

ABSTRACT

Mortality and morbidity for mother and baby are high due to Cesarean Section (CS) compared to vaginal delivery. The C-section rate in Kerala has been increasing over the last few years as indicated by various health surveys. This paper looks at the prevalence, cause and cost of C-section in three city corporations of Kerala.

Three hundred and sixty mothers (120 each from each city), who delivered babies between January 01, 2000 and December 31, 2000, were identified using cluster-sampling technique. A pre-tested questionnaire seeking information on date and time of delivery, parity, mode of delivery, age at marriage, education, place of delivery, number of ante-natal visits, socio-economic status (SES) ultrasound scanning (USS), sex and birth weight of the baby, and the direct cost for the delivery was administered to them by a physician. Bivariate and multivariate analyses were used to find out the relation, if any, between the predictor variables and C-section.

All the 360 mothers delivered in an institution and more than half the deliveries (53.3%) were in private health institutions. Overall prevalence of C-section was 34.4% (95% CI 29.5 - 39.3). Factors like SES, educational status, age, place of delivery, time of delivery, number of antenatal visits, number of USS and birth weight were found to be positively associated with C-section rate in bivariate analysis. However, in multiple logistic regression analysis, delivery during day time (OR 1.6, 95% CI 0.9 - 2.9) compared to night time, birth weight of more than 3500 gram (OR 3.8, 95% CI 1.3 - 11.4) compared to 2500 grams and three or more USS (OR 19.5, 95 % CI 4.9 - 77.1) compared to no USS during the antenatal period were associated with a high proportion of CS. The extra cost of CS deliveries in the three cities of Kerala was estimated to be Rs. 2,53,37,488/-

C-section rate found by this study is much higher than the desirable standard (up to 15%) set by the World Health Organization (WHO). Among the major determinants of high C-section rate are non-clinical factors like time of delivery and more USS dominated over clinical factors. Urgent policy decisions including auditing of each CS delivery are required in urban Kerala to reduce the high rate of C-section delivery.

INTRODUCTION

There has been much said and written in the past three decades about the high levels of health standards achieved by the Indian state of Kerala. Many factors such as high levels of female literacy and near equitable distribution of economic assets, together with the role played by the health sector, both public and private, contributed towards this phenomenal accomplishment. The Infant Mortality Rate (IMR) has hit a low of 16 per 1000 live births.[1] Immunization coverage is scaling new heights and authorities are seriously reinforcing the near 100% antenatal coverage to a minimum of 5 visits during each pregnancy against the nationally accepted minimum of 3. Kerala's life expectancy too is the highest in the country.

In short, every thing looks headed in the right direction. But statistics given out by a recent study by a state level NGO reveal a disturbing trend: an unprecedented increase in the percentage of C-sections over the past two decades. A closer look shows that the trend is not only continuing but is getting worse. Through the decades, feminists have complained of the *Medicalisation* of pregnancy. Is this an extreme example of that? We should also look at one health indicator in which Kerala is lagging behind many other states of India, that of Maternal Mortality Rate (MMR). The MMR[2] of Kerala to be 192 per 100,000, much behind our next-door neighbour, Tamil Nadu.

One can argue that institutional deliveries bring with it the risk of higher proportion of C-sections too. The WHO has suggested that 15% C-sections in all deliveries is more or less the acceptable limit internationally. The proportion of institutional deliveries in Kerala is a very high 97% in 1996[3] which is comparable with that of the developed countries. The percentage of C-sections in Kerala rose from 11.9% in 1987 to 21.4% in 1996.[4] There is variation across sectors – C-section rate ranges from 10% in public to 30% in private sector.[4] The proportion of C-sections is considerably higher in urban areas than the rural areas.[5]

The reasons for this are many. Medical records will be misleading, as they often cite the indication for C-section as emergency intervention in face of maternal or foetal distress. But insiders tell a different story. Real reasons are often non-clinical and doctors may advice a C-section for a patient even when it is not clinically indicated for reasons of their own. There are instances where doctors working in some private institutions are pressurised by the hospital management to promote C-sections as it brings in more revenue. Health

economists term it as 'provider induced demand' There are also reported instances where women themselves or their family members have requested a surgical intervention for the sake of the baby being born on an astrologically auspicious day!

Increase in C-section rate is disturbing, as it puts additional burden on the women in the form of unwanted morbidity and high economic cost. However, exact magnitude of the problem and the reasons are still unknown. This paper sets out on this venture. The broad aim is to estimate the burden of C-section, its determinants and cost in three city corporations of Kozhikode, Kochi and Thiruvananthapuram in Kerala. Specific objectives are:

1. To quantify the prevalence of C-section and compare and contrast it with WHO norms;
2. To identify clinical and non-clinical factors associated with high prevalence, if any;
3. To estimate the treatment and other costs attributable to C-section.

C-Section - The Operation

The origin of the word *Caesarean* is uncertain but probably derives from the Latin verb *caedere* meaning 'to cut'. By definition, C-section refers to the delivery of a foetus through an incision on the abdominal wall and the uterus and it does not include surgical procedures undertaken to remove the foetus from the peritoneal cavity after partial or complete rupture of the uterus, or in case of abdominal pregnancy. There is the Classical C-section where a longitudinal incision is made in the upper segment of the uterus and the Lower Segment Caesarean Section (LSCS) with a transverse incision in the lower segment. The Classical CS is now resorted to only if there is some contra indication for doing a LSCS.

The oldest authenticated record of a live child being born by this method occurred in Sicily in 508 BC. Up to the 16th century, the operation was mainly carried out to save the life of the child in the event of the death of the mother, and this is still resorted to today on occasion. Trautmann performed the first verifiable C-section on a living woman in Wittenberg in Germany in 1610 AD; the patient died 25 days later. It was not until late 19th century that the uterine incision became routine, with consequent improvement in maternal mortality. The first satisfactory method for suturing the upper segment incision was described by Sanger in 1822. Kehere and Munro Kerr pioneered and perfected the Transverse Lower Segment incision in 1911.

The advent of modern antibiotics and improvements in surgical technology and support mechanisms have helped to increase the popularity of C-section among the providers as well as to reduce the apprehensions of the potential subjects. Incidentally, this has given rise to a new set of 'indications' for the Caesarean section. The major indications are:

1. Cephalo-pelvic disproportion and contracted pelvis
2. Dystocia due to soft parts
3. Inadequate uterine forces
4. Ante-partum hemorrhage
5. Pre-eclamptic toxemia
6. Eclampsia
7. Fetal distress and prolapse of the cord
8. Mal-presentation
9. Bad Obstetric history like difficult deliveries or perinatal deaths
10. Elderly Primi Gravida

Regional spinal anaesthesia is the commonly used and General anaesthesia is resorted to only when there are other complications. There are a number of immediate complications like haemorrhage, infection, thrombo-embolism, wound dehiscence and paralytic ileus that can arise from a CS. Late complications include utero-parietal fistula, scar endometriosis and rupture of scar during subsequent pregnancy.

Indications and Reasons for C-section

Standard textbooks give many indications for CS, and they also rank them in an order of frequency of incidence. The ranking order available from other studies does conform to this order.[6, 7, 8] But factors like pressure from the patients and the physician factors are often not mentioned. Specific studies have been made to identify certain maternal factors (Non-Medical), which can influence the decision to go in for CS.

Rosenthal & Patterson[9] (1998) have found a positive association with the maternal age and the type of delivery. Webster et al [10](1992) also have found similar findings where a higher maternal age is one of the reasons for the type of delivery. Chacham and Perpetuo [11](1998)

in a study conducted in Brazil have clearly shown the positive association between maternal education and CS. The order of the birth is another factor which influences the type of delivery, where the first order birth is more likely to have a CS. The birth weight of the baby also has a positive association with babies weighing above 3000g having an increased chance for going in for a CS.[10, 12]

Physician/provider factors are also important. Lower tolerance for taking risks, fear of litigation (earlier only in the western context but now increasingly in India too) etc is usually quoted as the common physician related factors.[13,14] Physician convenience, physician 'style' of practice, financial incentives experience and training, availability of a expert second opinion were found to be factors associated with CS rates by some researchers.[15, 16]

Epidural anaesthesia has been blamed for the increased incidence of dystocia and so indirectly CS. This is evident from various studies and is quoted in the ICAN website.[17] Most private institutions provide Caesarean services on demand. In UK, an audit found that such demands were often much respected by the obstetricians.[18] In Brazil, CS is often made use of in performing surgical sterilization, as the accepted methods of family planning do not include sterilization. There is also a perception among women that a CS will help them keep their vaginal anatomy intact and will protect against loss of normal coital function. This perception is encouraged by at least some Obstetricians. The reduced skill of the upcoming Obstetricians in handling instrument-assisted[19] delivery also is one of the reasons for the rise in CS rates.[20, 14, 19]Treffers et al[20]have also suggested the needs for a larger role for the midwives.

Risks of C-sections

Caesarean Sections, which can be unavoidable and life saving on occasions also carries with it an additional burden of morbidity and even at times mortality to both the mother and the baby.[21] The risk of maternal mortality for CS in the USA is 20 per 100,000 as compared to 2.5 per 100,000 for vaginal delivery.[22] Mukherji et al[23] have reported, that in an Indian study, deaths related to CS accounted for one-eighth of all maternal deaths in the hospital and the institutional mortality for CS was 5.7 per 1000. Apart from mortality, CS poses documented medical risks like infections, hemorrhage, injury to associated organs, complications of anaesthesia, possible transfusion reactions etc.[17] Boehm et al.[24] (1994)

reports the risk of maternal morbidity is about 8 to 12 times higher for CS compared to vaginal delivery. The risk multiplies when primary CS leads to subsequent CS as repeat sections carry higher risk to the mother.[25]

Petitti et al[22], Bhargav (1998)[26], Kamal et al.[27] (1994) Pai et al[28] (1999), and DiMatteo et al[29] (1996), have all studied the effects of CS on maternal morbidity and reported significant findings. They all have shown that CS can adversely affect breastfeeding. Incisional hernia is one of the late complications, which is true for any abdominal surgery.[22] Savage (1999)[14] stresses on the occurrence of placental anomalies in subsequent pregnancies.

Apart from physical morbidity, there is also the psychosocial morbidity that we have to consider. The CS imposes a severe psychological stress on the mother and her family for years to come.[30] She goes on to quote different studies, which analyze the impact on the mother, the infant, and the father jointly and separately. The impact the surgery per se has on the individual can have long lasting effects. Oakley A. [31](1983) has discussed the significance of trivialization of the CS. He criticizes the medical education system for conceptualising and defining this major surgical procedure as a routine alternate method of birthing rather than a 'special event or crisis'. The use of the term 'section' instead of a more likely surgical term like 'hysterectomy', according to Oakley is an attempt in this direction.

Ethical issues

Many authors have stressed the problem of ethical issues concerning the use of unnecessary medical interventions.[14] Madhukar Pai asks how a country like India can afford such an extravagance when we can hardly meet our basic requirements with our dwindling resource.[28] In short, it seems to have left no doubts in anyone's mind that the CS rates have increased in the last decade, and is still rising. The time has come to sit up and take notice, and it is worth reiterating the recommendation of the KSSP study of 1991 in Kerala, "there is a need to de-emphasize the medicalization of such normal phenomena as pregnancy and child bearing."[32]

Caesarean Rates

The world is witnessing an unprecedented phenomenon in the increasing rates of certain surgical interventions like the Appendectomy, Coronary Artery Bypass, Hysterectomy and the Caesarean Section. Alarmed by the skyrocketing rates of these operations, the

medical community has, at least in some developed countries, set up audit systems and this has actually reversed these disturbing trends in some countries.[18] There were also certain isolated attempts like the Mount Sinai CS reduction program and they have succeeded in sustaining the CS rates at around 10-12% without any adverse effects.[33] The story is entirely different in the case of developing countries, where it is usually the largely unregulated private sector that controls the lion's share of the health care market. Here, medical audits are unheard of and will be resisted by all sections of providers. Studies prove that the rising trend of these procedures continues and this shows no signs of stabilizing in the near future. Of all, it is the Caesarean Section rate that has shown consistent gravity-defying trends.

There is no universally accepted optimal CS rate. The WHO, in April 1985, convened a meeting in Fortaleza, Brazil, to formulate guidelines on 'appropriate technology for birth'. It clearly states that there is no justification for rates higher than 10 - 15% in any region of the globe. It also encourages the publishing of information on birth practices like CS by individual hospitals. The World Health Organization has been advocating for the promotion of Vaginal Birth After Caesarean (VBAC) wherever possible. The government of USA also has put the optimum level at 15% in its 'Healthy People Strategy, 2000' report of 1991. But some experts has put advocated a flexible range of 20-25% for developing countries where the population is impoverished with poor reproductive health.

An editorial in 'The Lancet' [18] says that in creating awareness and making information available, the emphasis should be on comparisons of the implications of vaginal versus caesarean delivery. According to them the uptake of CS in women who possess such information will clearly be more appropriate than any of the "desirable targets" put forward by any agency.

Indian Scenario

In India, the research on such operative procedures also shows that it is the Caesarean Section (CS) and the Hysterectomy that are leading the pack[1]. There has been very little research in India on CS rates and its impact[28], but internationally there have been many studies that estimate the rates as well as analyze the impact of the rising CS rates.[18, 14, 34] The rate increased from 5% to 25% in fewer than twenty years.[35] Savage et al [13](1993) estimated the rate in England to be around 12%. Notzon et al [34](1985) provides some data

on developing countries. Belizan et al[36] (1999) who studied the situation in the Latin America estimated that around 8,50,000 unnecessary CS are performed each year. They put the overall CS rate in Latin America between 17 to 40%. They also demonstrated an association between high SES and CS rates. But it is Chile that takes the cake with an average rate of 37% of CS.[37] The rates in Brazil rose from 14.6% in 1970 to 31% in just ten years[19] In Asia, rates are available for few countries like China where it rose from 4.7% to 22.5% in a period of thirty years.[37] As stated earlier the second most populous country in the world, India, does not know what the national CS rate is!.[26]

Few Indian studies show that the situation is going from bad to worse. KSSP surveys in rural Kerala indicate a steady growth in C-section rate.[32, 3] A teaching hospital in Calcutta shows an unbelievable rate of 49.9%.[23] Another study in Chennai gives a figure of 45.2%;[28] it, however, does not give any significant relationships between this high CS rate and factors like SES, parity, literacy etc. An association between late initiation to breastfeeding and CS could be seen from the data, though not statistically significant. Sabu S. Padmadas et al[5] have reported a CS rate of 17 for urban and 11.3 for rural Kerala based on National Family Health Survey (MCH & FP), 1992 – 93.[5]

A study undertaken by undergraduates of Medical College, Thiruvananthapuram, under the guidance of the Community Medicine Department, shows that C-section rate grew from 14.7% in 1990 to 21.6% in 1999. It is interesting to note that 'Cephalo-pelvic disproportion' (CPD) is the first and 'previous CS' third in the list of reasons quoted in the hospital records as the indication for CS. According to the International Caesarean Awareness Network Inc.[17] (ICAN) website, up to 77% of women for whom the indication for CS was CPD and tried labour again for a subsequent delivery had a Vaginal Birth After Caesarean VBAC. Approximately one-third of these women gave birth to babies that were larger than their previous 'CPD' baby. The ICAN site goes on to claim that on reviewing all literature on VBAC for the period from 1985-1990, the rupture rate of a previous CS scar was 0.22% (in developed countries it is 0.18%) while the incidence of other obstetric emergencies like prolapsed cord, placental separation is much above this mark at 1-3%. This adds weight to the claim that the old dictum of 'once a Caesarean, always a Caesarean' is outdated.

CS rates are higher in private than in public sector and [32]have demonstrated this in Thiruvananthapuram. A study for [4]UNDP (1995) in the city of Thiruvananthapuram shows a CS rate of 10% in public sector and 30% in private sector. One of the reasons why Kerala is lagging behind as far as MMR is concerned could be its high and increasing Caesarean rates.[3] CS rates of some countries are given in Table-1.

Efforts to reduce CS Rates

Although several strategies have been suggested and tried to control the rising graph of CS, Studnicki et al[39] (1997) remarks that nothing worthwhile has come out of these efforts. The American College of Obstetrics and Gynecology (ACOG, 94) has brought out a consensus statement encouraging vaginal birth after previous CS (VBAC). In Canada, an attempt made to influence practice by opinion leaders and respected professionals have been more effective than audit or feedback in increasing the incidence of VBAC.[40]

Socol et al [41](1999), in a study of institutions, which have tried to reduce CS rates by following the "active management of labour" technique, found that it was effective in some while a failure in others. RCT of the same also showed mixed results.[42] It is evident from the Myers and Gleicher study that second opinion requirements and feedback mechanism have done their bit to bring down the rates . Another way is reducing the fee for CS and increasing that of vaginal delivery. Kabra et al[43] (1994) reports that it was successful in a private hospital in Jaipur. In Australia, an experiment making the fee for CS and vaginal delivery equal, failed because the busy doctors felt that it is easier to do a CS than wait for a normal vaginal delivery and the fee also is the same for both .

Cost of Caesarean Sections

Though data is not available in India, a CS means an extra week's stay in the hospital and other associated costs, which would be at least 2 - 3 times more than a vaginal delivery[28]. In the UK, National Health Service data shows that a CS costs the NHS at least 1000 pounds more than a vaginal delivery. Savage et al[13] (1993) suggests that a reduction of CS rate by 1% can save the NHS seven million pounds each year. In Brazil, an increase of 1% in the rate can cost the exchequer US $ 4,104,000/- each year[19]. The 'Public Health Citizen's Research Group' of US estimates that in 1987 alone 2500 CS resulted in serious infections which caused a loss of 1.1 million extra hospital days and cost over $ 1 billion.[17]

Table-1. C-Section Rates Across the World

Country	CS Rate delivery (%)	Institutional delivery (%)	Skilled attendant	Year
Africa				
Burkina Faso	1.3	43	41	88-93
Egypt	6.6	33	46	91-95
Kenya	5.2	44	45	88-93
Morocco	3.5	37	40	90-94
Namibia	7.0	67	68	87-92
Niger	0.9	16	15	87-92
Rwanda	1.8	25	26	87-92
Uganda	2.6	35	38	92-95
Zimbabwe	6.0	69	69	91-94
Latin America				
Brazil	36.4	92	97	91-96
Colombia	16.9	77	85	91-95
Dominican Republic	22.0	92	97	91-96
Guatemala	8.2	34	35	91-95
Asia				
Kerala (Rural)	21.4	97	99	1996

Source: Aravindan and Kunhikannan, 2000.[3]

METHODS

From the literature on the topic and also from discussions with a cross section of doctors and general public, we got a rough idea on what factors were likely to influence CS rates. This of course, took into consideration the standard indications as quoted by the textbooks as well as other factors, which we had reason to believe, would influence the rate.

Outcome Variables

C-section Rate is the proportion of C-section deliveries in hundred births.

Causes as reported by the subject.

Cost calculations are based on reported direct costs; indirect cost is captured to some extent.

Predictor Variables

Maternal Age in completed years. The chance of a C-section delivery is expected to increase as age advances. Mudaliar and Menon (Text Book of Obstetrics) explicitly state that 'elderly primiparas' have an increased risk of Caesarean.

Parity. It probably exerts its influence in association with age. Primiparas below the age of 18 and above the age of 35 are said to be at risk of a CS.

Socio Economic Status. Studies indicate a strong association between SES and the type of delivery, an increased CS rate for high SES. The subjects are classified into three categories, upper, middle and lower.

Educational status of the mother (completed years of education). Studies also show a strong association between educational status and CS rate. More educated the mother; more is the chance of a Caesarean. This trend is more evident in developing countries; however, of late, higher educated women in developing countries have actually started resisting Caesarean delivery.

Height of the woman (in cm). Maternal height is said to have an important effect on the outcome of pregnancy. Women of height below 135 cm are at high risk of CS.

Place of delivery (public/private). It is said that the CS rate is higher in private institutions. Earlier studies provided evidence in this regard.

Type of institution (referral centre/specialist centre/others). There are reasons to believe that institutions with specialist care and also operating room facilities will have a higher C-section rate, because of many reasons, the most important being that more high risk cases would be referred there.

Elective/emergency. Obstetricians argue that they do elective C-sections, succumbing to the demands made by the patients and their bystanders. We wanted to capture this information from the subject whether the surgery was planned in advance or undertaken as an emergency.

Time of delivery. A study in Brazil revealed that C-section rates peaked just before 5 o' clock in the evening. The reasons are quite obvious and had nothing to do with the textbook indications for C-section. 'Physician convenience' was the main 'indication'.

Previous delivery (normal/c-section). Despite evidence to the contrary, the old adage of 'once a Caesarean, always a Caesarean' is still the byword in the Obstetric wards across the state. This paper attempts to find out the percentage of VBAC in our sample.

Complications during last pregnancy. It is well known that maternal complications like PIH, DM, and PET are known indications for a CS.

Number of antenatal visits. Some authors and NFHS-2 have observed that more the number of antenatal visits more are the chance for a C-section. They have also expressed the view that, if the subject was seen at the ANC by an obstetrician, as against a General Practitioner or a Health Worker, the chances for a CS are even higher.

Whether USS was done during last pregnancy, Number of times. This was also found to have a linear relation with the risk of a CS.

Birth weight (in grams). Larger the baby, higher the chance for a CS.

Indication for CS. Here, we are only looking at the reported indications to compare it against the standard set of indications.

Study Site

Kerala, the southern Indian state, comprises of 1.2% of India's total geographic area and 3% of the population. The population as per 2001 census is 31.8 million. There are 5 city corporations and three of them - Thiruvananthapuram, Kochi and Kozhikode - were chosen. Each corporation has 50 wards and each ward has a population of 6000 to 15000. The chosen cities represent south, central and north of Kerala. Kerala, although a small state, shows great variations in culture and practices across the regions and so our choice is expected to be representative of all the regions.

Sampling

Multi stage cluster sampling technique was used to identify the subjects. This method was pioneered and perfected over the years by UNICEF for assessing immunization coverage. They used 'thirty clusters of seven' for their purpose, which was based on an assumed prevalence of 50% and a precision factor of 10. A modification of this technique was used in this study. We assumed a prevalence of 23% of C-sections in the community and a precision factor of 5. The subjects of the study were women who had delivered between 1st January and 31st December 2000. Sample size was calculated using the formula :

$$\frac{n = \{z^2 * PQ\} * d}{\triangle^2}$$

Where n = sample size, Z= Confidence limit factor (taken as 1.96 for 95% confidence interval), P= Assumed proportion of C-section deliveries (taken as 23% based on previous studies and after a series of discussions with key informants including leading Obstetricians

and Public Health experts), Q = 1 – P, r= Precision factor (difference between assumed prevalence and the lowest expected prevalence taken as 18%). So, r= 0.23 - 0.18 = 0.05, d= design effect (taken as 1.2).

The formula $Z^2 PQ/r^2$ is for random sampling. As we used cluster-sampling method, an addition of 20% (d) was made to the sample size, in order to reduce the design effect. The calculated sample size was n= $((1.96)^2 0.23 * 0.77 / (0.05)^2) * 1.2 = 326$

We took "30 clusters of 12" hiking the sample size to 360. The clusters were selected from all three corporations that have fifty wards each. The population according to the 1991 census was listed and cumulative population calculated. The sampling interval was calculated by dividing each city's population with the number of clusters (10). With the help of a random number and sampling interval, 30 clusters (wards) in three cities were identified.

Study Design

This is a cross-sectional study. A house-to-house survey was conducted in each of the chosen 30 clusters, 10 in each city. After identifying the cluster (ward), the main landmark of the ward was ascertained from the local public. The left hand side of the main road from the said landmark was surveyed. In each house we enquired whether the household had anyone conforming to the subject definition. If yes, willingness to participate in the study was sought and the subject was interviewed using the prepared questionnaire. The process continued till the required number of samples from the cluster was finished.

In Thiruvananthapuram and Kochi, the survey was undertaken by the principal investigator himself, and in Kozhikode, two external researchers collected the data under the direction of the Investigator. They were nursing graduates who were trained for the purpose by the principal investigator for two days. On the first day, the purpose of the study and the design were explained to the researchers. They were then made to read the questionnaire and translate it in to Malayalam. The mistakes were identified and corrected after which they conducted mock interviews using the questionnaire. On the second day, they were taken to the field, where they observed the principal investigator conducting interviews and later they did the same under the observation of the investigator.

Duration

The duration of study was 45 days from the start of the survey in January 2001. Every day the study started at 9 am and finished after the completion of one cluster. There were days when one cluster was finished sufficiently early for us to begin work on the next. On such

days, the remaining work in the cluster was finished first on the next morning before starting on a fresh cluster.

Instruments

Questionnaire

Structured questionnaire was prepared after many rounds of discussion with the guides and a thorough literature review. It was pre-tested and corrections were incorporated before the start of the survey. Questions were aimed at capturing accurate information on demographic characteristics, details on the delivery, costs and other predictor variables listed above. One questionnaire took about 20 to 25 minutes to complete, including height measurement. The socio-economic status was assessed by investigator's subjective assessment. It was primarily based on observing the type of the house, assets, and calculating the per capita expenditure according to reported income and expenditure. There was a prepared checklist against which items were matched and subjects were assigned to one of the three socio-economic categories.

Plumb Line

Height was measured by making the person to stand against a wall with hip and heel straight and head erect. It was measured with a graduated plumb line. The graduations were made with colored thread on the line using a measuring tape.

Data Entry and Analysis

A codebook was prepared by the investigator to facilitate data entry. Data was entered in Microsoft Excel Version.4. It was then cleaned and analysed using SPSS for Windows version 6.1. Bivariate and multi variate analysis were done to search for relations between the predictor variables and CS deliveries.

Sample Characteristics

As mentioned earlier, 360 subjects from three different cities were interviewed during the survey. Majority (78.1%) of the subjects belonged to the age group of 21-30 years. Age at marriage for women in Kerala is higher than the national average and our sample reflects this fact; the lowest age was found to be 18 years with the mean of 25.53 years.

RESULTS

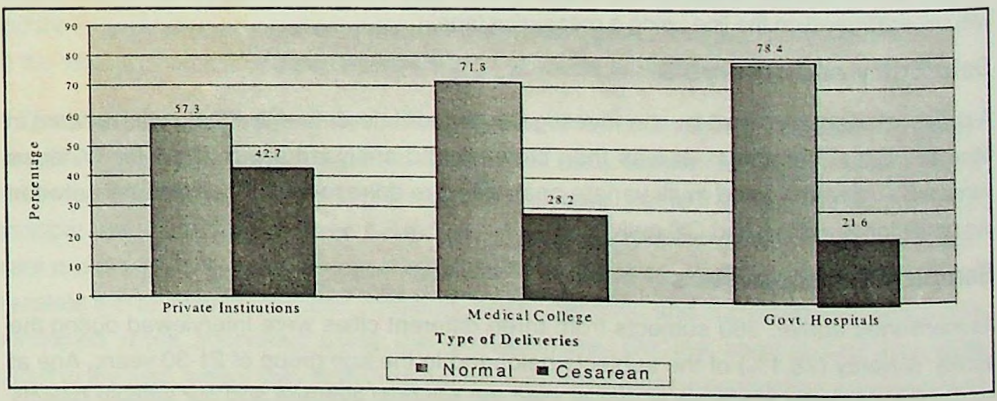
In the study population, majority of the subjects belonged to middle socio-economic class. Over 54% of the sample had high school education while 45% had college education. Level of education and SES were found to be strongly associated.

Thirty four percent of the deliveries were C-section and 65% were normal deliveries. There was a variation of 10-15% from the mean (39.2% in Thiruvananthapuram and 29.4% in Kozhikode) in the proportion of C-sections across cities. However, the sample size was not estimated with inter-city comparisons in mind. Going by age groups, chances for C-section seem to be high in < 20, 26-30 and > 31 age groups. The proportion of women delivering by C-section also increased steadily with the socio-economic status. Similarly, the incidence of C-section increased with the educational status.

Majority of the subjects were primiparas with 2.15% of the sample coming over para 4 and 8.3% of para 3. This distribution corresponds to the expected distribution as per SRS data. When Primiparas alone are considered, the chances of CS are significantly high in the age group above 30 (Chi Square for linear trend is 6.943; p value: < 0.008; OR for group 4 is 9.45).

Proportion of people utilizing private facilities was 53.3%. As figure-1 shows, 43.2% of deliveries in the private sector were Caesareans and the difference was significant compared to the government facilities. C-section rate among private institutions was 51.5% in Thiruvananthapuram, 39.2% in Kochi and 35.9% in Kozhikode. It was clear from the study that the private sector cost much more than the public sector for both types of deliveries. A normal delivery cost 2.39 times more in private sector while a caesarean cost 2.62 times more.

Fig. 1. Percentage and type of deliveries in different type of institutions



While 60.2% of normal deliveries occurred during 12 hours between 5:00 a.m. and 5 p.m., 79% of C-section took place during 5 p.m. and 5 a.m. The subjects were not given a choice to decide and the doctor took the decision in favour of C-section. Earlier international studies indicated that the elective C-section is more in the upper SES but it was not found in this study. The vast majority (87.2%) of subjects preferred a normal delivery if given a choice because they felt it was the natural and safe method to deliver.

Reasons or indications prompting the C-section were more or less the same as those given out by standard Obstetrics textbooks. Almost all women who had a C-section earlier said that this time it was an elective procedure. Only one had a normal delivery, she was also told that she would need surgery but she delivered prematurely. There was no significant association between the sex of the baby and mode of delivery with the percentage of both types of deliveries more or less equal in either sex (Chi square p value:0. 734). An increase in birth weight increase meant a definite and significant increase in the chance for a Caesarean from 21% in group-1 (babies below 2500g) to 45.5% in group-4 (babies above 3500g). There was no significant association between mode of **delivery and maternal height (Chi square** p value : 0. 739). The period of admission prior to delivery did not have an effect on the mode of delivery. However, there was a significant association between the mode of delivery and the number of days of hospitalisation after delivery. The days of hospitalisation after a CS were higher than that of a normal delivery.

While 24.6% of the subjects who had a normal delivery took rest for about 90 days, 48.5% of those who had a CS took this long to return to their routine activities. The mean period of rest after a normal delivery was 56.6 ± 24.4 and that of CS was 69.5 ± 25.6. Those who had a CS had a significantly higher chance of taking more days of bed rest after delivery than those who had a normal delivery.

Only 12 women (3.3%) had less than 5 antenatal visits during the course of the pregnancy. Average number of antenatal visits was 8.87 (± 2.98). Average number of ultrasound scans during the antenatal period was 1.183 (± 0.8) and Thiruvananthapuram had a higher mean compared to the other two. A qualified doctor attended to 99.5% of all deliveries and of this, an Obstetrician attended 86.5% deliveries! There was definitely an association with the person attending delivery and type of delivery; those attended to by an Obstetrician had significantly higher chance of having a CS.

A significantly larger proportion of babies delivered by CS were not breast fed in the first hour after delivery, than babies who were delivered by CS. Yet, there was no change in infant morbidity patterns by the mode of delivery (Chi Square p value: 0.517). As for the safety of their babies, 4 subjects who preferred normal delivery for their own safety thought that a CS is better for the baby as it does not have to suffer the strain of passing through the birth process.

Multiple Logistic Regressions

A logistic regression model was used to study the relationships between the individual independent variables like age, SES, place of delivery, birth weight, number of USS etc and

C-sections while controlling for the effects of other maternal and institutional factors. From the table-2, it is clear that, when adjusted for other factors, the incidence of Caesarean Sections was significantly related to birth weight (Odds Ratio for the above 3500g group: 3.807; 95% CI: 1.3 - 11.4), time of delivery (the time slot of 5 pm to 5 am being significantly associated with less number of Caesarean Sections) and the number of USS performed during the antenatal period (Odds Ratio for the above 3 USS group: 19.5; 95% CI: 4.9 - 77.1). The other variables, which were found to be significant on bivariate analysis, did not return similar results on multivariate analysis.

Table-2. Results of Multivariate Analysis

Variable Odds Ratio	Odds Ratio	95% CI for adds Ratio
Age Group		
20 and below *	1	
21 to 25	0. 733	0.301 - 1.785
26 and above	1. 538	0.643 - 3.680
Birth Weight		
Less than 2500g *	1	
2500 to 3000g	2. 995	1.297 - 6.916
3000 to 3500g	2. 911	1.170 - 7.241
Above 3500g	3. 807	1.270 - 11.412
Place of Delivery		
Government Hospital *	1	
Private Hospital	1.551	0.783 - 3.073
Govt. Med. College	0.963	0.427 - 2.174
Socioeconomic Class		
Lower *1		
Middle	1. 250	0.668 - 2.337
Uppe	0. 835	0.321 - 2.168
Time of Delivery		
05. 01 am to 05.00 pm *		1
05. 01 pm to 05.00 am	0.219	0.107 - 0.641
Ultra sound scans		
No USS *	1	
1 USS	1.462	0.692 - 3.086
2 USS	1.839	0.777 - 4.352
3 and above	19.502	4.934 - 77.084

* *Referral Class*

DISCUSSION

Caesarean rate in three Kerala cities was found to be 34.4%. This is higher than the rates revealed by earlier studies. The KSSP study indicated a rising trend from 11.9% in 1987 to 21.4% in 1996.[3,4] Although the study design does not allow for comparison across cities, it should, however, be mentioned here that there was a wide variation in the CS rates across the cities with Thiruvananthapuram recording the highest of 40%, Kochi 35% and Kozhikode 29%. A closer look into the details behind this wide variation calls for a more detailed, thorough anthropological and sociological study.

There were only two instrumental deliveries out of 360. These were reported cases not based on hospital records. The subjects may not have been aware of the use of vacuum extractors as attending physicians seldom mention this later to the patient. Two leading Obstetricians (one each from private and Government sectors) admitted that the proportion of instrumental deliveries have indeed declined and claimed that newer crop of obstetricians (including the respondents) seldom use forceps. Senior staff nurses in the Government Medical College too said that none of the younger doctors use the method anymore, though they are trained in their use during their post graduation. Such doctors, when employed in government or private sector, may lack the confidence to go in for a delivery that may not be very smooth and opt for a C-Section instead. Declining skills in instrumental delivery has been suggested as one of the reasons for the rising CS rate.[19,14]

All of the 360 subjects delivered in a health facility (two deliveries took place outside health facility - one on the way to the hospital and the other delivered prematurely but immediately taken to the hospital to complete the third stage of labour). Institutional delivery is, of course, a pre-requisite for a C-section and we have seen that the CS rate increased with the increase in the proportion of institutional deliveries.

It was found that 53.3% of our subjects delivered in a private facility. This falls short of the figure (60%) indicated by an earlier study[4]. This could be due to the peculiar feature that the private sector in Kerala is stronger in rural areas than in urban areas. We can hardly find a village in Kerala where there is no private institution offering obstetric care.

In the private institutions, 42.7% of all deliveries were by CS, while in government institutions, the figure was 25%. There is a significant association in the place of delivery and the mode of delivery (c^2 p value: < 0.001). This finding is in tune with earlier studies on the matter.[4,16,44] Physician convenience, lack of support and monitoring facilities are the reasons quoted for increased CS rates in the private sector.[21] Pahari et al also cited similar reasons for the

private physicians going in for emergency caesareans rather than a trial of labour. There was a wide variation in the private sector CS rate across cities, with Thiruvananthapuram leading the way once again with 51.5%; it was 39.2% in Kochi and 35.9% in Kozhikode.

There was a significant relationship between the time of delivery and the mode of delivery. Nearly 80% of C-sections took place during 12 hours starting at 5.00 a.m. While 40% of the normal deliveries took place in the twelve hours between 17.00 hours and 5.00 hours, only about 20% of the CS took place during the same period. Even when adjusted for other factors like age, place of delivery, SES etc, there was a significant association between the type of delivery and the time. Deliveries taking place during 12 hours starting from 5 a.m. had definitely higher odds of being a Caesarean section (Odds Ratio: 2.66). As cited elsewhere, if majority of the CS were emergency procedures, then we would expect them to be more uniformly spread out and would not expect such a low figure during night hours. That the total delivery itself is less in night does not hold much value as 40% of the normal deliveries take place at night in spite of the fact that all active induction procedures are usually stopped during night, again because of 'physician factors' rather than any scientific reasoning. 'Physician factors' include the tendency to avoid work during inconvenient hours and finish the job in a planned manner rather than waiting expectantly for the normal procedure[21]. Deliveries that are quoted as 'normal' were far from being normal, as it is probably the result of a number of other interventions like artificial rupture of membranes (ARM), priming of the cervix using prostaglandin, induction of labour using hormones like Oxytocin and epidural anaesthesia to name a few. Now, even in a normal delivery, according to obstetricians, a convenient and auspicious date is chosen. These inductions measures are usually started early in the morning so as to complete the procedure before the day ends. Usually, if the labour is not progressing on expected lines, the CS surgery takes place in the evening. One of the reasons often mentioned by the private Obstetricians during key-informant interviews is the unavailability of anaesthetists during odd hours of the night. 'Physician factors' mentioned earlier may be in play here too.

If we used a hypothetical model where all deliveries took place at night, the percentage of CS would then drop to 10.5%, which may be closer to the actually indicated proportion of CS. In such a scenario, we would be avoiding 69.4% of the Caesareans that are taking place now. The rate is much lower than the 15% that the WHO has put forward. The savings in terms of the direct and indirect costs involved will be huge.

More than 62% of the Caesareans were emergency procedures, as reported by the mothers. They meant that they or their relatives were told of the necessity of the procedure only immediately prior to the surgery. In all cases the decision for CS was the doctor's alone, and the subject or relatives did not have any say on the matter. This finding again do not conform to other studies on the issue which says that 'patients demand' constituted the third commonest reason for CS in the UK in 1992.[45] Mello e Souza[46] in 1994 quoted the need to avoid labour pain and the belief that a vaginal delivery would spoil a woman's future sexual performance and her husband's pleasure as the reasons for an increased 'patients demand' for CS. In India, subjects or relatives demanded CS, for the baby to be born on an astrologically auspicious day.[43] If, as suggested by the University Grants Commission, Universities start Astrology courses across the nation, and it gains more respectability as a science, probably this trend would rise. But here in our case, with the decision resting entirely on the physician, these issues do not come into the picture at all.

The indications quoted for CS were more or less in conformity with the classical indications given in most standard textbooks of Obstetrics. The expected proportions varied from the observed, but here there is one point which should be kept in mind, that these figures refer to reported figures and no attempt was made to verify the claims by cross checking with medical records.

Maternal age is acknowledged as one of the determinants of CS. Women below 18 years and above 35 years are said to be at high risk for pregnancy related complications and CS.[47,48] The findings here suggest that below 20 years and above 25 years had a higher risk (r^2 $p < 0.004$) of C-section. When primiparas alone are considered, there is a very high risk of CS in the age group of above 30 (r^2 for trend: 6.943; $p = 0.008$; OR for > 30 years: 9.45). This finding is in tandem with the view of standard textbooks, that the older aged the primiparas, the higher the risk of a CS. However books define elderly primiparas as those aged above 35 years.

Socio-economic status has been associated with higher CS rates.[36] In many Latin American Countries, a positive correlation has been found between CS rates and per capita GNP. Christine Nuttall (1999) claims that Caesarean delivery has become a 'status symbol' among affluent Brazilian women. Ethnographic studies have also supported this view. Pai (2000)[21] states that this could be one of the reasons for an impossibly high CS rate of 45% in an urban, upper class society of Chennai. In our study we find that the CS rates steadily increasing as we go up the socio-economic hierarchy.

Similarly, there are many studies which link high educational status to high CS rates.[11, 30] There are many reasons quoted for this association. One could be that the highly educated women postpone their first pregnancy, and are thus more likely to have a Caesarean delivery.[12] Or it could give the women a say in the final decision making which could be one of the reasons for the high CS rates. We found a similar pattern in our study too, that of the CS rate climbing steeply with the increase in educational level. The educational status and the socio-economic status were closely interlinked. So also was the educational status of the husbands.

Previous CS has been quoted in textbooks as well as studies as a major indication for CS. However, the American College of Obstetricians and Gynaecologists (ACOG) have made their policy clear and advice that the routine repeat Caesarean be replaced by a specific indication for surgery.[17] In this study we found that the old dictum 'once a Caesarean, always Caesarean!' seems to be held at high esteem, for of the 43 women who had a previous Caesarean, 42 had a repeat surgery. Interestingly, the 43rd was told earlier that she would need surgery, but she defied the dictum to deliver prematurely through the vaginal route!

NFHS-2 stated that women receiving more than 4 antenatal visits were 2 to 4 times more likely to deliver in an institution.[1] Institutional delivery brings with it the risk of caesarean too for all the reasons cited above. In the Kerala scenario, Institutional delivery is the norm and almost everyone had at least 5 antenatal visits (only 12 people out of the 360 had less than 5 ANCs) can we expect a high Caesarean rate too?[49] The data suggests that the more the number of ANCs the higher is the chance of Caesarean. As we move up the groups, Group 1 having up to 5 ANCs had a CS rate of 20.4% while in Group 3 having 10 or more ANCs, the CS rate is 42.9%!

High technology has become a part of everyday life and now here is it more evident than in the field of medicine. In Kerala, Ultra Sound Scan has become part of the Antenatal Check-up and that too has now become an indicator of one's status in the society. The number of USS taken by a woman had a profound influence on the type of the delivery. Even when adjusted for other factors like age and SES, the number of USS did have a significant association with the type of delivery with the odds ratio going as high as 19.5 for the group having more than 3 USS. Women who have complications will have more USS and they are naturally at higher risk of Caesarean. The same could be true for the number of antenatal visits too, the more the risk of a complication, the more will be the number of antenatal visits

and more will be the chance of a Caesarean. Another possibility is that the number of antenatal visits and the number of USS will be higher in the upper SES, and they are naturally at a higher risk of CS. We found a strong association between SES and the number of antenatal visits, with over 75% of the upper SES group going for more than 10 antenatal visits. The association was equally strong in the case of USS too, with a significantly higher proportion of subjects having had 3 or more USS belonging to the upper SES. Birth weight was one of the major indications for Caesarean. As birth weight increased from below 2500g to above 3500g, the chance of CS rose from 21% to 45.5%. Even for baby weighing between 2500 and 3000g, the risk of CS was a high 34.3%. This was found to be significant even when adjusted for other variables found to be significant on bivariate chi-square analysis, with the odds ratio steadily increasing as we go upwards from the above 2500 group onwards (from 2.9 in the 2500 - 3000g group to 3.8 in the above 3500g group). This was not at all in accordance with findings of separate surveys conducted among Obstetricians in London and in twelve states of USA and territories of Canada where 39% preferred CS if the baby was estimated to be above 4500g . CS rates were found to be higher for babies with over 3000g in many other studies too.[10, 12]Standard textbooks offer a limit of 4500g above which they recommend a Caesarean section. As mentioned earlier, 'physician factors' play an important role here. When the doctor sees a full-term pregnant lady armed with one or more USS reports saying that the weight of the baby is likely to be on the higher side, he/she likes to play safe and go in for a CS than take a chance with a difficult normal delivery. So, babies with a weight of above 3500g who could easily be born normally, now ends up being delivered through a CS.

Maternal Height is an important indicator of the type of delivery. Short-stature Primi gravidas are prime candidates for Caesarean Sections. Many traditional text books on Obstetrics state that women below 135 cm are likely to have a CS. Our data however did not return any significant relation between maternal height and mode of delivery. Probably it is because our sample had only 8 women below 140 cm. It may also mean that there is no real relation between the expected indications for a CS and the actually observed ones!

From our data, we find that the risk of CS is greater if attended to by an Obstetrician than a GP. Once again, the explanation could be quite straight forward, a trained expert obstetrician is more likely to be employed in a major centre with all the facilities and modern gadgetry, while a general practitioner is more likely to be employed in a small scale setup where he has

to make do with makeshift facilities. A high risk pregnancy is likely to be referred to a major centre and thus the chances for a CS is much more because of the better equipped health facility and may not be because of the obstetrician working there. Lack of trained and experienced midwives, who could take away a substantial workload from the physician, could be one of the reasons for the rising CS rates.[19,14] In Netherlands, the midwives play an important role and conduct a good proportion of the deliveries at home. The CS rate for Netherlands (10%) is one of the lowest in Europe.[20]

Hospital stay was significantly high for the CS subjects. While 90% of those who had a normal delivery left the hospital within 6 days, 82.7% of the CS women left the hospital after 7 days. This could have a great impact on the total cost also apart from the prolonged morbidity that befalls the woman who undergoes a Caesarean. Similarly, women who had a CS took longer to return to their routine activities.

Early initiation of breastfeeding has an important role in reducing maternal and infant/child mortality. The Baby Friendly Hospitals Initiative (BFHI) launched by the UNICEF, recommends initiation of breastfeeding as soon as the cord is cut. One major drawback of CS is that breastfeeding is delayed and this can cause problems to the mother and the child. While only 4.2% of the babies born normally were not put to breast by the end of 2 hours, 45.2% of the babies born by CS were not put to breast even at the end of 2 hour. There was no change in the pattern of infant morbidity in the first two months with the mode of delivery.

If given a choice, 87.2% of the subjects preferred vaginal delivery for their safety. The reasons they gave were that it was the natural and safe method to deliver. Many even expressed apprehensions about the safety Caesarean Section. 12.8% of the women felt that CS was safe and painless and they would prefer to deliver that way if given a chance. With more and more women preferring to deliver through a CS, our CS rates will go through the roof. If the baby's safety was the prime consideration, 4 of those who preferred a normal delivery for themselves, felt that a CS is better for the baby as it is spared of the strain it has to undergo in the normal process. One mother thought that it would be difficult to care for the baby if she had to undergo a CS. These findings are totally opposed to the providers' claim that they were under extreme pressure from the patients and their relatives to perform a CS even when they were certain that it was not absolutely necessary.[50]

Finally, coming to the cost, we could only crudely estimate the direct cost of the delivery. As the reference period was one year, most of the women could not recall the exact amount

paid for each category in calculating the exact cost. However, they knew the amount of the final bill of the hospital and this was the only figure we could capture in our study. In the process of the study, we contacted 12 private hospitals (4 in Thiruvananthapuram, 5 in Kochi and 3 in Kozhikode) and crosschecked the figures and it was found to exact in 96% of the cases. The same could not be done in Government facilities, as it involved hidden costs like the fee paid to the doctor and other categories of staff.

The mean cost of a normal delivery in a Government facility was Rs. 1907 ± 1429 and in the private facility, Rs. 4559 ± 2336. For a Caesarean, the mean in a Public Facility was Rs. 4044 ± 1917 and in a private hospital, Rs. 10613 ± 3238. The difference in cost of a CS and a normal delivery in a public facility is Rs. 2137 while in a private hospital it is Rs. 6054. If we take 15% CS as set by the WHO as the limit and consider the difference between the observed rate and this as excess, we could see that 5326 caesareans are taking place every year in these three cities, in excess of the acceptable limit. From the data we know that 66.9% of these are likely to take place in private hospitals and the rest in public hospitals. So, it is estimated that, the public spends Rs. 2,53,37,488/- extra every year on unjustified interventions. The total extra expenditure could be much more as we should add the amount spent each year by the Government on providing these obstetric services to this figure.

Strengths and Weaknesses of the study

The major plus point of the study was its community-based structure. Earlier studies, which looked into this area, were mostly based on secondary data. Cluster sampling technique made use of in this study did provide a representative cross section of the population.

We could not crosscheck the authenticity of the indications of CS from hospital records and so there are likely to be some margin of error in the reported indications. Another drawback was that we took only the live births into consideration, as the first question we asked on entering any house was that if there was a child there below the age of one year. This could affect the overall rates of normal and CS deliveries. As the recall period was one year, the figures provided in the cost section could be misleading. We could not get data on most of the queries related to this section, and only the direct cost could be estimated to a verifiable extent. It was one of our major objectives but as we were seriously curtailed by non-availability of data, analysis and projections had to be made from the available figures on direct costs.

CONCLUSIONS

C-section rate in the three cities of Kerala was 34.4%, more than double that of the desirable standards set by the WHO. This is despite more number of antenatal visits. This gives credence to the viewpoint that more antenatal visits and 100% institutional deliveries do not guarantee that the best care is being given. More revealing is the abysmally low rate of instrumental deliveries, 2 in 360 deliveries. We should accept the fact that, through decades, our over-emphasis on better antenatal, perinatal and post natal care have led to the 'medicalization' of an otherwise normal, physiological phenomenon. We should also remember that Kerala is standing now where most of the developed countries stood years back. They had the political will and determination to see that such unwanted and harmful practices should end and gave right to imaginative and effective strategies, which did succeed in bringing down the inflated rates.

Policy Implications and Recommendations

Caesarean Section is a major abdominal surgery, which could be life saving for the mother and the baby. But the fact that it carries with it documented medical risks like infections, haemorrhage, transfusion complications, injuries to other organs, anaesthesia complications and even an increased risk of maternal mortality by four times should not seen lightly. An elective CS increases the risk of the infant of premature birth and respiratory distress syndrome, both of which are associated with multiple complications, intensive care and burdensome financial costs. Even for mature babies CS could lead to breathing difficulties. It can further delay maternal-child interaction and breast-feeding.

Estimation of the CS rate is only the first step towards the ultimate goal of regulation of unnecessary surgical interventions. Formulating regulations alone may not be effective. It is important to make the medical fraternity aware of the situation and ask them to come forward with new ideas. The need for regulation should come from within. And for that, more studies of this nature are required. Indian Medical Association, a non-political umbrella organization of the doctors working in all sectors, can and should take the lead here.

Another potential area where some sort of regulations can be brought in is by the Institutions themselves. There have been such initiatives in the past in the developed countries, which have worked admirably. The Mount Sinai Caesarean Reduction programme is one such example, which effectively brought down and sustained the CS rates. Each institution offering obstetric care should set up audit systems. The government can formulate institutional guidelines.

Another area where we need a lot of input is in creating proper awareness of the actual indications, its advantages and health consequences of Caesarean Sections. Misconceptions need to be addressed through a well thought out and implemented awareness generation drive involving all strata of the society.

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Series Editors

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