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Rate of caesarean section in a rural community of North Kerala: A cross-sectional study

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Abstract

Introduction: Increasing rate of Caesarean births in developing countries is an issue of public health concern. There are very few Kerala-based studies relating to Caesarean section (CS). This study was conducted to determine the CS rate in a rural community and to identify factors associated with it.

Materials and Method: A community-based, cross-sectional study was done in rural north Kerala, among women who had a child-birth in the past 5 years. Cluster sampling was adopted to select 209 mothers. Data was collected using pre-tested questionnaire.

Result: The CS rate in our study was 36.8% (77/209), which is almost double the national rate. 76% of deliveries were in private institutions, though there was no significant difference in CS rates between private and government hospitals. The most common indication for CS, 49.3% (38/77), was previous caesarean; with all 38 cases culminating in repeat CS. Failed induction was the most frequent cause for a primary CS, 46.7% (36/77), which included the indication for the primary surgical intervention in repeat CS cases (21/38). Contraceptive use in the study population was very low, 6.7% (14/209), which resulted in lack of spacing between pregnancies. Thus 52.7% (20/38) previous CS cases were ineligible for a VBAC trial. Out of the 18 eligible cases only 4 were offered a VBAC trial ($p < 0.05$).

Conclusion: Adequate spacing between pregnancies and offering VBAC trials to eligible cases is necessary to curb increasing CS rates.

Keywords: Caesarean section (CS), Previous caesarean, Vaginal Birth After Caesarean (VBAC), Spacing

Introduction

Vaginal delivery is a normal physiological process and surgical intervention by Caesarean section (CS) is carried out only when medically indicated. It could be performed either as an emergency procedure to overcome certain life-threatening complications or as an elective CS where a vaginal delivery would pose more danger to mother and baby.

In 1985, World Health Organization (WHO) stated that CS rates higher than 15% could hardly be justified from a medical standpoint.[(1)] Apart from possible adverse outcomes as in any other major surgery, Caesarean sections are also associated with increased risk of infections and respiratory morbidity for infants,[(2)] iatrogenic prematurity, and abnormal placentation in subsequent pregnancies.[(3)]

However, there has been an increase in CS rates in different countries, which vary according to social, cultural, economic and educational backgrounds. Even in the same country, CS rates differ in different regions.

Singh and Gupta, in a retrospective analysis done in Haryana during 2007-2012 reported a rise in CS rates from 31% to 51.2%, with previous CS being the commonest cause.[(4)] Shewli Shabnam in her analysis of DLHS-3 data, 2008, found that among all Indian states, CS rates were highest in Kerala.[(2)] A study done by Vaishnavi et al found that 99.3% of deliveries in Kerala were institutional and CS rate was about 41%.[(5)]

There are very few Kerala-based studies relating to rates and factors leading to CS. We did a pilot study in the urban field practice area of our teaching hospital in north Kerala, which revealed a CS rate of 43.5%. In this background, we decided to conduct a population-based study in the rural field practice area of our teaching hospital to estimate the rate of caesarean section in a rural community in north Kerala and to identify various factors associated with caesarean delivery.

Materials and Method

A cross-sectional study was conducted during 1st May 2016 – 30th July 2016 in Pandikkad Panchayath, the rural training centre of our teaching hospital, North Kerala. Sample size was calculated considering the rate of CS in Kerala as 41%[(5)] and error 20% [$n=4pq/d^2= 139$]. To minimize the design effect, the obtained sample size was multiplied with 1.5. Our final sample size was 209 mothers

Our sampling frame was the list of all households with mothers who had a childbirth within the previous 5 years (Cumulative total of 5662). These lists were obtained from the sub-centres in Pandikad Panchayat and the household in these lists were then numbered in each respective sub-centre area.

We adopted Two-stage Cluster Sampling method in our study. Pandikad Panchayat was covered by 9 sub-centres. The areas covered by each sub-centre comprised our "Primary Sampling Units" (PSU) of 9 clusters. From each of these PSUs, the "Secondary Sampling Units" (SSU) households were selected based on probability proportionate to size, which ranged from 18 to 31 households. We used systematic random sampling technique to select the households from each primary cluster. The sampling interval was calculated as the population size divided by the required sample size (5662/209) =27. We then chose a random number between 1 and 27, which was number 3. The first house was chosen randomly from our sampling frame in each sub-centre. Thereafter, every 3rd house having a mother who had delivered within the last 5 years was selected till the sample size was attained. Similar process was repeated in other sub-centre areas.

Data was collected from mothers by house to house visit, interviewing them using a predesigned questionnaire which had been pre-tested among 85 mothers in our urban field practice area. Written informed consent was taken from mothers who were willing to participate.

Ethical clearance was obtained from the Institutional Ethical Committee.

Data was entered and analysed in Epi Info version 7. Proportions were expressed as percentage and Chi square tests used for associations.

Result

A total of 209 mothers in the age group 18-40 were included in the study. The mean age of the study population was 27.1years (SD 5.26), with 67% belonging to the age group of 21-30 years. Around 97.1% of the study group was home-makers. Only 11.5% of the mothers were graduates. Majority (30.1%) of the study participants belonged to the Class IV socio-economic status according to B G Prasad classification.[6] 93.3% of the participants followed Muslim religion. (Table 1)

97 (46.4%) of the respondents in our study had been married before the age of 18 years. 67(32%) mothers had 3 or more children, and 93.3% of our study group was not using any method of contraception. Around 55% of the mothers gave birth to male babies during the last 5 year period. Birth weight of babies ranged from1.65 to 4.2 kg (mean birth weight =2.9 ± 0.42 kg).About 19.6% of mothers had low birth weight babies (<2.5kg). (Table 2).

100% of the 209 deliveries in our study were institutional. The proportion of CS to total deliveries was 36.8% (77 /209). Of these 63.6% (49/77) were conducted as emergency procedures. (Table 3).

In our study, 159 (76.1%) of the deliveries were in private hospitals, however no significant association was noted in the difference in CS rates between government and private hospitals, which were 40% and 35.8% respectively. Though the primary CS rate of private hospitals was 24.4%, which was more than that of government hospitals, this difference was not statistically significant. In our study, higher proportion of CS was noted in mothers in the socio-economic class I (BG Prasad's classification[6] and this was a statistically significant association. Though the CS rate was higher among mothers who delivered large babies, it was not statistically significant. However, mothers who had complications during pregnancy and labour had higher odds of having a CS as compared to mothers with no complications (Odd's ratio 3.962, *CI* 2.841-5.523). (Table 4).

Spacing between pregnancies (3 years or more) was found to be less among mothers who do not adopt any contraceptive method and use of any contraceptive method by the couple had higher odds for better spacing (Odd's ratio: 3.750, CI 1.136-12.381). (Table 5).

The most common indication for CS in our study was previous CS (49.4%) followed by failed induction (19.5%) (Fig. 1). Other indications for CS were maternal causes like eclampsia, placenta previa, oligohydraminos, and fibroid uterus. Foetal causes were foetal distress (9.1%), mal-presentations, cord around the neck of foetus and pre-term). The most common cause for primary CS among repeat CS mothers was failed induction (55.3%) followed by malpresentation (13.2%) and other maternal and foetal causes. (Fig. 2)

In our study, a mere 6.1% couples were using contraceptive methods. Among the couples where the wife had a repeat CS, we found that only 4 out of 38 (10.5%) had adopted contraceptive methods for proper spacing between pregnancies. (Fig. 3)

In our study, we have considered an inter-pregnancy interval of 3 years as adequate spacing. Lack of spacing in the mothers who underwent repeat CS was the most common cause cited in our study for non-eligibility for trial of Vaginal Birth after Caesarean section (VBAC). Thus out of the 38 mothers with history of previous CS, only 18(47.3%) were eligible for trial of VBAC, since spacing between pregnancies was inadequate in the rest (52.7%). Even among these mothers eligible for VBAC trail, 78 % were not offered the VBAC trail by the concerned doctors, and this difference was found to be statistically significant ($p < 0.05$).(Fig. 4)

Table 1: Baseline characteristics of study participants

Baseline characteristics	Participants (N=209)
Age (years)	27.13 ± 5.26
Education level n (%)	
High school	123(58.9)
Pre degree	62(29.6)
Degree	24(11.5)

Occupation	***n (%)***
Professional	1(0.5)
Semi-Professional	4(1.9)
Unskilled	1(0.5)
Home maker	203(97.1)
Socio-economic status	***n (%)***
SES Class I	07(3.3)
SES Class II	44(21.1)
SES Class III	35(16.7)
SES Class IV	63(30.1)
SES Class V	60(28.8)

Table 2: Maternal and child characteristics

Maternal Characteristics	**Study participants (N=209)**
Age at marriage (years)	***n (%)***
<18	97(46.4)
18 to 21	85(40.7)
22 to 26	18(8.6)
27 and above	9(4.3)
No: of Children	***n (%)***
1	66(31.6)
2	76(36.4)
3	44(21.1)
4	18(8.6)
5	2(1.0)
6	3(1.4)
Use of Family planning method	***n (%)***
Barrier Method	1(0.5)
Copper T	10(4.8)
OCP	3(1.4)
Nil	195(93.3)
Child Characteristics	**Study participants (N=209)**
Birth weight (mean)	2.9 ± 0.42 Kg
Weight in Kilo gram	***n (%)***
> 3.5 Kg	12(5.7)
2.5 to 3.5 Kg	156(74.6)
<2.5 Kg	41(19.6)

Table 3: Obstetric determinants

Obstetric determinants	**Participants (N=209)**
Type of delivery	***n (%)***
Vaginal	132(63.2)
Caesarean Section	77(36.8)
Type of vaginal delivery	***n (%)***
Induced	54(41.2)
Spontaneous	77(58.8)
Type of Caesarean Section	***n (%)***
Emergency	49(63.6)
Elective	28(36.4)

Table 4: Factors associated with the type of delivery

Place of delivery and C-section	***Vaginal: n (%)***	***C-Section: n (%)***	***Total n (%)***	χ^2	***p value***
Government	30(60)	20(40)	50(23.9)	0.282	0.596
Private	102(64.2)	57(35.8)	159(76.1)		
Total	132(63.2)	77(36.8)	209(100)		
Place of delivery and primary CS	***Vaginal: n (%)***	***C-Section: n (%)***	***Total n (%)***	χ^2	***p value***
Government	30(83.3)	6(16.7)	36(100)	0.977	0.379
Private	102(75.6)	33(24.4)	135(100)		
Total	132(77.2)	39(22.8)	171(100)		
Birth weight	***Vaginal: n (%)***	***C-Section: n (%)***	***Total n (%)***	χ^2	**p value**
> 3.5 Kg	21(51.2)	28(48.8)	41(100)	3.126	0.209
2.5 to 3.5 Kg	103(66)	53(34)	156(100)		
< 2.5 Kg	8(66.7)	4(33.3)	12(100)		
Total n (%)	132(63.2)	77(36.8)	209(100)		
Socio economic class	***Vaginal: n (%)***	***C-Section: n (%)***	***Total n (%)***	**Fischer Exact**	**p value**
SES Class I	3(42.9)	4(57.1)	07(100)	*10.902*	*0.028*
SES Class II	28(63.6)	16(36.4)	44(100)		
SES Class III	26(74.3)	9(25.7)	35(100)		
SES Class IV	32(50.8)	31(49.2)	63(100)		
SES Class V	75(45)	15(25)	60(100)		
Complications	***Vaginal: n (%)***	***C-Section: n (%)***	***Total n (%)***	χ^2	**p value**
No complications	106(100)	0	106(100)	*128.264*	*<0.001**
Labour related complications	21(23.1)	70(76.9)	91(100)		

Pregnancy related complications	5(41.7)	7(58.3)	12(100)		
Total n (%)	132(63.2)	77(36.8)	209(100)		
*****Odd's ratio = 3.962, *CI* 2.841-5.523					

Table 5: Spacing and contraceptive use

Contraceptive use	*No Spacing: n (%)*	*Spacing: n (%)*	*Total n (%)*	p value *
No	117(60)	78(40)	195(93.3)	***0.026***
Yes	04(28.6)	10(71.4)	14(6.7)	
Total n (%)	121(57.9)	88(42.1)	209(100)	

*** Fisher's exact Test**

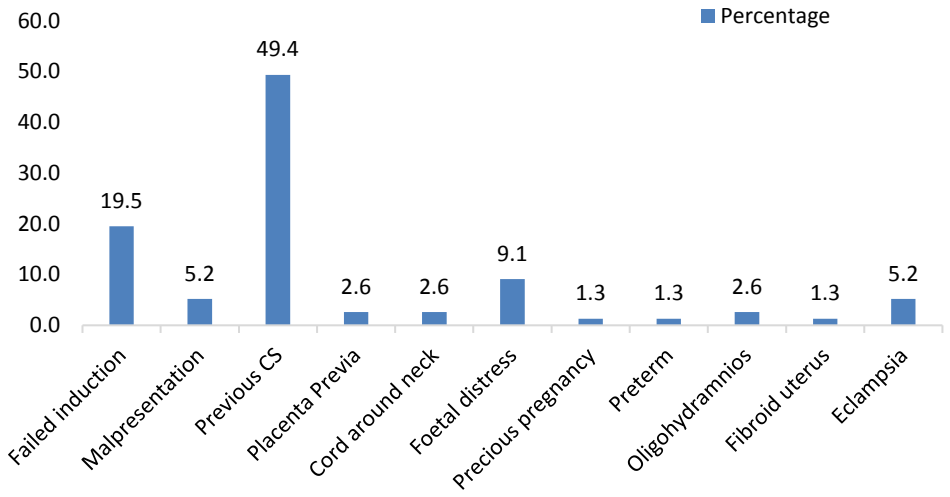

Fig. 1: Indications of caesarean section

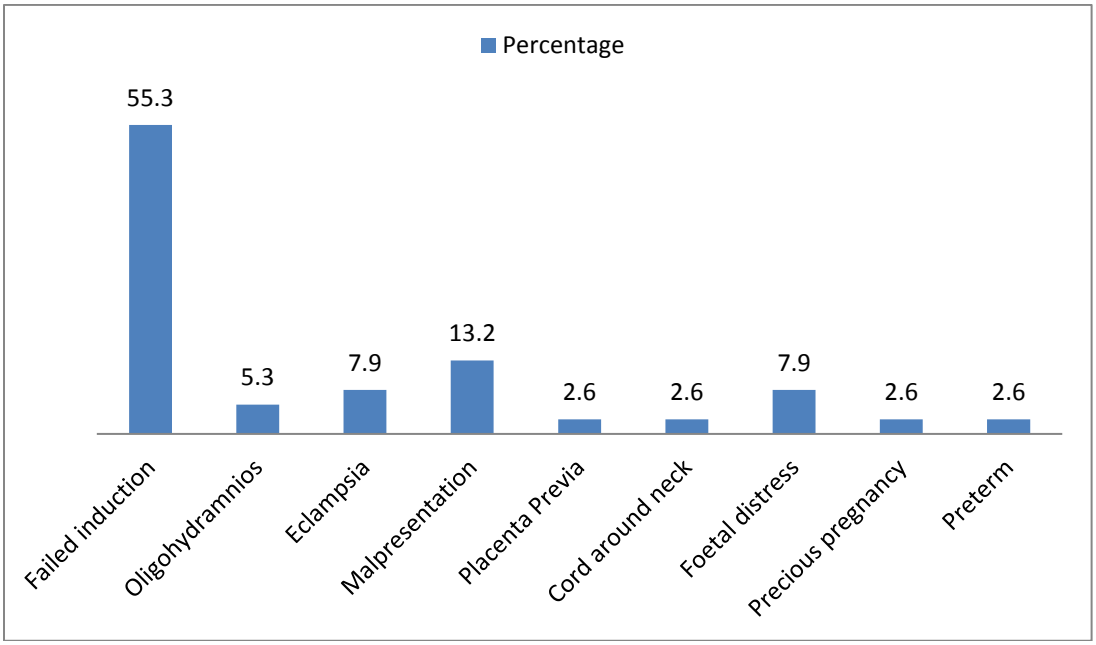

Fig. 2: Indications for primary CS in repeat CS cases

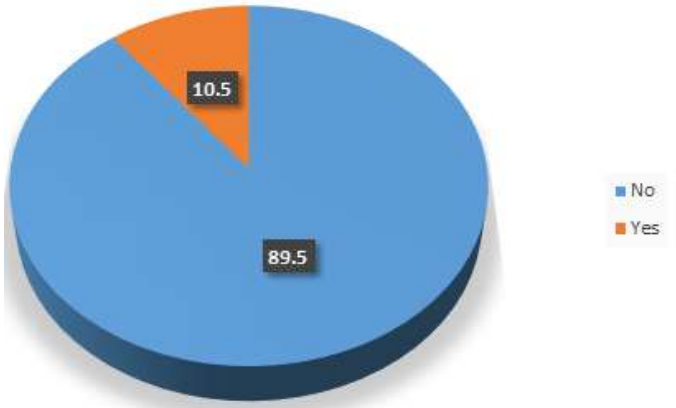

Fig. 3: Contraceptive use among previous CS mothers

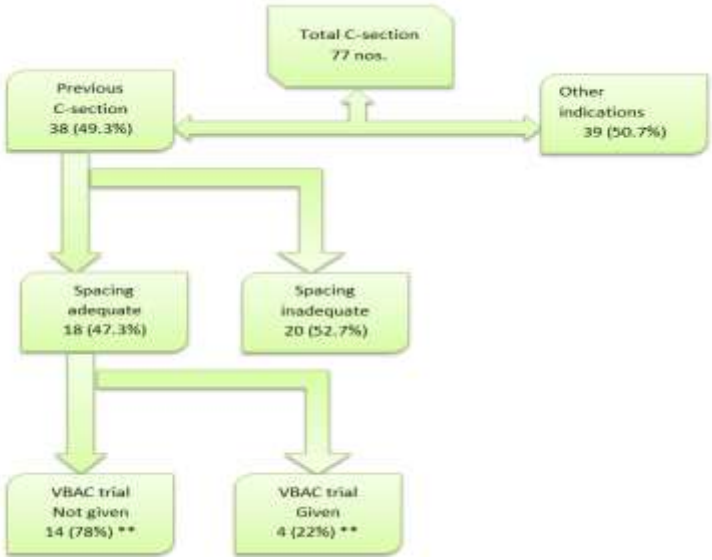

Fig. 4: VBAC trial in previous CS mothers

** CS rate with and without VBAC trial was statistically significant at $p<0.05$.

Discussion

In our study conducted in a rural area of north Kerala, we found that the proportion of CS to normal deliveries was 36.8%, (77/209), which is similar to the Kerala state average CS rate of 35.8% in 2016.[7] However it is more than double the average National CS rate of 17.2%[7] and the WHO recommended level of 15%.[1] Though our CS rate is low compared to countries like Iran(41.9%) and Brazil(45.9%), it is much higher to the CS rates of UK(22%), Canada(26.3%) and New Zealand(20.4%).[8] Studies quote that at population level CS rates higher than 10% are not associated with reductions in maternal and newborn mortality rates.[1] Despite this, even in a rural area in Kerala the CS rates are quite high.

The demographic profile of our respondents is in line with the Kerala state statistics for a rural area,[9] including higher number of mothers having been married before the age of 18 years in the study group.[10]

No statistical significance could be established between CS and education, occupation factors in our study, though significant associations with these factors were quoted in other studies.[2] A statistically significant association between the type of delivery and socio-economic class was noted in our study, with higher proportion of CS in the class I group, which was similar to findings in other studies.[5]

In our study, 100% of the deliveries were institutional, of which 76.1% were conducted in private hospitals. This is in contrast to DLHS – 4 data which showed that 45.8% of deliveries were taking place in government hospitals.[10]

In our study 35.8% of deliveries in private institutions were by CS, which is similar to NFHS – 4 data (38.6%).[11] The CS rate in Government hospitals in our study was found to be 40% which is similar to NFHS -4 data from Telangana state (40.6%).[12] More than half of the households in Kerala (62%) use private hospitals[11] probably because of the large number of private hospitals providing good quality services, even

in rural areas, and the respondents' closer proximity to them. In our study the difference in CS rates in government and private hospitals was not statistically significant, though the rate of primary CS was higher in private institutions.

In our study, 36.4% (28/77) of total CS deliveries were elective CS. This is higher compared to the 22% elective CS reported from a study conducted by Naeem in Pakistan[13] and lesser than the 48% reported from a Meghalaya study in 2014.[14] However, out of 103 mothers who had obstetric complications in our study, only 26 had a normal vaginal delivery whereas 77 ended up with surgical intervention. This was statistically significant and similar to the observation made by Shewli Shabnam in her DLHS-3 analysis.[2]

Previous CS was the most common indication for CS delivery in our study, 49.4%(38/77), which is similar to the study done in Haryana[4] and Pakistan.[15] None of the 38 mothers who had history of a previous CS went on to have a normal vaginal delivery and all of them had a repeat CS.

Among the indications for primary CS in our study, the most frequent cause, 46.7% (36/77), was failed induction of labour. This included the indication not only for the 15/77 mothers who were undergoing CS for the first time, but also the cause for the primary surgical intervention in the repeat CS mothers (21/38). 'Failed induction' could mean labour dystocia, failure of labour to progress or even a subjective assessment by the attending doctor. 'Foetal distress', mentioned as a cause for CS, could have meant an indeterminate foetal heart rate, meconium-stained liquor or other signs which were not conveyed to the mother. Thus both indications were rather ambiguous, as our respondents were unclear of the duration of their labour, progress of labour, or any foetal issues which culminated in a CS.

The biological plausibility for a repeat CS in mothers who had a previous CS is related to the amount of time required for the uterine scar to heal completely and the risk of uterine rupture. WHO reports an increased risk of uterine rupture when the birth-to-pregnancy was <16 months in women with previous CS who had undergone a trial of labour.[16] Though 18 months spacing is required for a trial of VBAC,[17] in clinical practice a safe 3 year inter-pregnancy gap is opted for.

In our study, 93.3% of respondents were not using any contraceptive methods (husband and wife), and thus lack of spacing between pregnancies was a major reason cited for VBAC trial ineligibility. Only 18/38 mothers who had undergone a previous CS had adequate spacing eligible for VBAC trial in their current pregnancy. However, in 78% (14/18) of these eligible mothers, there seems to have been an undue haste in proceeding to surgical intervention without offering a VBAC trial. Reasons given by study participants for this were rather vague; though some mothers mentioned the convenience of concerned doctors.

While offering VBAC trial, it is advisable that it is done in hospital settings where uterine rupture can be recognized and managed efficiently. In our study, though all the deliveries were in well-equipped institutions, the number of eligible mothers offered VBAC trial was only 4(22%). Even these cases culminated in CS, and the mothers were not sure of the protocol followed and time given for the trial. Many studies reported that more than 50% of previous CS mothers had successful VBAC.[18,19] A study done in Israel in 2007 concludes that successful vaginal birth after Caesarean even in grand multiparous did not lead to increased maternal complications.[19]

Conclusion

Institutional deliveries being the norm, it is recommended that the Robson's 10-group classification[20] promoted by WHO, as a tool for optimising CS rates at health facilities, should be used in the concerned institutions.

After a CS, the need for spacing has to be emphasized to the new parents to prevent complications and the risk of repeat CS. Family planning methods have to be provided to cover the unmet needs of such eligible couples. A carefully supervised VBAC trial for eligible mothers should be offered, which should follow a strict protocol.

Our study finds that reducing primary CS without clear-cut indications and offering a fair trial for VBAC to eligible mothers with previous CS, would lead to decreasing the CS rate in the community.

Limitations

Reasons for not offering a VBAC trail for eligible mothers with previous CS were not clear, as we relied on reports from the mother and could not verify the indications from the institutions or doctors concerned. Many of the husbands of the respondents are working abroad. We are not sure about the natural family planning methods which the study participants might have adopted.

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Conflicts of interest: Nil

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