

Original Research Article

## OBSERVATIONAL STUDY TO IDENTIFY THE FACTORS ASSOCIATED WITH FAILED INDUCTION IN A TERTIARY CARE CENTRE

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### ABSTRACT

**Background:** To identify factors associated with failed induction encompassing maternal, foetal and sociodemographic factors.

**Materials and Methods:** It is a Observational study done in Department of Obstetrics and Gynaecology for a period of 1 year in 249 subjects with Singleton pregnancy, POG  $\geq$  to 37 weeks, Past dates, Pregnancies complicated with medical comorbidities like GDM,HDP and Patients on induction with Dinoprostone 0.5 mg 6th hourly 3 doses alone or f\b oxytocin 1mU to 2mU in incremental doses of 1mU to 4mU every 30 minutes.

**Results:** Mothers with maternal age  $>30$  years were 2.39 times more likely to develop failed induction of labour than those whose age less than 30 years (Similarly, mothers who were primiparous had a 4.53-fold higher chance of a failed induction than mothers who were multiparous. when compared to women with normal, over weight range BMI those with obesity i.e., BMI  $>30$  kg/m<sup>2</sup>, had a 2.85-fold increased risk of a failed induction of labour. Mothers who had an induction time less than 12 hours had a 0.16-fold lower probability of a failed induction compared to those who had an induction time longer than 12 hours. Compared to women whose foetal weight was less than 2.8 kg, mothers who delivered a weight of more than 2.8 kg had a 3.99 times higher chance of developing failed. When comparing those with a lower bishop score to those with a higher score, the odds of a failure induction were 4.53 times higher. Among induced patients 191 patients had vaginal deliveries and 32 patients underwent lower segment caesarean section with indication being failed induction, 26 patients underwent lower segment caesarean section with indication being meconium stained liquor or foetal distress with either bradycardia or tachycardia.

**Conclusion:** The prevalence of failed induction of labor was relatively high in this study area because more than a quarter of mothers who underwent induction of labor had failed induction.

**Keywords:** Labor induction, failed induction, the outcome of induction, associated factors.

### INTRODUCTION

Induction of labour is a common obstetric procedure performed to initiate uterine contractions artificially for vaginal delivery. if it is safer for mother or foetus.

But despite advances in medical science and technology, not all inductions are successful. Some studies state that induction of labour increases caesarean section rates. So understanding of factors associated with failed induction is necessary for

optimising obstetric care and to improve outcome of mother and foetus.<sup>[1,2,3]</sup>

Factors such as age, BMI, parity, bishop score play an important role in influencing the response to induction. Underlying medical comorbidities like DM, HTN may have an effect on effectiveness of labour induction. Foetal factors like birth weight, anomalies, position, presentation, gestational age can also influence the outcome of induction. By examining these factors, we aim to not only enhance our understanding but also pave the way for improved clinical practice, ultimately striving for safer and more effective outcomes for both mothers and babies. Failed induction not only impacts the immediate delivery process but also carries potential implications for maternal and neonatal wellbeing, including increased risk of caesarean delivery, maternal complications. Rate of induction of labour has doubled in the past decade from 10 to 20 percent to as high as 40 percent.<sup>[4,5,6]</sup> This rate is related to a rise in the number of medically and obstetrically indicated induction. This study aims to identify the factors associated with failed induction and assess parity, bishop score, age, BMI, birth weight of baby, associated comorbidities like diabetes, preeclampsia.

## MATERIALS AND METHODS

It is a Observational study done in Department of Obstetrics and Gynaecology for a period of 1 year (from november 2022 to october 2023) in 249 subjects with term pregnancy.

**Inclusion Criteria:** Singleton pregnancy, POG >= to 37 weeks, Past dates, Pregnancies complicated with medical comorbidities like GDM, HDP and Patients on induction with Dinoprostone 0.5 mg 6th hourly 3 doses alone or f/b oxytocin 1mU to 2mU in incremental doses of 1mU to 4mU every 30 minutes.

**Exclusion Criteria:** Preterm, multifetal pregnancy, PROM.

General history of the patient was taken at the time of admission and Obstetric history as number of conceptions, mode of delivery, weather full term/preterm, birth weight of baby, age of baby, H/O need for induction, any antenatal/intranatal/postnatal complications, any abortions ,number and any postabortal complications were noted . Menstrual history as age of menarche, regular cycles or not, LMP and H/O any medical comorbidities General Examination, Abdominal Examination and Pervaginal Examination, Rule out CPD by clinical pelvimetry.

After per abdominal and pervaginal examination, after explaining the patient regarding need for induction, its advantages, and disadvantages, after writing indication of induction and after taking consent proceed for induction of labour, if bishop score is <6 and uterine contractions are inadequate. After looking for maternal vitals and non stress test for foetal heart ,if foetal heart rate is reassuring Start induction with 0.5mg dinoprostone gel 6th hourly maximum 3 doses till adequate uterine contractions achieved or till bishop score is >6,if bishop score is more than 6 and uterine contractions are inadequate then put 1mU to 2mU of oxytocin drip in incremental doses till regular uterine contractions or maximum 12 hours.if bishop score is <6 even after 3 doses of dinoprostone gel or inadequate uterine contractions even after 12 hours of oxytocin drip then we proceeded for LSCS by keeping the indication for caesarean section as failed induction, during this process if there is any foetal distress then we proceed for emergency LSCS by discontinuing the process of induction.

The data was entered in epidata version 4.6 and analysed using statistical product and service solution version 23. Descriptive statistics were performed to describe the study population. Logistic regression (bivariate and multivariable) analysis was conducted and association was expressed in odds ratio with 95% confidence interval and p-value <0.05 is used as cut off to determine the significance in our study.

## RESULTS

**Table 1: Demographic details in comparison with successful induction with failed induction**

		Successful Induction (n=191)	SI (%)	Failed Induction (n=32)	FI (%)	OR (95% CI)	p value
Age	>30 years	185	86	30	14	2.39(1.56-4.78)	0.047*
	<30 years	6	75	2	25		
Parity	Primipara	116	80.6	28	19.4	4.53(1.53-13.4)	0.013*
	Multipara	75	94.9	4	5.1		
BMI	>30	13	54.2	11	45.8	2.85(1.72-4.71)	0.001*
	25-29.9	51	85	9	15		
	18.5-24.9	125	91.2	12	8.8		
	< 18.5	2	100	0	0		

Age of the mother (> thirty years), parity, birth weight, induction time, and bishop score prior to induction have all been found to be associated in bivariate analysis with p-value <0.05. Mothers with maternal age >30 years were 2.39 times more likely

to develop failed induction of labour than those whose age less than 30 years (AOR =2.39; 95% CI: 1.56, 4.78). Similarly, mothers who were primiparous had a 4.53-fold higher chance of a failed induction

than mothers who were multiparous (AOR=4.53; 95%CI: 1.53, 13.4).

Finally when compared to women with normal, over weight range BMI those with obesity i.e., BMI >30

kg/m<sup>2</sup>, had a 2.85-fold increased risk of a failed induction of labour. (95%CI: 1.72, 4.71; AOR=2.85)

**Table 2: Obstetrics details of patients in in comparsion with successful induction with failed induction**

		Successful Induction (n=191)	SI (%)	Failed Induction (n=32)	FI (%)	OR (95% CI)	p value
Past dates	No	129	87.8	18	12.2	1.75(0.25-12.1)	0.57
	Yes	62	81.6	14	18.4		
GDM	No	160	86	26	14	2.45(0.34-17.8)	0.37
	Yes	31	83.8	6	16.2		
HDP	No	132	83	27	17	2.65(0.33-21.1)	0.35
	Yes	59	92.2	5	7.8		
Rh	Positive	175	85.4	30	14.6	0.68(0.36-12.8)	0.79
	Negative	16	88.9	2	11.1		
Foetal growth restriction(FGR)	No	175	85.8	29	14.2	0.593(0.27-13.3)	0.74
	Yes	16	84.2	3	15.8		
Oligos	No	172	84.7	31	15.3	6.13(0.36-104.4)	0.21
	Yes	19	95	1	5		

Obstetrics details are not significant when compared groups.

**Table 3: Outcome in comparison with successful induction with failed induction**

		Successful Induction (n=191)	SI (%)	Failed Induction (n=32)	FI (%)	OR (95% CI)	p value
Induction time	<12 hours	45	97.8	1	2.2	0.16(0.0003-0.83)	0.001*
	12-24 hours	119	100	0	0		
	>24 hours	27	46.6	31	53.4		
Gestational Age	<42 weeks	191	100	31	96.8	1.87(0.87-3.32)	0.99
	>42 weeks	0	0	1	3.2		
Birth weight	>2.8 kg	82	77.4	24	22.6	3.99(1.705-9.329)	0.001*
	<2.8 kg	109	93.2	8	6.8		
Bishop score	<3	116	80.6	28	19.4	4.526(1.526-13.42)	0.003*
	≥3	75	94.9	4	5.1		

Mothers who had an induction time less than 12 hours had a 0.16-fold lower probability of a failed induction compared to those who had an induction time longer than 12 hours (AOR= 0.16;95% CI:0.0003, 0.83).

Similarly, compared to women whose fetal weight was less than 2.8 kg, mothers who delivered a weight of more than 2.8 kg had a 3.99 times higher chance

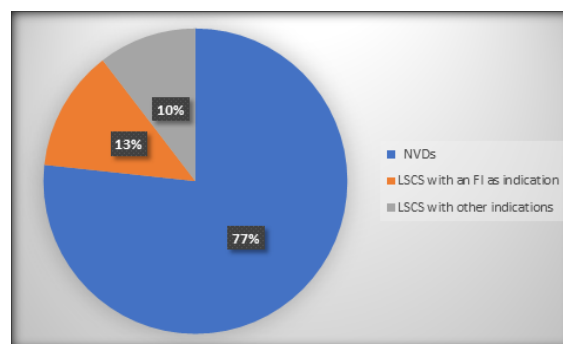
of developing failed IOL (AOR= 3.99; 95%CI: 1.705, 9.329).

When comparing those with a lower bishop score to those with a higher score, the odds of a failure induction were 4.53 times higher (AOR=4.526; 95%CI: 1.526, 13.42).

**Table 4: Based on induction delivery interval**

IDI	SI(n=191)	SI%	FI(n=32)	FI%
<12Hrs	45	100	0	0
12-24Hrs	119	100	0	0
>24Hrs	27	45.8	32	54.2

Among the induced patients 45 patients had an induction delivery interval of <12 hrs and 119 patients had an induction delivery interval between 12-24hrs, and 59 patients had an induction delivery interval of >24 hrs.



**Figure 1**

Among induced patients 191 patients had vaginal deliveries and 32 patients underwent lower segment

caesarean section with indication being failed induction, 26 patients underwent lower segment caesarean section with indication being meconium stained liquor or foetal distress with either bradycardia or tachycardia.

## DISCUSSIONS

The aim of this study is to assess the prevalence and to identify the factors associated with failed induction in a tertiary care centre. According to this study the prevalence of failed induction is 14.3 % that is 32 cases among 223 cases. That means approximately 1 out of 7 cases who had undergone induction of labour. This is comparable to a study done in Seongnamsi, Korea where prevalence of failed induction is 14% (10), this is a prospective observational study in Korea done in 110 women among them labour induction was failed in 15 women.<sup>[7]</sup>

In a study done by Dilnessa et al,<sup>[8]</sup> prevalence of failed induction is 19.75%, in Girma et al,<sup>[9]</sup> study it is 21.43%, in Huresia et al,<sup>[10]</sup> study it is 17.35%. In Wodaje et al,<sup>[11]</sup> study it is 37.37%, in Hilufsara et al study,<sup>[12]</sup> it is 40.35%, in Bekru et al,<sup>[13]</sup> it is 40.35%, in Aluk et al study,<sup>[14]</sup> it is 5.66%. In Lueth et al,<sup>[15]</sup> study prevalence of failed induction is 7.22%. But prevalence is lower than the studies done in Jimma university specialized hospital (21.4%), Dessie referral hospital, Ethiopia (19.7%), Adelaide, Australia (42%),<sup>[9]</sup> Trabzon Turkey (35.2%),<sup>[16]</sup> It may be due to different methods of induction in all these studies. In northeast Ethiopia study there are 319 women undergoing induction of labour among them 19.7% is the prevalence of failed induction. In Adelaide, Australia study, it is retrospective cohort study in 400 nulliparous women 42% is the prevalence of failed induction. In Trabzon, Turkey prevalence among 88 women was 35.2%.

**Table 5: Comparison of our study with other studies**

Author name	Sample size	Prevalence
<b>FI% (failed induction)</b>		
Current study	223	14.3%
Kyo Hoon Park et al <sup>[17]</sup>	110	14%
Dilnessa et al <sup>[8]</sup>	319	19.7%
Girma et al <sup>[9]</sup>	280	21.42%
Wodaje et al <sup>[11]</sup>	380	37.36%
Huresia et al <sup>[10]</sup>	294	17.34%
Hilufsara et al <sup>[12]</sup>	347	40.34%
Lueth et al <sup>[15]</sup>	346	7.22%
Bekru et al <sup>[13]</sup>	347	40.34%
Aluk et al <sup>[14]</sup>	212	5.66%
Current study	223	14.3%
<b>Percentage of unfavourable bishop score among failed induction patients</b>		
Current study	223	87.5%
Bikila Tefera Debelo et al <sup>[18]</sup>	293	81.9%

According to this study for a total of 223 cases, past dates are the most common cause for induction of labour accounting for 76 cases that is 34%. Hypertensive disorders of pregnancy is the second most common cause of induction accounts for 64 cases that is 28.6%

In this study women who had bishop score <3 are more prone to failed induction. So women who had bishop score <3 are 4.5 times more prone to failed induction. This is similar to the study done in Adama hospital medical college, Ethiopia in 2020 in Adama hospital among 293 women failed induction in unfavourable bishop score is 4.05 times higher which was similar to our study.<sup>[7]</sup> In a study done in Adelaide, Turkey among 400 women who had lower bishop scores are 1.4 times more prone to failed induction of labour.

In Bikila Tefera Debelo et al,<sup>[18]</sup> study among failed induction patients 81.9% had unfavourable cervix and 18.1% had favourable cervix. Among failed induction patients in current study 87.5% patients had unfavourable cervix and 12.5% patients had favourable cervix. Nulliparous are more prone to

failed induction this is similar to studies done in eastern Ethiopia, Pakistan, Saudi Arabia.<sup>[7]</sup> This may partly be due to preinduction cervical status and response to induction methods (Debele et al., 2021), or may be due to mothers pelvis hindering vaginal birth.<sup>[18]</sup>

In the current study total number of nulliparous women are 144 among them 28 women prone to failed induction that is 19.4%. Among multiparous women of 79 members 4 women had failed induction of labour that is 5.1%. So in current study nulliparous women are 4.5 times more prone to failed induction when compared to multiparous women. In a study done by Wodaje et al,<sup>[11]</sup> Nulliparous are 4.11 times more prone to failed induction when compared to multiparous. In a study done by Huresia et al,<sup>[10]</sup> nulliparous are 3.11 times more prone to failed induction than multiparous. In a study done by Melkie et al,<sup>[14]</sup> nulliparous are 6.24 times more prone to failed induction than multiparous. In a study done by Girma et al,<sup>[9]</sup> nulliparous are 2.29 times more prone to failed induction than multiparous.

**Table 6: Prone to failed induction and factors associated**

<b>Prone to failed induction than multiparous</b>	<b>OR(95%CI)</b>
Current study	4.5
Wodaje et al <sup>[11]</sup>	4.11
Huresia et al <sup>[10]</sup>	3.11
Melkie et al <sup>[14]</sup>	6.24
Girma et al <sup>[9]</sup>	2.29
<b>More than 30 years are more prone to failed induction</b>	
Current study	2.3
Melkie et al <sup>[14]</sup>	2.16
Huresia et al <sup>[10]</sup>	9.21
<b>BMI &gt;30 are more prone to failed induction</b>	
Current study	2.85
Brock E. Polnaszek et al <sup>[10]</sup>	1.62

In a study done in Ethiopia among 717 mothers who underwent induction of labour nulliparous women are among them 137 women prone to failed induction that is 39.8%.

In a study done in Jigjiga university sheikh Hassan Yabarre referral hospital, Somali region ,Ethiopia,2018-2021 had a sample size of 364 women among them 103 women were nulliparous and 43.2% went into failed induction. Multiparous women are 261 among them 83 had failed induction that is 33.7%. So primipara are 2.7 times more prone to failed induction than multiparous women.<sup>[19]</sup> Percentage of nulliparous women in failed induction is 87.5%,percentage of multiparous women in failed induction is 12.5%, percentage of nulliparous women in successful induction group is 60.7%, percentage of multiparous women in successful induction group is 39.2%.

Those more than 30 years are more prone to failed induction. Thus mothers with >30 years are 2.3 times more prone to failed induction. This is similar to the studies done in Hawassa, Ethiopia, Nepal, Australia, Melkie et al,<sup>[15]</sup> In a study done by Melkie et al, women > 30 yrs are 2.16 times more prone to failed induction than women <30yrs. In a study done by Huresia et al,<sup>[10]</sup> women > 30 yrs are 9.21 times more prone to failed induction than women <30yrs.

This may be due to increased maternal age causes less myometrial contractility and reduced number of oxytocin receptors so myometrium less sensitive to uterotonics such as oxytocin and prostaglandins, this is supported by hypothesis proposed. Percentage of women with age more than 30 yrs in the failed induction group is 93.75%, and the percentage of women with age less than 30 yrs in the failed induction group is 6.25%. Percentage of women with age more than 30 yrs in successful induction group is 96.8%, percentage of women with age less than 30 years in successful induction group is 3.14%.

Birth weight <2.8 kg babies are less prone to failed induction compared to >2.8kg babies. If baby birth weight is >2.8 kg they are 3.9 times more prone to failed induction than in those women with their baby birth weight >2.8 kg. In patients with failed induction birth weight more than 2.8kg are 24 in number, birth weight less than 2.8kg are 8 in number, among patients with successful induction birth weight less than 2.8 kg are 109 and birth weight more than 2.8kg

are 82 in number so percentage of babies with birth weight less than 2.8 kg in failed induction are 25%, in babies with birth weight more than 2.8 kg in failed induction group is 75%. In babies with birth weight more than 2.8kg in successful induction is 42.9%, in babies with birth weight less than 2.8kg in failed induction is 57%.

According to our study BMI >30 are more prone to failed induction. In the current study women with BMI> 30 are 24 among them 11 had failed induction that is 45.8% .in women <30 BMI total number of women are 197 among them 21 went into failed induction that is 10.6% .so women with BMI >30 are 2.85 times more prone to failed induction when compared to women with BMI <30. In a study done by Brock E. Polnaszek et al,<sup>[19]</sup> in nulliparous women with class 3 obesity that is BMI >30 are 1.62 times more prone to failed induction. And multiparous women with BMI >30 are 1.49 times more prone to failed induction. This study was done in 4,653 women in united states in a women who underwent induction of labour from 2010 -2014.

This is supported by Meta-analysis done on influence of maternal obesity on labour induction which shows that obesity increases the risk of failed induction and need more doses of prostaglandins than normal BMI individuals and there is a prolonged induction delivery interval. This may be due to women with more BMI having constitutionally large babies. And they need higher doses of prostaglandins than normal BMI individuals. Percentage of women with BMI >30 In failed induction group are 34.3%. Percentage of women with BMI <30 In failed induction group is 65.6%. Percentage of women with BMI >30 in the successful induction group is 6.8%, and the percentage of women with BMI <30 in the successful induction group is 93.1%.

Indications for induction like past dates, HDP, GDM, Rh Negative pregnancy, FGR, oligoamnios none of them are significantly associated with failed induction. but past dates are the most common cause for induction of labour in our study which is 30.5%, Diabetes complicating pregnancy accounts for 14.8%, Hypertensive disorders of pregnancy accounts for 25.7%, Rh negative pregnancy accounts for 7.2% ,oligohydramnios accounts for 8%, Foetal growth restriction accounts for 7.6%. in a population based study done by Emma M.Swift et al,<sup>[20]</sup> past

dates is the most common indication for induction accounts for 23.7% pre-eclampsia and eclampsia accounts for 11.6% of cases as indication for induction and pregestational diabetes accounts for 1.3%, gestational diabetes accounts for 16.5%, Rh isoimmunisation accounts for 0.5% In a study done

by Yohan Kerbage et al,<sup>[21]</sup> most common indication for induction is Gestational diabetes accounts for 27%, past dates accounts for 21%, hypertensive disorders of pregnancy accounts for 14%, oligohydramnios accounts for 5%, foetal growth restriction accounts for 3%.

**Table 7: Indications for induction of labour in comparison with other studies**

Author name	Indication for induction of labour	Percentage
Current study	Past dates	30.5%
Emma M.Swift et al <sup>[20]</sup>	Past dates	23.7%
Yohan kerbarg et al <sup>[21]</sup>	past dates	21%
Current study	HDP	25.7%
Emma M.Swift et al <sup>[20]</sup>	HDP	11.6%
Yohan kerbarg et al <sup>[21]</sup>	HDP	14%
Current study	GDM	14.8%
Emma M.Swift et al <sup>[20]</sup>	GDM	16.5%
Yohan kerbarg et al <sup>[21]</sup>	GDM	27%
Current study	Rh negative pregnancy	7.2%
Emma M.Swift et al <sup>[20]</sup>	Rh negative pregnancy	0.5%
Current study	oligohydramnios	8%
Yohan kerbarg et al <sup>[21]</sup>	oligohydramnios	5%
Current study	FGR	7.6%
Yohan kerbarg et al <sup>[21]</sup>	FGR	3%

Percentage of past date in current study is 30.5%, in a study done by Emma M.Swift et al,<sup>[20]</sup> it is 23.7%, in a study done by Yohan kerbarg et al,<sup>[21]</sup> it is 21%. Percentage of Hypertensive disorders of Pregnancy in current study is 25.7%, in a study done by Emma M.Swift et al,<sup>[20]</sup> it is 11.6%, and in study done by Yohan kerbarg et al,<sup>[21]</sup> it is 14%.

In the current study GDM accounts for 14.8% of cases, in Emma M.Swift et al,<sup>[20]</sup> study it is 16.5%, in Yohan kerbarg et al,<sup>[21]</sup> study it is 27%. In current study Rh negative pregnancy accounts for 7.2%, in Emma M.Swift et al,<sup>[20]</sup> study it accounts for 0.5%.

In current study oligoamnios accounts for 8%, FGR accounts for 7.6% of cases, in Yohan kerbarg et al,<sup>[21]</sup> study oligoamnios accounts for 5%, FGR accounts for 3% of cases.

In current study among 249 induced cases 191 patients had vaginal delivery that is 76.7%. and in remaining 58 patients 32 had LSCS with indication for LSCS as failed induction and 26 had LSCS with other indications like meconium stained liquor and foetal distress with foetal bradycardia or tachycardia.

## CONCLUSION

In this study 1 in every 7 women who underwent induction of labour went into failed induction. The most common cause for induction of labour in this study is past dates.

Factors such as Bishop score, parity, age, birth weight are the main predictors of failed induction in this study.

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