



STUDY OF RISK FACTORS FOR CESAREAN SECTION FOLLOWING INDUCTION OF LABOR AT TERM PREGNANCY

Obstetrics & Gynaecology

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KEYWORDS

Induction of labor, vaginal delivery, risk factors, cesarean section

INTRODUCTION

Induction implies stimulation of contractions before the spontaneous onset of labor, with or without ruptured membranes. Induction of labor is one of the most common obstetric interventions¹, the rate varies from 9 - 33% of all pregnancies annually²; one fifth of all pregnancies are terminated with induction method.³

Induction of labor indicated when the benefits to either mother or fetus outweigh those of pregnancy continuation and more common indication for induction of labor are rupture of membrane without labor, gestational hypertension, post term pregnancy and various maternal medical condition such as chronic hypertension, diabetes etc.⁴

When induction fails it becomes necessary to perform emergency cesarean section, in which maternal risks are greater than those in elective cesarean delivery.

Induction of labor is thought to be associated with an increased risk of cesarean delivery for nulliparous woman.⁵

Active management of term PROM with induction is associated with reduced maternal infective morbidity without increasing cesarean or operative vaginal birth.⁶

Induction of labor has shown improved maternal outcome and is advised for women with mild hypertensive disease beyond 37 weeks of gestation, and in pre-eclampsia beyond 34 weeks of gestation; elective delivery can decrease the incidence of complications, severe hypertension and need for antihypertensives.^{7,8}

In case of GDM, 38th week is the most favorable time to perform induction in terms of neonatal complications.^{9,10}

In case of fetal growth restriction it is reasonable to undergo an induction of labor with a counselling regarding a higher risk of cesarean delivery.¹¹ NICE recommendations advocate birth for women with a dichorionic twin pregnancy at 37+0 weeks gestation.¹² In case of intrahepatic cholestasis of pregnancy, early induction at 37-38 weeks are considered for improving perinatal outcome.¹³

As fetal, neonatal and maternal complications do increase beyond 42 weeks, earlier intervention with induction of labor at 41 weeks appears to be an appropriate management and is justified to minimise both fetal and maternal complications.¹⁴

To prevent still birth, the ACOG recommends induction of labor between 36 0/7 and 37 6/7 weeks in pregnancies complicated by oligohydramnios.¹⁵

The aim and objective of our study was to identify risk factors for Cesarean section following failure of induction of labor in term pregnancy as primary outcome and secondary outcome measures were to evaluate fetomaternal outcomes following cesarean section after failure of induction of labor.

MATERIAL AND METHODS

It was a hospital based observational study and was carried out in the department of Obstetrics and Gynaecology, Assam Medical College and Hospital, Dibrugarh, from 1st July 2019 to 30th June 2020, for a period of one year. Taking 95% confidence interval with a margin of

error of 5% and considering the findings of the study by Mhaske *N et al*¹⁶ a total of 375 pregnant women were selected randomly for the study. Induction of labor was started for both booked and unbooked women with gravida one to three, live, singleton fetus, at term pregnancy (from 37 completed weeks upto 42 weeks) cephalic presentation and willing to participate in the study.

Women with previous cesarean or other uterine scar, multiple pregnancy, malpresentation with history of previous difficult vaginal delivery are excluded from the study.

APPROVAL

Ethical committee approval was obtained from institutional Ethics committee (Human), Assam Medical College and Hospital, Dibrugarh.

STUDY PROCEDURE

Pregnant women at term pregnancy meeting all inclusion criteria with a desire to participate voluntarily were selected randomly. The patients were well explained in their regional language about the protocol and the objective of the study. Written informed consent were given by the patients both in English and regional language (Assamese).

An elaborate history including gravidity, parity, socioeconomic status, booking status, habitat, educational status, last menstrual period, menstrual cycle, duration of amenorrhea, any complaints like bleeding or leaking per vagina was taken from the patients. Details of past medical and obstetric history, including abortion and medical termination and history of any complication in previous pregnancy were recorded.

Thereafter detailed physical and obstetric examination was carried out. Per speculum examination was performed to confirm any draining of the liquor.

Investigations included Hb estimation, oral glucose tolerance test, blood grouping and rhesus typing, Bleeding time, Clotting time, RPR/VDRL, HbsAg, anti HCV, PPTCT, thyroid profile, routine urine examination, ultrasonography for fetal assessment. Special investigations like FBS, PPBS, glycosylated Hb, hepatic function, renal function, coagulation profile were done in selected cases.

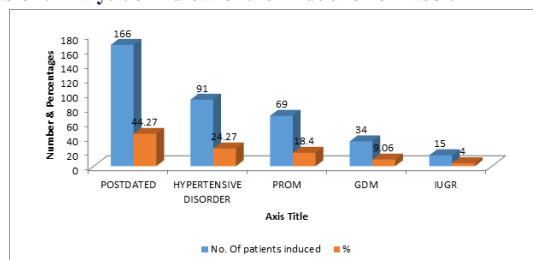
Pregnant women meeting all inclusion criteria were given 0.5mg dinoprostone gel intracervically. Uterine activity and fetal heart rate were monitored. Same dose of dinoprostone gel was repeated after 6 hours if required, labor was augmented using oxytocin (starting from dose of 6 mU/min, increased every 40 minutes but employed flexible dosing based on uterine response). All the women were observed throughout labor, the whole events of labor were recorded in WHO partograph. Mode of delivery vaginal or cesarean was noted. In case of cesarean delivery, indication for the same was noted. Women were followed up till two hours after delivery of the baby. Details of the baby were noted regarding sex, weight, date and time of birth. Pulse rate, blood pressure and temperature of the mother were monitored twice daily in the morning and evening during the lying-in period. Mother and the baby were followed up till discharge for any complications.

Datas were described using percentage, proportions, mean and standard deviation. Chi square test done to calculate p value and the value <0.05 was considered significant. The datas were presented as tables and figures.

RESULTS

Participants in the study belonged to mean age group of 24.37 ± 2.50 . Majority of women 40.27% were in the age group of 25 to 30 years and had maximum no (78.45%) cesarean delivery. 32.80% women were from lower socioeconomic group, resulting in 34.25% cesarean section. 58.67% of patients were unbooked and had cesarean rate of 60.22%; women coming from rural habitat comprising 67.47% resulting in 71.27% cesarean section; 42.67% of women with educational status up to middle school resulting in 32.60% of cesarean section; 53.87% of patients were nulliparous and 46.13% were multiparous with a mean Gestational age of 39.6 ± 19.75 .

Table 1: Analysis of indications for induction of labor.



PROM-Premature rupture of membrane; GDM-Gestational diabetes mellitus; IUGR- Intrauterine growth restriction.

Table 2 : Analysis Of Risk Factors For Cesarean Delivery Following Induction Of Labor.

Risk factors		CESAREAN DELIVERY N=181 (%)	VAGINAL DELIVERY N=194 (%)	Odds ratio (95% CI)	p value
Maternal age	≥25 years	147(81.22%)	15(7.73%)	51.594	<0.001
	< 25 years	34(18.78%)	179(92.97%)	(27.055-98.388)	1
Parity	Nullipara	145(80.11%)	59(30.41%)	9.375 (5.816-15.111)	<0.001
	Multipara (1-3)	36(19.88%)	135(69.59%)		1
BMI	≥ 25kg/m ²	115(63.54%)	10(5.15%)	32.606	<0.001
	< 25kg/m ²	66(36.46%)	184(94.85%)	(15.845-64.868)	1
Bishop score	<5	112(61.88%)	21(10.82%)	13.372	<0.001
	≥5	69(38.12%)	173(89.18%)	(7.767-23.021)	1
GDM		31(17.13%)	3(1.55%)	13.157	<0.001
				(3.946-43.870)	1
IUGR		2(1.10%)	13(6.70%)	0.155 (0.034-0.699)	0.015
PROM		27(14.92%)	42(21.65%)	0.634(0.372-1.081)	0.094
Hypertensive disorder		49(27.07%)	42(21.65%)	1.343(0.836-2.157)	0.221
Postdated pregnancy		72(39.78%)	94(48.45%)	0.702(0.466-1.058)	0.091

Maternal age ≥ 25years, BMI ≥ 25kg/m², Bishop score < 5, IUGR, nulliparous women, GDM had significant association (p <0.05) and considered to be the risk factors for cesarean delivery after induction.

PROM, hypertensive disorder of pregnancy, postdated pregnancy did not have significant association (p >0.05) as a risk factor for cesarean delivery after induction.

Table 3: Analysis of maternal outcome after emergency cesarean delivery following induction of labor at term

Maternal outcome	Emergency LSCS		Vaginal delivery		Odd ratio(95% CI)	p-value
	N	%	N	%		
Blood transfusion	29	16.02	6	3.09	5.978 (2.419-14.772)	0.001
SSI	32	17.68	12	6.19	3.257(1.620-6.545)	0.009
UTI	21	11.60	8	4.12	3.084(1.330-7.153)	0.008
Febrile morbidity	7	3.87	3	1.55	2.561(0.652-10.059)	0.177

SSI– Surgical site infection; UTI– Urinary tract infection;

Among 181 cesarean deliveries after induction, 29(16.02%) needed blood transfusion, 21(11.60%) had UTI and 32(17.68%) had surgical site infection and these complications were statistically significant in case of cesarean delivery after induction (p <0.05).

Table 4: Analysis of fetal outcome in cesarean delivery after induction of labor at term

Fetal outcome	Emergency LSCS		Vaginal delivery		Odd ratio. (95% CI)	p-value
	N	%	N	%		
Birth asphyxia	21	11.60	2	1.03	2.600(2.910-54.555)	0.007
Respiratory morbidity	17	9.39	5	2.58	3.198(1.414-10.853)	0.008
APGAR score ≤7 @ 1 min	28	15.47	2	1.03	17.569(4.120-74.913)	0.001
NICU admission	27	14.92	4	2.06	8.327(2.852-24.312)	0.001

Fetal outcome was classified into primary and secondary. Among primary outcome, there was no neonatal death and still birth. All babies had live birth irrespective of mode of delivery. Among secondary outcome, birth asphyxia, respiratory morbidity, APGAR score and NICU admissions were considered which showed significant association. Out of 181 cesarean deliveries, 3.88% babies were <2.5kg, 90.60% between 2.5-3.5 kg and 5.52% were >3.5 kg. In case of cesarean births, 14.92% were admitted in NICU after birth.

DISCUSSION

Induction of labor is one of the most common obstetrics interventions. In certain conditions, induction may not succeed in vaginal delivery and the pregnancy may end up in cesarean section.

In our study, age of the mother ≥25 years had more cesarean delivery after induction at term pregnancy when compared to mothers <25 years and this finding was statistically significant. In a study by Mhaske *et al.*,¹⁶ there was significant increase in cesarean delivery after induction for the age group ≥35 years. Independent association was noted between maternal age and cesarean delivery in induced labor as shown by Byrampour *et al.*,¹⁷.

Considering parity as a risk factor for cesarean delivery after induction of labor at term pregnancy, nulliparous women contributed to 80.11% and multiparous women 19.88% and this was statistically significant. Mhaske *et al.*,¹⁶ also found significant association between parity and cesarean delivery after induction.

In our study, women with BMI of <25kg/m² had 36.46% cesarean delivery and BMI ≥25kg/m² had 63.54% cesarean delivery after induction and this was statistically significant (p <0.05). In a study by Sheiner *et al.*,¹⁹ significant association was shown between obesity and cesarean delivery.

We observed that women with Bishop score <5 had higher incidence of cesarean delivery after induction (61.88%) compared to women with bishop score ≥5 (38.12%); this was statistically significant. Johnson *et al.*,²¹ also found significant association between increased cesarean delivery after induction in women with preinduction Bishop score of <5.

Among the total cesarean delivery after induction in our study (181), 17.13% were with GDM and 82.87% were without GDM and this was statistically significant. GDM was proven to be a risk factor for cesarean delivery after induction at term as reported by Ehrenberg *et al.*,²⁰

In our study, 1.1% of total cesarean delivery after induction were with IUGR and this was statistically significant and considered to be a risk factor for cesarean delivery after induction. Mhaske *et al.*,¹⁶ also noted similar findings.

Among total cesarean delivery after induction, we found 39.78% postdated pregnancy and was not statistically significant. Mei-Dan *et al.*,²⁴ also did not find any significant association between post dated pregnancy and cesarean delivery.

Out of total cesarean delivery after induction (181), 14.92% were with PROM and this finding was not statistically significant (p >0.05), as

also reported by Mhaske *et al.*,¹⁶. In another study by Jayaprakash *et al.*,²⁵ there was no increased risk of cesarean delivery after induction at term among the patients with PROM.

In our study, out of cesarean delivery after induction (181), 27.07% were with hypertensive disorder and this was statistically not significant showing no association between the two. Study by Mhaske *et al.*,¹⁶ also did not find any significant association between hypertensive disorder and cesarean delivery after induction.

In our study, maternal outcome in cesarean delivery after induction (181), 17.9% needed blood transfusion, 12.96% had UTI and 19.7% had wound infection with significant p value. 4.32% had febrile morbidity and was statistically not significant. In a study by Thakur V *et al.*,²⁶ postoperative maternal morbidity were categorized in a same way and findings were similar to our study.

In our study, 11.6% of babies had birth asphyxia, 9.39% had other respiratory morbidity, 14.92% needed NICU admission and there were no perinatal death. All neonatal complications were statistically significant in our study. In a study by Benzouina *et al.*,²⁷ neonatal complications were similar to our study and fetal morbidity was more in emergency cesarean delivery when compared to elective cesarean delivery

CONCLUSION:

While the incidence of induction of labor is increasing, the question regarding the end result of induction have also been under debate. The factors which may hinder the progress of labor and results in emergency cesarean section with increased chance of maternal and fetal morbidity need to be considered.

Finally to conclude, our study shows that pregnant women with age ≥ 25 years, BMI $\geq 25\text{kg/m}^2$, preinduction Bishop score < 5 , nulliparity, gestational diabetes mellitus, IUGR carry higher risk for cesarean section following induction of labor and may also have increase chance of maternal morbidity with poor fetal outcome due to emergency cesarean delivery compared to elective cesarean section as was also shown by various authors. However, large scale study is required to formulate recommendation.

Clinical significance:

Induction of labor, the most common obstetric intervention, may not be successful in presence of risk factors. Emergency cesarean section following failure may cause maternal and fetal morbidity, though limited.

Compliance with Ethical Standards and Conflict of interest :

The authors declare no conflicts of interest to the contents of this manuscript. The study is a prospective observational study approved by the Institutional ethics Committee.

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