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RISK FACTORS FOR CAESAREAN DELIVERY IN INDUCED LABOR AT TERM

Obstetrics & Gynaecology

Mahima Sharma* Senior Resident, Department Of Obstetrics & Gynecology, Pandit Deen Dayal Upadhyay Hospital, SMS Medical College Hospital, Jaipur, Rajasthan, India - 302001. *Corresponding Author

Pushpa Nagar Senior Professor and Head of unit, Department Of Obstetrics & Gynecology, Pandit Deen Dayal Upadhyay Hospital, SMS Medical College Hospital, Jaipur, Rajasthan, India - 302001.

Abhilash Eshwar Resident doctor, Department Of Obstetrics & Gynecology, Pandit Deen Dayal Upadhyay Hospital, SMS Medical College Hospital, Jaipur, Rajasthan, India - 302001.

Pravesh Poonia Resident doctor, Department Of Obstetrics & Gynecology, Pandit Deen Dayal Upadhyay Hospital, SMS Medical College Hospital, Jaipur, Rajasthan, India - 302001.

ABSTRACT

Background: Labor inductions have increased steadily over the past two decades and caesarean delivery in induced labour is seen more over the general caesarean cases. This study was designed to assess the factors which are associated with greater risk of cesarean delivery when induced at term.

Methodology: This prospective observational study was carried out at department of Obstetrics and Gynecology in our hospital between March 2018- December 2020 in 120 pregnant women. Induction of labor by cervical ripening with Prostaglandin E2 gel (0.5 mg in 3ml) instilled intracervically followed by reassessment after 6 hours. If progress was not satisfactory, repeat gel induction was done after 24 hours, maximum of 3 doses of Prostaglandin E2 gels were used.

Results: The cesarean delivery rate in the study was 39% which was greater than the general cesarean rate. Patients with poor Bishop score, obesity, gestational diabetes, IUGR and cholestasis were at high risk for emergency cesarean section.

Conclusion: It can be concluded that a number of factors are implicated in increased cesarean rate after induction of labor. Unnecessary cesarean sections should therefore be avoided.

KEYWORDS

Cesarean section, Labor induction, Prostaglandin E2 gel, Risk factors

INTRODUCTION

Induction of labor is the initiation of contractions in a pregnant woman who is not in labor to help her achieve a vaginal birth. Induction is indicated when the risk of continuing the pregnancy exceeds the risk associated with induced labor and delivery.

Labor inductions have increased steadily over the past two decades, with overall rates in many countries now exceeding 20% of all births [1,2].

Common indications for induction of labor are postdatism and post-term pregnancies, hypertensive disorders of pregnancy, gestational diabetes mellitus, oligohydramnios, Rh negative pregnancy, polyhydramnios, cholestasis of pregnancy and intrauterine fetal demise [3].Labor induction is contraindicated when vaginal delivery would endanger the life of the mother or foetus. Common contraindications include contracted pelvis, placenta previa, transverse fetal lie, prolapsed umbilical cord and prior classical uterine incision[3].

This study was designed to assess the factors which are associated with greater risk of cesarean delivery when induced at term so that better obstetric and perinatal outcomes can be achieved.

METHODOLOGY

This prospective observational study was carried out at Department of Obstetrics and Gynecology in our hospitalbetween March 2018-December 2020. Written informed consent was obtained from all the subjects. Study population consisted of 120 pregnant women with singleton live fetus in cephalic presentation and induced at gestational age equal to or more than 37 weeks by cervical ripening with Prostaglandin E2 gel. Pregnancy with contraindications to vaginal birth, malpresentation, multifetal gestation, previous cesarean delivery and uterine scar (myomectomy and metroplasty) were excluded from the study.

All women enrolled were examined and cervical inducibility score was calculated. Induction of labor by cervical ripening with Prostaglandin E2 gel (0.5 mg in 3ml) instilled intracervically followed by reassessment after 6 hours. If needed augmentation of labor by oxytocin was done. If progress was not satisfactory, repeat gel induction was done after 24 hours, maximum of 3 doses of Prostaglandin E2 gels were used. Partographic monitoring of labor was carried out.

STATISTICAL ANALYSIS

Continuous variables were summarized as mean and standard deviation whereas nominal/categorical variables as proportions (%).In universal analysis Chi Square test was applied and Crude odds ratio with 95% Confidence Interval (CI) were calculated for Nominal/ categorical variables whereas Unpaired t-test and Man Whitney test were used for continuous variables. Multivariate logistic regression analysis was done to identify the risk factors among significant factors found in univariate analysis $p< 0.05$ was taken as significant. SPSS 22 version software was used for all statistical calculations.

RESULTS

Out of 120 pregnant women, 47 had cesarean section. Thus, the cesarean delivery rate in the study was 39% which was greater than the general cesarean rate. 25 women were aged >35 years and 12 among them had cesarean, contributing to 25.5 % of total cesarean births. With regards to the age, risk of caesarean section was 1.58 times higher in those aged >35 years. Urban patients had higher odd's (OR 1.46) of caesarean section as compared to rural counterparts.

Table 1: Baseline characteristics

	Cesarean Section		Vaginal Delivery		Total	p	OR (95%CI)
	N	%	N	%			
Maternal age (years)							
< 35	12	25.5	13	17.8	25	0.431	1.58 (0.65-3.85)
>35	35	74.5	60	82.2	95		
Residence							
Urban	33	70.2	45	61.6	78	0.445	1.46 (0.67-3.21)
Rural	14	29.8	28	38.4	42		
Parity							
Primipara	44	93.6	58	79.5	102	0.063	3.79 (1.03-13.92)
Multipara	3	6.4	15	20.5	18		
History of Abortion							
Yes	4	8.5	6	8.2	10	0.778	1.04 (0.28-3.89)
No	43	91.5	67	91.8	110		

Treatment for Infertility							
Yes	6	12.8	6	8.2	12	0.618	1.63 (0.49-5.41)
No	41	87.2	67	91.8	108		
Maternal BMI (kg/m^2)							
≥ 25	14	29.8	6	8.2	20	0.004	4.74 (1.67-13.45)
≤ 25	33	70.2	67	91.8	100		
Modified Bishop's score							
<5	38	80.9	40	54.8	78	0.006	3.48 (1.47-8.24)
≥5	9	19.1	33	45.2	42		
AFI							
≤8	23	48.9	32	43.8	55	0.758	1.18 2.16
9-20	23	48.9	38	52.1	61		
>20	1	2.2	3	4.1	4		
Estimated Fetal Weight (grams)							
>3400	14	29.8	6	8.2	20	0.004	4.74 (1.67-13.45)
<3400	33	70.2	67	91.8	100		

OR Odd's ratio, CI Confidence interval,BMI Body mass index, AFI Amniotic fluid index Nulliparity was associated with significant increase in caesarean rate as compared to multiparity (p=0.04). Previous history of abortion didn't correlate with risk of caesarean section (p=0.78). The rate of caesarean section was higher in patients who had taken treatment for infertility though the difference was statistically insignificant (p=0.62). The risk of caesarean delivery was 4.7 times higher in women with BMI >=25 kg/m2 . Modified Bishop's score <5 was significantly associated with increased caesarean rate (p=0.006) as compared to those with score >5. Caeserean rate in patients with oligohydramnios was 41.8 % as compared to 37.7 % with AFI =9 to 20 , and 25% with polyhydramnios (AFI >20). Caeserean delivery rate with macrosomia (EFW>3.5 kg) was significantly higher (p=0.004).

Table 2: Obstetric characteristics

	Cesarean Section		Vaginal Delivery		Total	p	OR (95%CI)
	N	%	N	%			
Hypertensive Disorder							
Yes	13	27.7	22	30.1	35	0.932	0.89 (0.39-1.99)
No	34	72.3	51	69.9	85		
GDM							
Yes	12	25.5	11	15.1	23	0.813	0.99 (0.39-2.57)
No	35	74.5	32	43.8	97		
IUGR							
Yes	12	25.5	13	17.8	25	0.431	1.58 (0.65-3.85)
No	35	74.5	60	82.2	95		
ICP							
Yes	14	29.8	20	27.4	34	0.939	1.12 (0.5-2.53)
No	33	70.2	53	72.6	86		
Postdatism							
Yes	14	29.8	29	39.7	43	0.361	0.64 (0.3-1.41)
No	33	70.2	44	60.3	77		
PROM							
Yes	13	27.7	31	42.5	44	0.147	0.52 (0.24-1.14)
No	34	72.3	42	57.5	76		

OR Odd's ratio, CI Confidence interval, GDM Gestational diabetes mellitus,

There was no significant association of hypertensive disorders of pregnancy, gestational diabetes mellitus, IUGR and intrahepatic cholestasis of pregnancy with caesarean section (p>0.05 for all). Also, neither postdatism nor prelabour rupture of membranes showed increased caesarean delivery rate.

Table 3 : Induction-Delivery Interval in relation to parity

Group	N	Mean (Hours)	SD	p
Primipara	102	22.99	16.34	0.001
Multipara	18	10.17	6.71	

The mean induction to delivery interval was 22.99 hours in primipara and 10.17 hours in multipara (p=0.001).

Table 4 : Indication for Caesarean section

Indication	N	%
CDMR	2	4.3
Failed Induction	12	25.5
MSL	16	34
Non Reassuring Fetal Heart	8	17
Second stage arrest	9	19.1
	47	100

CDMR, Caesarean delivery at maternal request;MSL, Meconium stained liquor

The most common cause for caesarean section in our study was meconium stained liquor (34%) followed by failed induction(25.5 %) and second stage arrest (19.1%).

DISCUSSION

The increase in caesarean delivery rate in induced labour over the general caesarean rate can be attributed to complications in pregnancy requiring termination by induction. Induction of labour is associated with increased incidence of uterine tachysystole, non-reassuring fetal heart rate and meconium stained liquor[4,5].In our study, CS following labour induction was 39%. In study done by Tarimo CS et al (2020), the prevalence of CS following labour induction was 26.75% [6]. In a similar study by Ethiraj G et al (2019), it was found that primigravida had a risk of 4.4 times for Cesarean after induction with odds ratio of 0.2 [7].

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The risk for women aged >35years of having caesarean section was 1.58 times the women aged<35 years. This possibly is secondary to age related changes in the maternal pelvis, the psychology of the patient and the cautious attitude of the obstetrician towards such patients [8]. Bergholt T et al (2020) also found that women with induced labor the rate of cesarean section increased from 14.0% in women less than 20 years of age to 39.9% in women 40 years and older. Compared to women aged 25-29 years, the corresponding relative risk were 0.60 (95% confidence interval (CI); 0.57 to 0.64) and 1.72 (95% CI; 1.66 to 1.79 [9]. The likelihood of nullipara having caesarean was 3.793 times that of multipara.. Women with poor Modified Bishop's score (<5) were more prone to undergo caesarean section(OR 3.48). Nullipara have slower progress of labour and in circumstances such as fetal heart rate abnormalities or meconium, the obstetrician prefers to perform an emergency caesarean section rather than giving a trial of labour which may eventually compromise the baby[10]. Johnson DP et al(2003) also found that the cesarean delivery rate was 31.5% among patients whose Bishop score was <5 at induction versus 18.1% for patients with a score ≥5 (*P* <.001) [11]. In our study, previous history of abortion didn't correlate with risk of caesarean section . However, the rate of caesarean section was higher (OR 1.634) in patients who had taken treatment for infertility though the difference was statistically insignificant . These women have a poor mental make-up towards vaginal delivery and the obstetrician prefers a caesarean section in case of even a transient fetal heart abnormality[12].Obesity was a significant risk factor for caesarean delivery, as women with BMI>25 kg/m^2 having 4.7 times likelihood of caesarean as compared to those with normal BMI. Obese women have less effective uterine contractility and longer duration of labour, and are more likely to experience failure to progress/labour arrest[13]. Obesity is also associated with other risk factors such as hypertensive disorders of pregnancy, gestational diabetes and PROM [14]. Ferrazzi E et al (2019) suggested that a BMI >25 kg/m2 at term of pregnancy is a risk factor for higher caesarean section rate [15].

The caesarean delivery rate in oligohydramnios group was the highest (41.8%) compared to those with polyhydramnios (25%). Higher rate of cesarean deliveries in oligohydramnios is a consequence of obstetric interventions for fetuses potentially at risk, with nonreassuring cardiotocographic patterns [16].

The women with higher estimated foetal weight (>3.4 kg) had increased likelihood of caesarean delivery(p=0.004).Higher foetal weight leads to increased incidence of Cephalopelvic disproportion or Deep transverse arrest which ultimately leads to caesarean[17]. Considering the various obstetric characteristics, hypertensive disorders of pregnancy did not increase the likelihood of caesarean delivery (p=0.93). Women with IUGR were 1.6 times more likely to have caesarean delivery. IUGR is associated with oligohydramnios, hypertensive disorder of pregnancy , fetal heart irregularities and thus increases the incidence of caesarean when induced at term [18]. Pfützenreuter GR et al.(2019) also concluded that there was an increased risk for cesarean section in presence of fetuses with intrauterine growth restriction (PR ¼ 1.82; 95%CI: 1.32–2.19) [19].

The women with obstetric cholestasis had higher likelihood (OR =1.124) of having caesarean delivery. Women with obstetric cholestasis had higher incidence of passage of meconium and fetal heart rate abnormalities which possibly contributes to increase in caesarean rate.

In our study,GDM and PROM were not risk factors for caesarean delivery however, Mhaske N et al(2015) showed that GDM patients were 4.67 times and PROM patients were 1.04 times more likely to have caesarean section[20]. This is probably because our patients were mostly multiparous and had a favourable bishop's score.

In summary, meconium stained liquor was the most common (34%) cause for caesarean section followed by failed induction (25%) and second stage arrest (19.1%) in our study.

CONCLUSION

Careful evaluation of patients with poor Bishop score, obesity, gestational diabetes, IUGR and cholestasis should be done as they are associated with high risk for emergency cesarean section. We thus conclude that a number of factors are implicated in increased cesarean rate after induction of labor. Unnecessary cesarean sections should therefore be avoided.

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Conflicts of interest There is no conflict of interest

Ethical Statements All the procedures followed in study were in accordance with the ethical standards of institution, and ethical committee of institution had critically evaluated the study and its methodology and given the approval before study was started. I am sending scanned document of the approval with this title page, kindly make note of it.

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