Section: OBG

Original Research Article

TO DETERMINE THE ASSOCIATION OF RISK FACTORS FOR CAESAREAN DELIVERY IN INDUCED LABORS

Monika Mishra[1], Vivek Upadhyay[2], Sombit Chowdhury[3]

[1]*Senior Resident, Department of OBG, Military Hospital Ramgarh, Jharkhand, India.*
[2]*Associate Professor & Head, Department of Surgery, Military Hospital Ramgarh, Jharkhand, India*
[3]*Assistant Professor, Department of ENT, Military Hospital Namkun, Namkun, Ranchi, Jharkhand, India*

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Corresponding Author:
Dr. Monika Mishra,
Senior Resident, Department of OBG, Mh Ramgarh, Jharkhand, India.
Email: monikamishra375@gmail.com

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ABSTRACT

Background: Induction of labour implies the act of stimulation of uterine contractions before the spontaneous onset of labour. It is a common intervention done during pregnancy. **Objective:** To determine the association of risk factors for caesarean delivery in induced labors.

Materials and Methods: This prospective observational study was conducted among antenatal women admitted to the labour room with medical indications for induction of labour in the Department of Obstetrics and Gynaecology, Command Hospital, Eastern Command, Kolkata. The duration of the study was from 1st September 2022 to 31st March 2024.

Results: Caesarean delivery (failed induction) rate was 34.1%. Relative risk of caesarean delivery was significantly associated with age >30 years (RR=2.31), non-vegetarian/mixed diet (RR=1.3), primiparity (RR=1.17), gestational age >40 weeks (RR=1.66), Bishop score ≤5 (RR=1.34), BMI ≥25 kg/m² (RR=1.52) and pregnancy complicated by hypertensive disorders (RR=2.21). In the present study, there were 4 (2.4%) intrauterine deaths, low APGAR at birth was seen in 26.5%, and there were 40 (23.5%) babies born with a weight of <2.5 kg. The NICU admission rate was 28.8%. NICU admission rate was significantly higher in caesarean delivery (43.1%) as compared to that in vaginal delivery (21.4%) (RR=2.01).

Conclusion: a relatively high caesarean rate in induced deliveries at our centre. Identifying risk factors associated with failed induction will help evolve appropriate antenatal care strategies to reduce the need for induction and ensure favourable outcomes.

Keywords: Risk factors, Caesarean delivery, Induced labors.

INTRODUCTION

Nearly 20 to 30% of pregnancies receive induction of labour.[1] It is generally performed after the period of viability using mechanical, medical, surgical or a combination of these to ensure vaginal delivery.[2] Induction of labour (IOL) is done to reduce the risk of complications associated with the continuation of pregnancy, either to the mother or to the fetus, apart from ensuring a safe vaginal delivery. The decision for induction of labour is dependent on a number of factors, including maternal and fetal conditions, gestational age, and status of cervical ripening.

Reducing the Cesarean delivery rate remains one of the most common problems in obstetrics. Incidentally, it is being increasingly used as more of an option than an exception for delivery worldwide, particularly in low- and middle-income countries.[3,4] The rate of Caesarean delivery was as low as 5% during the 1940s and 1950s. However, global trends indicate a high increase in Caesarean section rate, with rates as high as 30% in some regions by the end of the twentieth century.[5] The highest Caesarean rates have been seen in Latin America and Caribbean countries, with 29.2% of deliveries in this region being conducted through Caesarean section. On the other hand, these rates are as low as 3.5% in African countries. Across economic lines,

the proportion of deliveries through Caesarean section is 21.1% in developed countries as compared to only 2% in underdeveloped countries.[6]

In India, the Caesarean delivery rate has increased from 149.33/1000 live births in 2009 to 234.03/1000 live births in 2015.[7] If we look at the Caesarean delivery rate across public and private health facilities. We see a vast difference in caesarean rates, with only 11.9% caesareans of total births in public facilities compared to 40.9% caesareans in private facilities. Interestingly, time trends indicate that between 2005-2006 and 2015-2016, the public facilities showed a decline in Caesarean rate from 15.2% to 11.9%, the private facilities showed a high growth from 27.9% to 40.9% during the same period, thus offsetting the improvements in Caesarean rates in public facilities by multiple folds.[8]

Given these short and long-term implications of caesarean delivery, it always remains an issue of concern, especially among women undergoing induction of labour, as it is documented to have an association with an increased rate of caesarean delivery. Caesarean delivery is one of the primary outcomes associated with the induction of labour and is considered an indication of failed induction. Hence, an obstetrician's focus during labour induction is to avert caesarean delivery. Despite all the efforts on the part of the obstetrician, almost one-fifth to two-fifths of induced labors end up in caesarean delivery, thus adding to the disappointment of the obstetrician. The first step to reducing these high caesarean rates among women undergoing IOL is to identify the women who have a high probability of ending up in caesarean delivery with the help of identifiable risk factors. Subsequently, with the help of appropriate customised changes in the intervention time and methods of induction of labour, caesarean rates can be decreased in such at-risk women.

With this background, the present study was planned to study the caesarean rates in induced labors and to determine the association of risk factors for caesarean delivery in induced labors.

MATERIALS AND METHODS

This prospective observational study was conducted among antenatal women admitted to the labour room with medical indications for induction of labour in the Department of Obstetrics and Gynaecology, Command Hospital, Eastern Command, Kolkata. The duration of the study was from 1st September 2022 to 31st March 2024. The study was approved by the Institutional Ethics Committee before the enrolment of participants.

Sample size calculation

In a previous study,[9] the caesarean delivery rate in induced labours was reported as ~22%. The sample size was calculated using the following formula (Charan and Biswas, 2013)[10]:

$n = Z_{\alpha/2}^2 \times (p*(1-p) / d^2$

where $Z_{\alpha/2}$ = is a constant with value 1.96 at 95% confidence

n = Sample size

p = 22% or 0.22

d = error allowance, taken as 6.5% or 0.065

$n = 1.96^2 * 0.284 * 0.716 / 0.065^2$

$= 156.02806 \sim 156$

Thus, the calculated sample size was 156. However, we made a contingency provision of 10% and then rounded it off to the nearest 10 to target a sample size of 170.

Inclusion Criteria

- Antenatal women admitted to the labour room with medical indications for induction of labour.
- Singleton pregnancy.
- Gestational age ≥37 weeks as determined from the date of last menses and confirmed by sonographic measurements in the first trimester.
- Cephalic presentation.

Exclusion Criteria

- Women with previous uterine scar.
- Previous caesarean section
- Malpresentation
- Women not willing for induction.

Methodology

Upon arrival at the labour ward, the subjects were informed about the procedure and its outcomes, and a written informed consent was obtained.

They were evaluated for detailed history, clinical and routine obstetric examination. The following risk factors were specifically focused upon:

- Maternal age
- Body mass index (kg/m^2)
- Parity
- Bishop score
- Hypertensive disorders in pregnancy
- Gestational diabetes mellitus
- Post-term pregnancy
- IUGR
- PROM

Then, per vaginal examination was performed to examine the status of the cervix and determine the Bishop score. The following criteria were used for the determination of the Bishop score.

CERVICAL FACTORS	BISHOP SCORING SYSTEM used for assessment of inducibility			
	0	1	2	3
Dilatation (cm)	closed	1–2	3-4	≥5
Effacement (%)	0-30	40-50	60-70	≥ 80
Station (-3 to +2)	-3	-2	-1	+1,+2
Consistency	Firm	Medium	Soft	–
Position	Posterior	Midposition	Anterior	–

Labour was induced by two cerviprime 0.5 mg twice (at 2200 and 0400 hrs), followed by Pitocin with an initial dose of 1.8 ml/hr and then increased by 1.8ml/hr every 40 min up to a maximum of 10.8ml/ hour or till adequate contractions were achieved.
All the women were followed up till delivery. A time gap between the start of induction and delivery was noted.
Cesarean section was noted as the primary outcome.
Indications for caesarean section were noted.
Pregnancy outcomes like the status of the baby (live/IUD), baby sex, birth weight, Apgar score at birth and NICU admission need were noted.

Statistical Analysis

Data collected from the study was fed into the computer using Microsoft Excel software. Data analysis was done using IBM SPSS 21.0 software. Data has been presented as numbers and percentages or mean standard deviation. Chi-square test, Independent samples 't'-test and ANOVA were used to compare the data. A 'p' value less than 0.05 was considered as statistically significant.

RESULTS

Out of a Total (n=170) of 170 induced pregnancies, a Total (n=170) of 112 (65.9%) underwent vaginal delivery. However, 58 (34.1%) delivered by caesarean delivery
In Group 1, the ages of women ranged from 23 to 33 years. There were 14 (24.1%) women aged 21-25 years, 26 (44.8%) aged 26-30 years and 18 (31%) aged 31-35 years, respectively. The mean age of Group 1 women was 28.42±2.97 years. In Group 2, the ages of women ranged from 21 to 35 years. There were 39 (34.8%) women aged 21-25 years, 58 (51.8%) aged 26-30 years and 16 (13.4%) aged 31-35 years. The mean age of women in Group 2 was 26.98±2.87 years. The mean age of women in Group 1 was also found to be significantly higher (28.42±2.97 years) as compared to that of Group 2 women (26.98±2.87 years) (p=0.002)
The majority of group 1 (69%) and group 2 (69.6%) women were urban residents. Only 18 (31%) of Group 1 and 34 (30.4%) of Group 2 women were rural residents. (p=0.928)
In Group 1, 91.4% of women and 90.2% of women were homemakers. There were 5 (8.6%) working women in Group 1 compared to 11 (9.8%) in Group 2. (p=0.799)
A comparison of the educational status between the two groups did not show a statistically significant difference (p=0.273)
Comparative assessment in statistical terms did not show a significant difference in monthly per capita family income between the two groups (p=0.998).
All the women used to reside in a pucca house and belonged to the upper-middle socioeconomic class.
Statistically, there was a significant difference in the dietary preferences of the two groups (p=0.020).
Except for 9 (5.3%) women who had few ANC visits, all the others had complete ANC visits. The Proportion of those partial/incomplete ANC visits was 3.4% in Group 1 as compared to 6.3% in Group 2. (p=0.439)
Overall, primipara (84.1%) dominated over multipara (15.9%). The proportion of primipara women was significantly higher in Group 1 (93.1%) than in Group 2 (79.5%) (p=0.021)
Overall (60.6%) and in, 67inductions done in the vaginal delivery group at gestational age 37 to 39wk 6d interval, whereas in the caesarean delivery group majority of inductions (53.4%) were done at gestational age >40 weeks. Statistically, this difference was significant (p=0.007).
In the caesarean delivery group, of 96.6% women had a Bishop score <5 at the time of induction and only 2 (3.4%) had a Bishop score in the 6-8 range. None of the women delivered through Caesarean had a Bishop score >8. Compared to this, in the vaginal delivery group, 81 (72.3%) had a Bishop score <5, 27 (24.1%) had a Bishop score in the 6-8 range, and 4 (3.6%) had a Bishop score >8. The proportion of those having a Bishop score <5 was significantly higher in the caesarean delivery group as compared to that in the vaginal delivery group (p=0.001) (Table 1).

Table 1: Comparison of Bishop score at induction between the two study groups

SN	Bishop score	Group 1 (Caesarean delivery) (n=58)		Group 2 (Vaginal delivery) (n=112)		Total (n=170)	
		No.	%	No.	%	No.	%
1.	≤5	56	96.6	81	72.3	137	80.6
2.	6-8	2	3.4	27	24.1	29	17.1
3.	>8	0	0.0	4	3.6	4	2.4
χ^2=14.415 (df=2); p=0.001							

The proportion of overweight and obese women was significantly higher in the caesarean delivery group (70.7%) as compared to that in the vaginal delivery group (46.4%) (p=0.004). The mean BMI of the caesarean delivery group was also significantly higher as compared to that of the vaginal delivery group (p=0.035) (Table 2).

Table 2: Comparison of Maternal BMI status at induction between the two study groups

SN	BMI Status	Group 1 (Caesarean delivery) (n=58)		Group 2 (Vaginal delivery) (n=112)		Total (n=170)	
		No.	%	No.	%	No.	%
1.	Normal (18.5-24.9 kg/m^2)	17	29.3	60	53.6	77	45.3
2.	Overweight (25.0-29.9 kg/m^2)	32	55.2	46	41.1	78	45.9
3.	Obese (≥30 kg/m^2)	9	15.5	6	5.4	15	8.8
χ^2=11.092 (df=2); p=0.004							
Mean±SD (Range) in kg/m^2		26.21±3.46 (18.6-33.3)		25.14±2.94 (19.4-33.8)		25.51±3.16 (19.4-33.8)	
t=2.129; p=0.035							

The proportion of cases with pregnancy complication was 65.5% and 66.1%, respectively in caesarean and vaginal delivery groups, thereby showing no significant difference between the two groups (p=0.942) (Table 13; Fig. 12.1). In caesarean delivery group, hypertensive disorders of pregnancy (HDP) were the most common complications (27.6%) followed by gestational diabetes mellitus (GDM) (12.1%), thyroid disorder and intrauterine growth retardation (IUGR) (8.6%) respectively as the other most common complications. In the vaginal delivery group, gestational diabetes mellitus (GDM) was the most common complication (17.9%), followed by HDP (12.5%) and IHCP (11.6%) as the other most common complications. Statistically, a significant difference between the two groups was observed for hypertensive disorders of pregnancy, which were seen in a significantly higher proportion of the caesarean delivery group as compared to that in the vaginal delivery group (p=0.014) (Table 3).

Table 3: Comparison of Pregnancy complications and their types between the two study groups

SN	Pregnancy complications	Group 1 (Caesarean delivery) (n=58)		Group 2 (Vaginal delivery) (n=112)		Total (n=170)	
		No.	%	No.	%	χ^2	'p'
1.	Complications present	38	65.5	74	66.1	0.005	0.942
2.	Hypertensive disorders of pregnancy (HDP)	16	27.6	14	12.5	5.984	0.014
3.	Gestational diabetes mellitus (GDM)	7	12.1	20	17.9	0.958	0.328
4.	Intrahepatic cholestasis of pregnancy (IHCP)	3	5.2	13	11.6	1.855	0.173
5.	Thyroid disorder	6	8.6	8	7.1	0.518	0.472
6.	Intrauterine growth retardation (IUGR)	6	8.6	6	5.4	1.449	0.229
7.	Premature rupture of membranes (PROM)	3	5.2	5	4.5	0.043	0.836
8.	Oligohydramnios	4	6.9	2	1.8	2.931	0.087
9.	Rheumatoid factor (Rh) Negative	1	1.7	4	3.6	0.457	0.499
10.	Intrauterine death (IUD)	0	0	4	3.6	2.121	0.145
11.	Anemia	2	3.4	1	0.9	1.439	0.230
12.	Others	1	1.7	10	8.9	3.277	0.070

Mean induction to delivery interval was significantly longer in the vaginal delivery group as compared to that in the caesarean delivery group (p=0.004) (Fig. 1).

Failed induction and fetal distress (32.8%) were the most common indications for caesarean delivery, followed by cervical dystocia (10.3%), NPOL/second stage arrest (8.6%), meconium-stained liquor (5.2%) and inadequate pelvis (3.4%), respectively. There were 4 cases placed in other categories, including one case each with failed induction with imminent eclampsia, severe preeclampsia, thin MSL and persistent fetal tachycardia, respectively (Table 4).

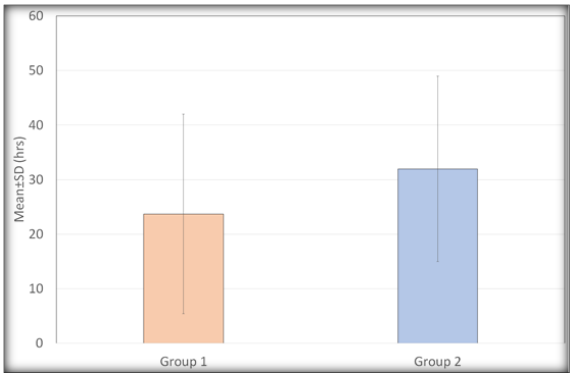

Figure 1: Comparison of Induction delivery interval between the two study groups
(Group 1=Caesarean delivery; Group 2=Vaginal delivery)

Table 4: Distribution of cases according to indications for caesarean delivery (Group 1 only) (n=58)

SN	Indication	No. of cases	Percentage
1.	Failed induction	25	43.1
2.	Fetal distress	19	32.8
3.	NPOL/Second-stage arrest	5	8.6

4.	MSL	3	5.2
5.	Inadequate pelvis	2	3.4
6.	Others	4	6.9

Overall, the IUD rate was 2.4%, all being intrapartum deaths. An equal number of babies were males/females. A total of 45 (26.5%) babies had low APGAR, and 40 (23.5%) were born with low birth weight. NICU admission was required for 49 (28.8%) babies. A statistically significant difference in fetal/neonatal outcomes was observed for low Apgar and NICU admission rates only, which was significantly higher in the caesarean as compared to that in the vaginal delivery group ($p<0.05$) (Table 5).

Table 5: Fetal Outcomes in Induced Deliveries

SN	Outcome	Group 1 (Caesarean delivery) (n=58)		Group 2 (Vaginal delivery) (n=112)		Total (n=170)		Statistical significance	
		No.	%	No.	%	No.	%	χ^2	P
1.	IUD	0	0	4	3.6	4	2.4	2.121	0.145
2.	Baby sex								
	Male	27	46.6	58	51.8	85	50.0	0.419	0.518
	Female	31	53.4	54	48.2	85	50.0		
3.	Low Apgar (<7) at birth	24	41.4	21	18.8	45	26.5	10.05	0.002
4.	Low Birth weight (<2.5 kg)	13	22.4	27	24.1	40	23.5	0.061	0.805
5.	NICU adm.	25	43.1	24	21.4	49	28.8	8.75	0.003

DISCUSSION

The present study recorded the caesarean delivery (failed induction) rate as 34.1%. Major indications for caesarean delivery were induction failure (43.1%) and fetal distress (32.8%). MSL (5.2%) and inadequate pelvis (3.4%) were the other less common indications for caesarean delivery. In the present study, we found a substantial association of caesarean delivery with age >30 years (RR=2.31), non-vegetarian/mixed diet (RR=1.3), primiparity (RR=1.17), gestational age >40 weeks (RR=1.66), Bishop score <5 (RR=1.34), BMI >25 kg/m² (RR=1.52) and pregnancy complicated by hypertensive disorders (RR=2.21). A longer induction delivery interval was also associated with an increased risk of caesarean delivery. On reviewing the literature, we find the incidence of caesarean delivery in various series of induced labour cases, ranging from 17.8%11 to 52.67%.[12] Several of these studies report this rate in the 20-25% range.[13,14,15] A few report it in the 25-30% range.[16,17,16] Only some others, like our study, in the 30-40% range19.20 and a number of those report it to be above 40%.[12,21] The differences in caesarean rates among different studies could be owing to differences in the risk profile of women undergoing induction of labour. A relatively higher caesarean rate in the present study could be attributed to a high proportion of women with unfavourable cervix (Bishop score <5), a high proportion of primigravida and almost two-fifths of pregnancies with gestational age >40 weeks. Some of the recent studies reporting the caesarean rate and corresponding characteristics of the study population. [9,12,17,20]

Risk Factors Associated with Induction Failure

As far as the spectrum of risk factors explored for their association with caesarean delivery in induced labour is concerned, it shows a huge variation across different studies. [9,12,17,20, 21,22]

It may be seen that the risk factors significantly associated with caesarean rate vary, and their spectrum varies from study to study. In the present study, we primarily focused on the role of maternal age, body mass index, parity, Bishop score, hypertensive disorders of pregnancy, gestational diabetes mellitus, post-term pregnancy, intrauterine growth retardation and premature rupture of membrane as potential risk factors for caesarean delivery in women undergoing induction of labour. Additionally, we studied the role of demographic factors and induction delivery interval. Some studies have looked at the role of other risk factors too, viz., type of analgesia42,58, history of scarred uterus,[11] type and dose of induction agent, [11,23] maternal height,[14] pregestational diabetes, placental grade,[12] cervical length,[12] cervicometry status. Cardiotocographic status, fetal growth, and place of residence. [23,9]

Regarding the role of maternal age, BMI and primiparity, similar to the present study, Papoutsis et al,[24] also found all these factors to be significantly associated with the risk of caesarean delivery in induced labours. Identification of lower parity as a risk factor for caesarean delivery in induced labors has also been identified by other workers, like Branger et al,[11] and Levine et al. apart from several other workers.[23,17,21] Parity has also been documented to affect the relationship of other risk factors with caesarean delivery.[20] Although several studies similar to the present study have documented advancing maternal age as a risk factor for caesarean delivery,[46,59,62] some studies report younger age (<30 years) as a risk factor for caesarean delivery in induced labours.[61] Identification of higher BMI/overweight/obesity as a risk factor for caesarean delivery in induced labour

has also been documented by other workers.[14,15,17,20]

In the present study, we also documented the association of a vegetarian/mixed diet with caesarean delivery risk. None of the previous studies we reviewed focused on dietary preference. Hence, there needs to be documentation of its role in determining the caesarean delivery rate in induced labors. However, a non-vegetarian/mixed diet can be linked to overweight /obesity. A vegetarian diet, on the other hand, has been shown to reduce the risk of complications like gestational diabetes, hypertension and excessive weight gain during pregnancy. Incidentally, all of these complications have been linked with the risk of caesarean delivery in induced labours. Hence, the passive or surrogate role of diet in determining the caesarean rate in induced labors can be justified.

Significance of Bishop Score

With respect to the role of low Bishop score, it is an established indicator of cervical ripening and hence, its impact on the progress of labour and the caesarean rate could be well understood. Most of the studies taking into account this factor, it has emerged as a significant risk factor for increased caesarean rate.[11,12,20,21,23] In our study, we also found it to be a significant risk factor associated with caesarean delivery.

The role of pregnancy complications like gestational diabetes mellitus, hypertensive disorders of pregnancy, PROM and IUGR with caesarean delivery in spontaneous labour as well as induced labour has been illustrated in various studies. In the present study, however, we found that only hypertensive disorders of pregnancy were significantly associated with the cesarean delivery rate. The reason to derive a significant association of other complications with caesarean rate could be the fewer cases with these conditions in the present study. The role of hypertensive disorders of pregnancy in influencing the caesarean delivery rate has also been documented by other studies reviewed by us. [14,21] Similarly, slower labour progress as a risk factor emerging in the present study has also been reported to be a risk factor for caesarean delivery by other workers. [12,17]

Thus, most of the significant relationships observed in the present study are based on contemporary literature. Apart from these traditional risk factors, we also identified the vegetarian diet as a protective factor against caesarean delivery in induced labour.

Perinatal Outcomes

In the present study, there were 4 (2.4%) intrauterine deaths, low APGAR at birth was seen in 26.5%, and there were 40 (23.5%) babies born with a weight of <2.5 kg. The NICU admission rate was 28.8%. Moreover, the NICU admission rate was significantly higher in caesarean delivery (43.1%) as compared to that in vaginal delivery (21.4%) (RR=2.01).

As far as intrauterine fetal death is concerned, it is an absolute indication of induction of labour.[25] Some studies report the rate of stillbirth/IUD to be much higher. Ejigu and Lambyo,[17] recorded it as 12.9% in their study. In the present study, however, we did not have stillbirths but only 4 (2.4%) IUDs. They also reported low Apgar at 1 min in 38.3% of newborns.

The present study showed low birth weight (<2.5 kg) in 23.5% births. Kalpana and Manvi68 recorded it in 38.4% of births. However, a relatively higher proportion of low birth weight in their study could be interpreted in the light of the fact that they defined it as <3 Kg instead of <2.5 kg in the present study. Mohammed et al,[9] however, did not report any birth with a weight <2.5 kg, but Desta and Duguma,,[26] observed low birth weight (<2.5 kg) in 18.6% of cases. These findings indicate that low birth weight could be a study-specific phenomenon, and its prevalence may not necessarily be associated with induction need.

The NICU admission rate of 28.8% in the present study is much lower than the 42.85% reported in the survey by Manjappa et al,[21] and Ethiraj et al,[15] in their research recorded NICU admission rate of 38.5% in caesarean delivery group and 1.5% in the vaginal delivery group. In the present study, we also found the NICU admission rate to be higher in the caesarean delivery group as compared to that in the vaginal delivery group. Still, we did not find a significant difference between the two groups. A relatively higher NICU admission rate in the vaginal delivery group could be owing to the comparable prevalence of many absolute indications of induction of labour in the vaginal as well as the caesarean delivery groups.

CONCLUSION

The study's findings show a relatively high caesarean rate in induced deliveries at our centre. Identifying risk factors associated with failed induction will help evolve appropriate antenatal care strategies to reduce the need for induction and ensure favourable outcomes. Further studies on a larger sample size will help accumulate knowledge on this aspect.

REFERENCES

1. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Menacker F, Munson ML. Births: final data for 2002. Natl Vital Stat Rep 2003; 52:1–113.
2. Konar H (Ed.). Induction of Labour. In: DC Dutta's Textbook of Obstetrics. 8th Ed., 2015, New Delhi, Jaypee Brothers Medical Publishers (P) Ltd., p. 598
3. Lumbiganon P, Laopaiboon M, Gulmezoglu AM, Souza JP, Taneepanichskul S, Ruyan P, et al. Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007–08. Lancet. 2010;375(9713):490–9.
4. Souza JP, Gulmezoglu A, Lumbiganon P, Laopaiboon M, Carroli G, Fawole B, et al. Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004–2008 WHO Global Survey on Maternal and Perinatal Health. BMC Medicine. 2010; 8:71.

5. National Institutes of Health state-of-the-science conference statement. Cesarean delivery on maternal request. Obstet Gynecol 2006; 107:1386–97.
6. Betrán AP, Merialdi M, Lauer JA, Bing-Shun W, Thomas J, Van Look P, Wagner M. Rates of caesarean section: analysis of global, regional and national estimates. Paediatr Perinat Epidemiol. 2007 Mar;21(2):98-113.
7. Agarwal M, Verma M, Garg A. Changing trends in cesarean delivery: rate and indications. Int J Reprod Contracept Obstet Gynecol. 2016 Oct;5(10):3522-3524
8. Bhatia M, Banerjee K, Dixit P, Dwivedi LK. Assessment of Variation in Cesarean Delivery Rates Between Public and Private Health Facilities in India From 2005 to 2016. JAMA Netw Open. 2020;3(8):e2015022.
9. Mohammed M, Oumer R, Mohammed F, Walle F, Mosa H, Ahmed R, Eanga S. Prevalence and factors associated with failed induction of labor in Worabe Comprehensive Specialised Hospital, Southern Ethiopia. PLoS One. 2022;17(1):e0263371
10. Bhide A. Induction of labor and cesarean section. Acta Obstet Gynecol Scand. 2021;100(2):187-188.
11. Branger B, Dochez V, Gervier S, Winer N. Césarienne après déclenchement du travail : facteurs de risque et score de prédiction [Cesarean after labor induction: Risk factors and prediction score]. Gynecol Obstet Fertil Senol. 2018;46(5):458-465
12. Bila J, Plesinac S, Vidakovic S, Spremovic S, Terzic M, Dotlic J, Kalezic Vukovic I. Clinical and ultrasonographic parameters in assessment of labor induction success in nulliparous women. J Matern Fetal Neonatal Med. 2020;33(23):3990-3997
13. Kjerulff KH, Attanasio LB, Edmonds JK, Kozhimannil KB, Repke JT. Labor induction and cesarean delivery: A prospective cohort study of first births in Pennsylvania, USA. Birth. 2017;44(3):252-261.
14. Rossi RM, Requarth EW, Warshak CR, Dufendach K, Hall ES, DeFranco EA. Predictive Model for Failed Induction of Labor Among Obese Women. Obstet Gynecol. 2019;134(3):485-493.
15. Ethiraj G, Ramachandra AC, Rajan S. Induction of Labor and Risk for Emergency Cesarean Section in Women at Term Pregnancy. J Clin Gynecol Obstet. 2019;8(1):17-20.
16. Beninati MJ, Ramos SZ, Danilack VA, Has P, Savitz DA, Werner EF. Prediction Model for Vaginal Birth After Induction of Labor in Women with Hypertensive Disorders of Pregnancy. Obstet Gynecol. 2020;136(2):402-410.
17. Ejigu AG, Lambyo SH. Predicting factors of failed induction of labor in three hospitals of Southwest Ethiopia: a cross-sectional study. BMC Pregnancy Childbirth. 2021;21(1):387.
18. Patidar BL, Saini M, Gupta V. Incidence of caesarean delivery after induction of labour in nulliparous women with unfavorable Bishop's score at a tertiary care centre.Int J Reprod Contracept Obstet Gynecol 2022;11:3156-60.
19. Sievert RA, Kuper SG, Jauk VC, Parrish M, Biggio JR, Harper LM. Predictors of vaginal delivery in medically indicated early preterm induction of labor. Am J Obstet Gynecol. 2017;217(3):375.e1-375.e7.
20. Obeidat RA, Almaaitah M, Ben-Sadon A, Istaiti D, Rawashdeh H, Hamadneh S, Hammouri H, Bataineh A. Clinical predictive factors for vaginal delivery following induction of labour among pregnant women in Jordan. BMC Pregnancy Childbirth. 2021;21(1):685.
21. Manjappa AA, Patil AB, Gopinath KR. Study of the Risk Factors for Cesarean Delivery among Pregnant Women Requiring Induction of Labor in a Tertiary Care Institute. J South Asian Feder Obs Gynae 2022; 14 (2):122-127.
22. Cowman W, Scroggins SM, Hamilton WS, Karras AE, Bowdler NC, Devor EJ, Santillan MK, Santillan DA. Association between plasma leptin and cesarean section after induction of labor: a case-control study. BMC Pregnancy Childbirth. 2022;22(1):29.
23. Tarimo CS, Mahande MJ, Obure J. Prevalence and risk factors for caesarean delivery following labor induction at a tertiary hospital in North Tanzania: a retrospective cohort study (2000-2015). BMC Pregnancy Childbirth. 2020;20(1):173.
24. Papoutsis D, Antonakou A, Gornall A, Tzavara C, Mohajer M. The SaTH risk-assessment tool for the prediction of emergency cesarean section in women having induction of labor for all indications: a large-cohort based study. Arch Gynecol Obstet. 2017;295(1):59-66.
25. Goel K, Gedam JK, Rajput DA, Bhalerao MV. Induction of Labor: A Review. Indian Journal of Clinical Practice 2014; 24(11): 1057-1064.
26. Desta M, Duguma A. The Magnitude of Failed Induction of Labor and Associated Factors Among Women Delivered at Public Hospitals of Arsi Zone, Southeast Ethiopia, 2020: A Cross-Sectional Study. Int J Gen Med. 2021; 14:6021-6033.