

## Original research article

## A One Year Cross Sectional Study of Factors Responsible for Failure of Induction of Labor in Term Nulliparous women

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### Abstract

**Objective:** To assess the factors responsible for failed induction of labour (IOL) in a Tertiary care hospital.

**Method:** This is a cross sectional study on women admitted for labour induction in Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar from August 2020 to July 2021. Induction was considered successful if the patient delivered vaginally and failed if it ended up in Caesarean Section.

**Result:** Eighteen percent of our pregnant population who underwent induction of labour failed to deliver vaginally. About 25% of 328 nulliparous women had failed induction. With a Bishop score of <5 in 84.3%. In 28.2% with prolonged latent phase of more than 20 hours in Caesarean section had to be performed.

**Conclusion:** Nulliparity, poor Bishop score and prolonged latent phase had strongest association with failed Induction of Labour. Macrosomia, gestation age, bad obstetric history and pre labour rupture of membranes were other significant risk factors for emergency caesarean sections in IOL.

**Keyword:** Labour induction; Caesarean section; Failed induction

### Introduction

Induction of labour (IOL) is a commonly performed obstetric procedure. It is indicated in cases where waiting for spontaneous onset of labour can jeopardize the maternal or foetal health.

Rate of caesarean section is steadily increasing despite the risk associated with caesarean delivery. Most of the studies have found that there is a 2 fold increased risk for caesarean delivery with induction of labour compared to spontaneous labour.<sup>1,2</sup>

Rate of Induction of labour has doubled in the past decade from 10 to 20%.<sup>3</sup> In some institutions, the rate of IOL is as high as 40%. Some of the increase in this rate is related to a rise in the number of medically and obstetrically indicated inductions, however, it appears that marginally indicated and elective inductions account for a large proportion of IOL.<sup>4</sup> One of the other contributing factors for increasing rate of IOL is the concern of the patients and healthcare providers about the possible risk of foetal demise at term or post term with the expectant management.

Labour induction is considered elective when it is under taken for the purpose of convenience and in the absence of any maternal and foetal condition that justifies delivery.<sup>5</sup>

Case controlled studies or randomized trials<sup>1,6,7</sup> have shown that elective inductions lead to more operative deliveries, more need for pain relief but less meconium in labour.

Borderline reduced amniotic fluid index (AFI), reduced foetal movements, mild pregnancy induced hypertension (PIH), favourable Bishop score, small for gestational age foetus, excess liquor, macrosomia, Impaired Glucose Tolerance at or after 36 weeks of pregnancy are some of the common marginal indications.

Major concerns associated with induction of labour are the potential for increased risk of caesarean delivery, iatrogenic prematurity and cost. Emergency caesarean delivery as compared to simple vaginal delivery is in turn associated with a higher rate of excessive blood loss, post partum infection and maternal mortality.

Known risk factors for failed IOL are nulliparity, diabetes and hypertension. Duration of induction is also a risk factor for caesarean delivery in IOL. The risk of caesarean delivery increases linearly over the course of an induction, with more vaginal deliveries occurring in the earlier part and more caesarean deliveries occurring in the later part of IOL.

The effect of individual physician decision making adds significantly to the caesarean delivery risk.<sup>8,9</sup>

Most common methods for labour induction especially with an unfavourable cervix include intra vaginal insertion of Dinoprostone (PGE<sub>2</sub>), prostaglandin E<sub>1</sub> (PGE<sub>1</sub>) analogue Misoprostol or intra-cervical insertion of balloon catheter.

This study was undertaken to determine the factors leading to failed IOL in women attending a tertiary care hospital.

### **Material and Methods**

This is cross sectional study. All women, admitted for induction of labour in Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar from August 2020 to July 2021 were included. Patient was kept in a lithotomy position, intra cervical Foley's catheter 22-24 gauge was inserted with aseptic technique, under direct vision through Sim's speculum with help of a long artery forceps. The balloon of catheter was inflated with up to 50ml of distilled water. After 10-12 hours of foley's catheter insertion, Prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) 3mg was inserted vaginally, and the dose was repeated after six hours. Maximum of three doses of PGE<sub>2</sub> was inserted depending on the Bishop score followed by augmentation with amniotomy and Oxytocin infusion. Induction was considered successful if the patient delivered vaginally and failed if it ended up in Caesarean Section. Information regarding demographic features, details of induction of labour (indication, method, mode of delivery, complications, and neonatal outcome) was collected from the induction register and medical record files and entered in a pre designed proforma. Data was analyzed using SPSS version 16.0, descriptive statistics were computed. Association of failed induction with the parity, gestational age, macrocosmic babies and bad obstetric history was computed through logistic regression. Association between failed induction and Bishop score, ruptured membranes and prolonged latent phase were also calculated.

### **Results**

A total of 719 women were included in the study. Out of these women, 130 (18.1%) had failed induction. Failed induction rate was 4.6 times higher in nulliparous patients (25.3%) compared to their multiparous counterparts (6.8%). Similarly women undergoing Caesarean section were significantly more likely to have gestational age more than 40 weeks (47.7%) than women having vaginal delivery (36.7%) after IOL.

It was also observed that women having failure of induction were 2.5 times more at odds of having macrosomic babies (3.8%) than patients with successful inductions (1.5%).

Our results suggest that women undergoing Caesarean section had significantly higher chance of having previous bad obstetric history (3.1%) than women having vaginal deliveries (1.5%). A significant association between Bishop score and failed induction was also noted. Rate of induction failure was 1.9 times higher in women with Bishop score of 5 or less (84%) versus (18%) in women with favourable cervix.

This study also proves a relationship between ruptured membranes and failed induction. Women having Caesarean section were 1.3 times more likely to have ruptured membranes than their counterparts. It was further noted that women with failed induction were 2.9 times more at odds of having prolonged latent phase and 1.4 times more likely to have prolonged second stage.

**Table 1 : Frequency of risk factors in women with successful and failed induction**

<b>Risk factor</b>	<b>Successful induction (n=589)</b>	<b>Failed induction (n=130)</b>
<b>Parity</b>		
Nulliparous	328(74.7%)	111(25.3%)
Multiparous	261(93.2%)	19(6.8%)
<b>Gestational Age</b>		
37-40 weeks	349(59.3%)	63(48.5%)
24-36+6 weeks	24(4.1%)	5(3.8%)
>40 weeks	216(36.7%)	62(47.7%)
<b>Ruptured membranes</b>		
Absent	508(82.6%)	107(17.4%)
<12hours	45(83.3%)	9(16.7%)
>12 hours	36(72%)	14(28%)
<b>Bishop</b>		
<5	394(73%)	97(84.3%)
>5	146(27%)	18(15.7%)
<b>Bad obstetric history</b>		
Yes	9(1.5%)	4(3.1%)
No	580(98.5%)	126(96.9%)
<b>Prolonged latent phase</b>		
<20 hours	490(84.9%)	61(71.8%)
>20 hours	73(15.1%)	24(28.2%)
<b>Prolonged second phase</b>		
<2 hours	433(88.4%)	44(84.6%)
>2 hours	57(11.6%)	8(15.4%)
<b>Macrosomia</b>		
Yes	9(1.5%)	5(3.1%)
No	580(98.5%)	125(96.9%)

**Table 2 : Multivariate analysis of risk factors for failed induction**

<b>Risk factor</b>	<b>Adjusted OR</b>	<b>95% Confidence Interval</b>
<b>Parity</b>		
Nulliparous	4.6	2.7-7.7
Multiparous	1	
<b>Gestational Age</b>		
37-40 weeks	1	
24-36+6 weeks	1.2	1.06-3.1
>40 weeks	1.6	1.07-2.3
<b>Ruptured membranes</b>		
Absent	1	
<12hours	0.95	0.4-2
>12 hours	1.84	1.6-3.5
<b>Bishop</b>		
<5	1.99	1.16-3.4
>5	1	
<b>Bad obstetric history</b>		
Yes	2	1.5-6.7
No	1	
<b>Prolonged latent phase</b>		
<20 hours	1	
>20 hours	2.95	1.6-2.6
<b>Prolonged second phase</b>		
<2 hours	1	
>2 hours	1.38	1.2-3.1
<b>Macrosomia</b>		
Yes	2.5	1.7-7.8
No	1	

## Discussion

In this study, 18% of our pregnant population who underwent labour induction because of either indication or elective indications failed to deliver vaginally.

We found that the induction of labour (at term) in nulliparous women is a significant risk factor for emergency caesarean delivery. Failed induction was 4.6 times more likely in nulliparous patients compared to their multiparous counterpart. This association between induction and increased risk for caesarean delivery especially for nulliparity<sup>1,11</sup> has been documented in many studies.

Timely onset of labour and delivery is an important determinant of maternal and perinatal outcome. Both preterm and post term births are associated with higher rates of perinatal morbidity and mortality than pregnancies delivered at term. Gestation age has been reported to be associated with the success or failure of IOL. In our study, caesarean sections were 1.5 times more likely to have gestational age of more than 40 weeks than women having vaginal delivery. A meta analysis of 19 randomized trial showed routine labour induction at > 41 weeks of gestation to be associated with significantly lower rate of perinatal mortality than expectant management (1/2986 versus 9/2953, OR 0.3, 95% CI 0.09 - 0.99) and no significant increase in the caesarean birth rate (OR 0.92, 95% CI 0.76 - 1.12) with induction at 41 week.<sup>12</sup> Our results are contrary to the existing literature. This may be explained by the practice of inducing

labour just after 40 weeks rather than following expectant management till 41 weeks when majority of women may present in spontaneous labour.

Previous studies have shown that preterm pregnancies are induced mainly due to PROM (premature rupture of membranes), foetal growth restriction, small for gestational age,, decreased foetal movement or hypertensive disorders. In these cases caesarean delivery is usually conducted due to presumed foetal distress or non progress of labour. Preterm women with a poor Bishop score are also one of the identified groups with high induction failure.<sup>13</sup> However our results are in contrast to these findings with a weak association of preterm delivery with failed induction. This contrast may be related to the small number of preterm cases in our study.

The odds of failed induction were 1.9 times more likely in women with Bishop score of 5 or less.

The condition of the cervix at the start of induction is an important predictor, with the modified Bishop score being a widely used scoring system. Induction of labour results in high failure rate if the cervix is not ripe.<sup>13,14</sup> The most important element of the Bishop score is dilatation<sup>15-17</sup> although other elements like consistency, effacement, station and position are also important in predicting successful induction in both nulliparous and multiparous women.

Similar results were noted in our study with decrease in the rate of failed IOL with increase in bishop scores.

Various methods have been recommended for induction of labour such as intracervical Foleys balloon, prostaglandin E2 and I/V Oxytocin etc. In our institution we inserted intracervical Foleys balloon for cervical ripening followed by prostaglandin E2 and ARM and I/V oxytocin. Mechanical dilatation of the cervix probably causes collagen disruption and local inflammation increasing the release of prostaglandin and cytokines. Foleys catheter application is a safe and effective method for cervical ripening.<sup>13</sup> This study did not include comparison between different methods of induction of labour.

Given the significantly elevated risk for caesarean delivery, induction of labour in nulliparous women should be approached with caution. This is particularly true if the cervix is unfavorable and the indication is either elective in nature or marginally indicated.

Women with bad obstetric history many times are not allowed to go beyond 40 weeks and therefore have unfavourable cervix at time of induction. In addition, both physician and patient have low threshold for caesarean section.

Duration of induction is also a known risk factor. The risk increases linearly over the course of an induction, with more vaginal deliveries occurring early in induction and more caesarean deliveries occurring later.<sup>18</sup> In our study women with failed induction were 2.9 times more at odds of having prolonged latent phase and 1.4 times more likely to have prolonged second stage. In Michael Beckmann's study in 2007, increased length of latent phase increased the likelihood of birth by c- section significantly.<sup>19</sup>

Length of labour varies by maternal ethnicity,<sup>20</sup> maternal weight and BMI, gestational age, maternal age and other parameters.<sup>21-23</sup> We did not look at these demographic characteristic in our study. One interesting observation was that cesarean sections were 2.3 times more likely in patients who were under care of visiting faculty than full time faculty.

This may be explained by greater time constraints for the visiting faculty leading to possibly a lower threshold for Caesarean section.

Certain characteristics of the foetus may also be associated with induction success. Higher birth weights have been found to increase the risk of failed induction including an increased caesarean delivery rate and a lower rate of vaginal delivery.<sup>24,25</sup> One of the risk factors for failed IOL identified in our study was macrosomic babies. Women having failure of induction were 2.5 times more at odds of having macrosomic babies than women with successful induction. Some studies have found an association of induction failure with specific birth weights such as birth weight greater than 3.5kg. This study shows the magnitude of association of different factors related to failed IOL.

### Conclusion

In conclusion nulliparity, poor Bishop score and prolonged latent phase had strongest association with failed IOL. Macrosomia, gestational age, bad obstetric history and pre labour rupture of membranes were other significant risk factors for emergency caesarean sections in IOL.

We recommend further multicentre, prospective studies of a larger sample size to have a better understanding of factors leading to failure of induction of labour.

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