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Determinants of primary vs previous caesarean delivery in a tertiary care institution in Kerala, India

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Abstract

Introduction: Caesarean delivery is one of the most performed surgical procedures and is a globally recognised maternal health-care indicator.

Aim: To study the determinants of primary and previous caesareans in a tertiary care teaching hospital in Kerala.

Methodology: A observational study was conducted over a period of 12 months from 1st January 2018 to 31st December 2018 to analyse the maternal and foetal determinants of primary and previous caesarean deliveries. Data was collected and analysed.

Results: Maternal age was a significant predictor of primary caesarean. Employed mothers constituted 40% previous caesareans (p value 0.001). There were more obstetric referrals undergoing primary caesareans (p value-0.003) than repeat caesareans. 30% primary caesareans belonged to lower (p value-0.001) in contrast to 14 % in previous caesareans. Primary Caesareans underwent emergency decisions significantly (p value-0.001) while previous caesareans were decided as elective procedures. 34.59% babies born via primary caesareans were of low-birth weight (p value-0.001). Extended hospital stay (>8 days) was evidenced in 38.12% of first -time caesareans (p value-0.001). NICU stay pattern was similar in both the groups.

Conclusion: Good clinical policies regarding induction of labour and labour analgesia must be routinely implemented in all health care institutions to reduce the primary caesarean delivery which can indirectly reduce abnormally invasive placentation (AIP) and morbidities in subsequent pregnancies.

Keywords: Caesarean, maternal, indications, primary, previous, foetal

Introduction

Caesarean delivery is defined as the birth of a foetus through incision in the abdominal wall (laparotomy) and the uterine wall (hysterotomy). This definition does not include removal of the foetus from the abdominal cavity in the case of rupture of the uterus or in the case of an abdominal pregnancy^[1, 2]. The caesarean delivery is a globally recognised maternal health-care indicator. Unnecessary caesarean sections also pulls resources away from other services in overloaded and weak health systems. Caesarean Delivery, being one of the most commonly performed surgical procedures is associated with a great deal of maternal morbidity. The level of Caesarean delivery is well above the WHO^[3] (1985) mentioned fifteen per cent mark for many of the countries, and is escalating over time. Though the estimates of CD rates in India was only 7.1 per cent in 1998, there was 16.7 per cent change in the rates annually in India. Caesarean deliveries have doubled from 9% to 18.5% (this increase corresponds with global increment 21%)^[4]. The caesarean rate varies from state to state across our country. Highest number reported in Chandigarh (98%), followed by Delhi (67.83%)^[5]. The rising rate of caesarean delivery is an alarming concern worldwide. The advent of better anaesthesia; safety of lower uterine segment technique, prophylactic antibiotics, the broadening of indication for operation, the recognition of foetus as a patient and the acceptance of this procedure by women have characterized the evolution of caesarean birth in the 20th century. Globally, previous caesarean section is the leading contributor to the bulk of caesarean deliveries. Total caesarean rate is total number of deliveries by caesarean divided by total number of live births multiplied by 100.

Primary caesarean is caesarean in a woman who has had no previous caesarean and is done for the first time in any gravida. Indications for primary caesarean vary in both primipara and multipara. CD should be done on the basis of evidence based indications especially in primigravida patients.

Previous caesarean is caesarean done as elective/planned or emergency with or without associated obstetric /medical co-morbidities. Serious maternal morbidity increases with increasing number of caesarean deliveries specifically from triad of placenta previa, placenta accreta (AIP) and caesarean hysterectomy [6]. The risk of complications increases with increase in the number of caesarean and is due to adhesions and scarring. Scar rupture in cases with previous caesarean section is a dreaded complication.

The reasons for the alarmingly increased caesarean rates are multifaceted and comprise sociodemographic, obstetric causes like medical, social, ethical, economic and medico legal reasons. Hence we decided to assess determinants of primary caesarean delivery and the associations of previous caesarean delivery in a tertiary care teaching hospital in Kerala, India.

Methodology

This was an observational study conducted in a tertiary care hospital receiving referred obstetric patients from nearby hospitals. All 378 caesarean deliveries performed at the hospital during the one year period (January 1 2018- December 31 2018) were included and the case records were traced from the medical records department and operation theatre registers, after approval from research committee of the hospital.

Inclusion criteria: All patients undergoing caesarean section whether elective or emergency, during the study period were included in the study.

Exclusion criteria: Cases with incomplete data

The subjects were divided into

Group A: Primary caesarean (n=223)

Group B: Previous caesarean (n=155)

Socio-demographic details, obstetric and medical co-morbidities were noted. Indications for primary caesarean delivery in both primipara and multipara, gestational age at delivery, birth weight, postoperative complications were noted in a proforma. Previous repeat caesarean and its association, the need for blood

transfusion and intraoperative findings were also looked into. Emergency/elective decision at delivery was highlighted. Duration of hospital stay of more than 7 days was considered as an indicator for post-operative morbidity. NICU stay duration was considered as indicator of neonatal morbidity.

The indications of caesarean section included previous caesarean, arrest of labour, cephalopelvic disproportion, foetal distress, multiple gestation, malpresentation, and failed induction, foetal and obstetric indications. Foetal indications included oligohydramnios, FGR with or without doppler abnormality and Macrosomia. Obstetric indications include placenta previa, abruption, adherent placenta (AIP), severe pre-eclampsia and eclampsia.

Indications for repeat caesarean included previous one/two/three caesarean deliveries, scar thinning/dehiscence, foetal distress, arrest of labour, refusal to VBAC, malposition, malpresentation, multiple pregnancy, oligohydramnios and APH. Complications during surgery and post-operative period were also recorded.

Total, primary and repeat caesarean deliveries were calculated. The caesarean rate was calculated as the number of caesarean birth in a year divided by total number of deliveries in that year. The data collected, were coded and entered into the computer using MS Excel and analysed using SPSS V 19. Descriptive statistics such as mean, standard deviation were noted. The proportion and percentages were computed and univariate Chi-square test was performed. Clearance was obtained from the hospital ethical committee.

Results

During this period of one year, total no of deliveries were 655, of which 277 were vaginal deliveries. Out of 378 caesarean cases, 223 primary and 155 previous caesarean were recruited and analysed.

Group 1: Women undergoing primary caesarean delivery (n=223).

200 first-time mothers constituted Primary caesarean. Primary caesarean in multi for high risk obstetric care made up 23.

Group 2: Women undergoing previous caesarean delivery (n=155).

Table 1: Socio-demographic variables and caesarean Delivery

Characteristic	Number of Caesareans	Primary Caesarean	Previous caesarean	P-value
	378 (%)	223(%)	155(%)	
Maternal Age (years)				
<20	10	9(4.03)	1(0.65)	0.001*
20-25	101	90(40.35)	11(7.09)	
26-29	153	85(38.11)	68(43.87)	
30-34	80	31(13.91)	49(31.61)	
35-39	26	5(2.25)	21(13.54)	
>40	8	3(1.35)	5(3.22)	
Employed during pregnancy				
Yes	107	44(19.73)	63(40.64)	0.001*
No	271	179(80.26)	92(59.35)	
Domicile				
Urban	199	122(54.70)	77(49.67)	0.335
Rural	179	101(45.29)	78(50.32)	
Status of Subject				
Booked	358	205(91.92)	153(98.7)	0.003*
Referred	20	18(8.07)	02(1.3)	
Socioeconomic class				
Lower	90	68(30.49)	22(14.19)	0.001*
Middle	149	95(42.60)	54(34.84)	
Upper	139	60(26.90)	79(50.97)	

*Statistically significant

Maternal age was a predictor of primary caesarean (p value-0.001). Around 91% mothers were >25 years in previous caesarean group. Employed mothers constituted 40% previous caesareans (p value-0.001) while only 20% first time mothers were working during their pregnancy. Domicile had no effect on

their primary/previous caesarean status. There were more obstetric referrals undergoing primary caesareans (p value-0.003) than repeat caesarean deliveries. 30% mothers with primary caesareans belonged to lower economic status (p value-0.001) while it was only 14 % in previous caesarean group.

Table 2: Obstetric variables and Caesarean Delivery

Characteristic	Caesareans N=378	Primary Caesarean N=223	Previous Caesarean N=155	
Parity				
Primipara	200	200(89.68)	0	0.001*
Multipara	178	23(10.32)	155(100)	
Infertility Treated				
Yes	27	18(8.07)	9(5.08)	0.400
No	351	205(91.93)	146(94.02)	
H/O Abortion				
No	301	215(96.41)	86(55.48)	0.001*
Yes	077	8(3.59)	69(44.51)	
Ectopic Pregnancy				
Yes	08	01(0.44)	7(4.52)	0.007*
		222	148	

*Statistically significant

In Group 1, 200 mothers were first -time mothers and 23 were mothers with one or more live children with previous vaginal delivery. 143 mothers had previous one caesarean while 11 of

them had para 2. There was a mother who had two children born via caesarean and underwent elective caesarean delivery with sterilisation.

Table 3: Indications of primary caesarean (Primipara/Multipara) & previous caesarean delivery

Indication of caesarean delivery	Total(n)	Primary CS in primigravida N=200	Primary CS In multigravida N=23	Previous caesarean N=155
Obstetric				
Failed induction	77	77(38.5)	0	0
Non-progression of labour/CPD	18	16(8)	02(8.69)	0
Foetal				
Non reassuring foetal heart rate	27	25(12.5)	02(8.69)	0
MSAF	09	09(4.5)	0	0
FGR/Oligohydramnios/Doppler Abnormal	16	12(6)	2(8.69)	2(1.29)
Macrosomia	6	4(2)	2(8.69)	0
Maternal & Medical				
Multifetal gestation	15	9(4.5)	4(17.39)	2(1.29)
Malpresentation	19	13(6.5)	4(17.39)	2(1.29)
Antepartum haemorrhage.	16	13(6.5)	3(13.04)	0
Abnormally invasive placentation(AIP) needing	3	0(0)	0	3(1.93)
Severe pre-eclampsia/ impending eclampsia	07	2(1)	3(13.04)	2(1.29)
Previous caesarean refusing VBAC	135	0(0)	00	135(87.10)
Pprom	19	13(6.5)	00	6(3.87)
Fibroid complicating pregnancy	06	2(1)	1(4.35)	3(1.93)
Treated for infertility/IVF	04	4(2)	0	0
Caesarean on demand/CDMR	1	1(0.5)	0	0

Failed induction and non-progress of labour /CPD followed by NRFHR/MSAF compromised the bulk of primary caesareans.

Previous caesarean refusing VBAC constituted 87% of group 2.

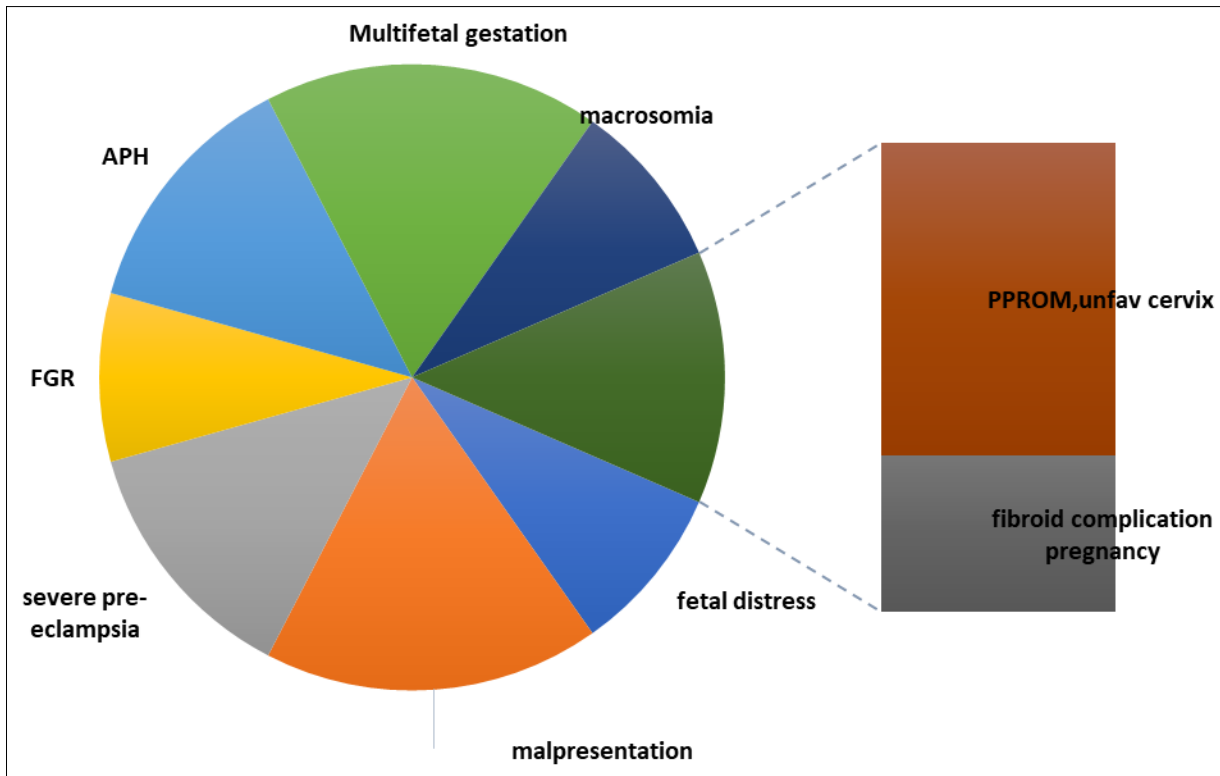


Fig 1: Indications of Primary Caesarean delivery in Multipara

Multifetal gestation, malpresentation, foetal distress (NRFHR), the reasons for primary caesarean in multipara. PPROM, Severe pre-eclampsia, FGR, APH, Macrosomia were

Table 4: Associations of Previous Caesarean Delivery

Associations with previous caesarean delivery	N=155
Previous 1 caesarean uncomplicated	47
Previous 2 caesarean uncomplicated	7
Previous 3 caesarean + dense adhesions	1
Previous 1 caesarean + scar thinning	15
Previous 1 caesarean +scar dehiscence	6
Previous 1 caesarean + fibroid complicating pregnancy	3
Previous 1 caesarean +NRFHR	6
Previous 1 caesarean +FGR	2
Previous 2 caesarean+ Placenta praevia	4
Previous 1 caesarean+ Abnormally invasive placentation	3
Previous 1 caesarean with multifetal pregnancy	2
Previous caesarean+ GDM/ Pre- DM	31
Previous caesarean +HDP/ Eclampsia	05
Previous caesarean+ HBSAg +ve	2
Previous caesarean+ PPROM/PTL	8
Previous caesarean+ PROM	7
Previous caesarean + Malpresentation	3
Previous caesarean + multiple drug allergy	3

Previous caesarean was associated with medical co-morbidities malpresentation, multifetal pregnancy, scar thinning AIP, like GDM, GHT and obstetric morbidities like APH, NRFHR, PPROM and PTL

Table 5: Gestational Age, Birthweight at Caesarean Delivery and Extended Hospital stay

	Total	Primary	Previous	P value
Gestational age in weeks	378	223	155	
26-31.6	10	8(3.58)	2(1.29)	0.555
32-36.6	100	57(25.56)	43(27.74)	
37-39.6	250	148(66.36)	102(65.80)	
>40	18	10(4.48)	8(5.16)	
Timing of caesarean				
Emergency	283	186(83.41)	97(62.58)	0.001*
Elective	95	37(16.59)	58(37.42)	

Birthweights in grams	N=394	237	157	
<999	2	2(0.84)	0(0)	0.130
1000-1499	19	12(5.06)	7(4.45)	
1500-1999	27	18(7.59)	9(5.73)	
2000-2499	72	50(21.09)	22(14.01)	
2500-2999	144	74(31.22)	70(44.58)	
3000-3499	106	69(29.11)	37(23.56)	
3500-3999	22	11(4.64)	11(7.01)	
>4000	2	1(0.42)	1(0.64)	
Birthweights in grams				
<2500	120	82(34.59)	38(24.20)	0.028
>2500	274	155(65.41)	119(75.80)	
<i>Days of hospital stay</i>	378			
Maternal stay				
		N=223	N=155	
< 7days	273	138(61.88)	135(87.09)	0.001*
>8 days	115	85(38.12)	20(12.91)	
Neonatal stay				
		N=63	N=23	
<7 days	30	21(33.33)	9(39.13)	0.956
>8 days	48	34(53.96)	14(60.87)	

*Statistically significant

Mothers of various gestational ages were distributed nearly uniformly in both the groups. 83.41% of Primary Caesareans had emergency decisions (p value-0.001) while 37.42% previous caesareans were decided as elective procedures. 34.59% babies born via primary caesareans were of low-birth weight (p value-

0.001) while it was 24.20 % in the other group. Extended hospital stay (>8 days) was evidenced in 38.12% of first -time caesareans (p value-0.001) while only 12.91% of repeat caesareans had the same. NICU stay pattern was similar in both the groups.

Table 6: Post -op Morbidity and Caesarean Delivery

	Total	Primary	Previous
Morbidity	378	223	155
none		174(78.02)	125(80.64)
UTI	18	14(28.57)	4(14.28)
Maternal fever	16	12(24.48)	4(14.28)
PPH	10	6(12.24)	4(14.28)
Need for blood transfusion	16	10(20.40)	6(21.48)
Need for maternal ventilation	6	4(8.16)	2(7.14)
SSI	5	3(6.12)	2(7.14)
Scar dehiscence	3	0	3(10.71)
AIP	3	0	03(10.71)
Dense adhesions	2	0	02(7.14)

SSI, UTI, Need for blood transfusion, ventilation, Scar dehiscence, AIP were distributed among both the groups.

Table 7: Mean of variables and Caesarean Delivery

Variable	Primary (n=223)	Previous (n=155)
Mean age of mother	26.38	29.17
Mean gestational age in weeks	37.11	36.98
Mean birthweight in grams	2696.75	2696.75
Mean hospital stay in days	6.85	6.7943

Discussion

Over the past three decades, the rate of caesarean delivery has increased dramatically all over the globe. The rates of both primary and repeat caesarean section have been on the rise. The future obstetric course of any woman is determined by primary caesarean delivery rates. So it has to be done only on genuine indications.

Caesarean delivery rates

The rate of primary caesarean section in the study was 34.04% and it was 36.39% in Nigar *et al.* [7] Gupta *et al.* [8] found Caesarean rate of 31.46% while a similar study reported 9.5%, 19.9% and 25.87% [9], 51.1% in Nepal [10], Rajkot [11], and

Haryana [12] respectively. Being a tertiary care centre with a lot of obstetric referrals and state of art NICU facility, high risk and complicated cases with one or more co-morbidities accounted for high primary caesarean rates.

With rising litigations on the obstetricians, refusal of VBAC's and as difficult vaginal deliveries are diverted to ERCD, caesarean delivery rates have escalated. Out of 378 LSCS, 223 (58.99 %) patients underwent Primary LSCS whereas previous caesareans comprised 155(41.01%). In a similar study by Sharma N *et al.* [13] among cases of 1440 lower segment caesarean deliveries, 66.5% patients underwent Primary LSCS and 33.5% repeat caesareans while our repeat caesarean delivery rate was only 23.66%.

Primary caesarean rates

In the present study, among 378 caesareans, 200 were primary caesarean delivery in primipara (52.91%) and 23 (6.08%) were multipara respectively. Saluja *et al.* [14] conducted a study in which the total caesarean delivery rate was 24.6 % and rate of primary Caesarean section in multipara was 3.8 %. Rao *et al.* [15] observed that total caesarean section rate and rate of primary Caesarean section in multipara were 29.4% and 10.2% respectively. Rate of primary cesarean in primigravida versus multigravida in another Indian study [9] was 70.2 versus 30.8% while in Sharma R *et al.* [16] study it is 57.1 versus 42.7%.

Socio-demographic and caesarean delivery

We observed that mean age of the respondents was 26.38 in primary caesarean and it was 29.17 in previous caesarean group and was significant. It was 25.9±4.58 years [13] in a similar study, with maximum number 40.35% were in maternal age group 20-25years among primary caesareans while 43.87% were in 26-29 age group in previous caesareans. Cases underwent LSCS were mainly in the age group of 25-29 years (48%) followed by 20-24 years (43%) in Sharma N *et al.* [13] Employment in previous caesarean mothers was significant due to older maternal age and added responsibilities. Domicile as a determinant of caesarean delivery, the rate of caesarean delivery is higher in urban areas than their rural counterparts for all the states in India. The rural-urban gap is relatively low in the states of Kerala [17], Haryana, Delhi, Arunachal Pradesh (below 5 percentage points) as evidenced in the research here while the gap is very high in the states of Jammu and Kashmir, West Bengal and Tripura (above 20 percentage points) [18]. Moreover, the demographic and socioeconomic backgrounds of the persons living in the rural and urban places affect the CS rate to a great extent [19].

Income had positive association with pattern of previous caesarean delivery in contrast to Balmur SK [20] *et al.* 8.7% primary caesareans were obstetric referrals with one or more associated morbidities which added to the burden of caesarean delivery. Obstetric referrals had 6.7 times odds of undergoing primary caesarean delivery.

Pregnancy loss and ectopic pregnancy was statistically significant in previous caesarean mothers.

Timing of caesarean delivery

In the present study, 74.8% were done as emergency as in Sharma N *et al.* [13] where emergency: elective cases were 72.1%: 27.9%. Nigar *et al.* [8] also reported 79% emergency caesarean and 21% elective caesareans. Arpitha SB *et al.* [9] and Onankpa *et al.* [21] also had caesareans distributed in the same manner. Emergency caesareans were 3 times primary caesarean than elective decisions.

Indications of primary caesarean delivery

In primigravidae, labour related primary caesarean accounted for 46.5% which included failed induction and non - progress of labour. Malpresentations and multifetal gestations constituted 6.5% and 4.5% respectively. APH and PPROM were (n=13) 6.5% each. Foetal distress which included NRFHR and MSAF were 12.5 and 4.5% respectively. 6% of primary caesarean deliveries were done for FGR with doppler abnormality and 2% for macrosomic foetuses. 4.5% of first time operative deliveries had medical co-morbidities like either GDM on insulin or severe and non-severe HDP. Implementation of standard labour management strategies can reduce primary caesarean section rates without compromising maternal or foetal safety [22].

Literature supports the routine induction of labour at 41 weeks in uncomplicated pregnancies [23].

The most common indication for primary caesarean in Rajbhondary [19] S *et al* was foetal distress (40%) followed by cephalopelvic disproportion (15%), breech presentation (10%) and non-progress of labour (9%). Primary caesarean delivery in Cheluvamba hospital, Mysore Medical College Research Institute accounted for 40.3% cases of foetal distress, failed induction (13.6%), breech (10%), CPD (8%), IUGR with poor BPP (1.8%) and antepartum haemorrhage (3%) and deep transverse arrest (3.5%) [9], while Samal R *et al.* [24], study shows foetal distress (42.6%) malpresentation (26.4%) CPD (14.7%) and cord prolapse (1.5%). The two most common indications of primary caesarean in Nigar *et al.* were arrest of labour (18.1%) and CPD (14.2%) followed by foetal distress (12.9%), malpresentation (5.2%), and failed induction (4.8%).

In a study by Sharmila *et al.* [25] the incidence of primary caesarean in multi was 3%. Malpresentation (23.4%), APH (16.8%), Foetal indications (15.3%), medical disorders (16.5%) and CPD (15.8%) were the common causes of primary caesarean section in multigravida as in our study.

Previous caesarean delivery

Most common indication of Caesarean delivery in Chavda D *et al.* [11] was scarred uterus 39.9% similar to 41% in this study. Indications of repeat caesarean (n=155) showed 43 (37.83 %) were previous one caesarean and 11 (2.91%) were previous two caesareans we had a case of Previous 3 Caesarean with dense adhesions. Among various factors for caesarean section were scar thinning on ultrasonogram (n=21), foetal distress/FGR (n=4). Patients also refused TOLAC because of associated risk factors like PPROM/PROM (n=15), GDM /Pre-GDM (n=31), severe/non severe HDP (n=5), multifetal/malpresentation (n=5). Other less common indications were placenta previa (n=4), and multiple drug allergy (n=3). There were 2 Hepatitis B positive mothers who underwent elective caesarean with sterilisation. Lakshmi *et al.* [26] and Divyamol N *et al.* [27] had similar repeat caesarean rates.

Nigar *et al.* had 47 (22.4%) previous one caesarean and 20 (9.5%) previous two caesarean. Among various factors for caesarean section were scar tenderness (12%), contracted pelvis (10.4%), foetal distress (10.4%). (9%) patients underwent caesarean because of arrest of labor, (7.5%) patients refused for VBAC. PIH, oligohydramnios and breech were the indication in 4.5% of patients.

Gestational age at caesarean delivery

29.04% births were before <37 weeks of gestation in both groups while 43.6% of previous 2caesareans were decided at the same time frame in Singh P *et al.* [28]

AIP (Abnormally invasive placentation)

Diagnosis of placenta accreta before delivery allows multidisciplinary planning to reduce the potential maternal or neonatal morbidity and mortality [29-30]. Out of 155 cases of previous caesarean operated, 4 cases had placenta previa and 3 cases had adherent placenta. In cases with morbidly adherent placenta 2 cases required elective classical caesarean hysterectomy at 37 weeks and the other ended in classical caesarean with sterilisation at 35.4 weeks.

Birthweights and caesarean delivery

There were twice the number of babies with <2.5 kg in primary caesarean group. Majority of the neonates in Singh P *et al.* [28]

had birth weight between 2.5 to 3 kgs (45.6%) similar to the present study. Low birth weight babies were 1.65 more in primary caesarean group and statistically significant.

Days of hospital stay

Primary caesareans had longer duration of hospital stay 4.157 times than previous caesarean.

Conclusion

Induction of labour and pre-labour caesarean in first time mothers have contributed to the current scenario. Induction of labour protocols needs to strictly adhere in order to reduce the burden of unnecessary surgical interventions. The present study shows that the maternal and morbidity is increased with increasing number of caesarean sections. So, trial of labour and use of labour analgesia should be promoted in order to reduce rate of primary caesarean section which can reduce the rate of placenta previa and adherent placenta in subsequent pregnancies.

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