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Influence of Maternal Factors on Labour Induction Outcomes

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Abstract

Background and Aim: *Induction of labour (IOL) plays a crucial role in minimising negative outcomes for both mothers and newborns. Improved pregnancy outcomes are particularly notable in resource-limited countries, where the rates of maternal and perinatal mortality remain unacceptably high. This research aimed to pinpoint the elements influencing both the success and failure of labour induction, with the goal of enhancing the quality of the procedure and reducing unwarranted indications for its use.*

Materials and Methods: *The research focused on expectant mothers and their newborns. A total of 160 participants were involved in the study. The study examined various maternal parameters, including age, parity, gestational age, BMI, Bishop score, reasons for induction, induction methods, delivery modes, and maternal complications. Additionally, neonatal parameters such as Apgar score, birth weight, and NICU admissions were also analysed.*

Results: *The findings indicate that the vaginal delivery rate was 47.27% for those delivering between 37 and 40 weeks, compared to a significantly higher rate of 76% for deliveries occurring beyond 40 to 42 weeks. The rate of vaginal delivery among women with premature rupture of membranes and those who are postdates was notably high, recorded at 68.42%. A Bishop score of less than 5 was linked to a notably elevated rate of caesarean sections, while a score of 5 or higher correlated with a high rate of vaginal deliveries, reaching 93.75%.*

Conclusion: *The study revealed that the success rate of inducing labour to achieve vaginal delivery stood at 56.25%. Women under 30 years of age, Multigravidas, gestational age between 40 and 42 weeks gestation, Bishop Score above 5 showed a significant correlation with successful labour induction*.

Key Words: Antenatal Mothers, BMI, Labour, Bishop Score, Neonates

Introduction

Induction has become a prevalent practice in contemporary obstetrics, representing 20% of all deliveries.

Induction of labour (IOL) refers to the deliberate initiation of labour or uterine contractions prior to the natural onset of true labour. This procedure is typically considered when the advantages of delivering the foetus surpass the benefits of continuing the pregnancy.[1] The primary objective of inducing labour prematurely is to safeguard the health of both the mother and the unborn foetus, while also reducing the risk of serious obstetric complications associated with unnecessary caesarean sections.[2] Nonetheless, there are instances where the artificial initiation of labour may not yield effective uterine contractions, resulting in a failed induction. The unsuccessful Induction of Labour (IOL) is linked to a heightened risk of various negative maternal and perinatal outcomes.[3] Inducing labour presents a valuable therapeutic choice when the advantages of a timely delivery surpass the potential risks associated with prolonging the pregnancy. The prevalence of labour induction has risen significantly over the years, resulting in a higher rate of this intervention during childbirth. The decision to induce labour in the presence of an unfavourable cervix can be categorised as either medical or elective. Medical induction occurs when there are specific maternal or foetal indications, while elective induction is pursued for the individual's convenience, lacking any medical necessity.[4]

The condition of the cervix plays a crucial role in determining the likelihood of a successful labour induction.

Alongside an unfavorable cervix, several other factors elevate the likelihood of a caesarean section after labour induction. These include being a first-time mother, obesity, maternal age over 30, foetal macrosomia, the administration of epidural anaesthesia, the use of magnesium sulphate, and the presence of chorioamnionitis.[5,6.7] Inducing labour in first-time mothers is associated with a heightened risk of requiring instrumental assistance during vaginal delivery, the necessity for blood transfusions, extended hospital stays, immediate care for the newborn, and potential admission to an intensive care unit.[8.9]

The most prevalent techniques for labour induction, particularly in cases of an unfavourable cervix, involve the intra-cervical insertion of Dinoprostone (PGE2), the use of the prostaglandin E1 (PGE1) analogue Misoprostol intra vaginally or sub lingually, or the intra-cervical placement of a Foley catheter. In most cases, patients undergoing labour induction can expect to achieve vaginal delivery, irrespective of their cervical status and parity. Close monitoring of both the woman and her foetus is essential to mitigate potential risks linked to the procedure. This situation can place significant pressure on the already limited health-care resources available in under-resourced areas.

This research aimed to pinpoint the elements influencing the success and failure of labour induction, with the goal of enhancing the quality of the procedure and reducing unnecessary indications for its use.

Material and Methods

This study was prospective in nature and took place over the course of four months from January 2024 to April 2024within the department of Obstetrics and Gynaecology at Belagavi Institute of Medical Sciences, a Tertiary Care Teaching Institute in South India. The research focused on expectant mothers and their newborns.

Pregnant women meeting the specified inclusion and exclusion criteria and expressing a willingness to participate in the study were recruited. All patients who took part in the study provided written and informed consent. The research focused on women experiencing singleton pregnancies between 37 and 42 weeks of gestation, characterized singeton pregnancy, vertex presentation and sufficient pelvic dimensions. It specifically excluded participants with foetal anomalies, prolonged rupture of membranes exceeding 12 hours, chorioamnionitis, uterine scarring, severe oligohydramnios, cephalo pelvic disproportion and antepartum

haemorrhage.

Statistical analysis

The collected data was systematically organised and input into a spreadsheet application (Microsoft Excel 2019) before being transferred to the data editor interface of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were characterized using means and standard deviations or medians and interquartile ranges, depending on their distribution. Qualitative variables were reported using counts and percentages. The confidence level for all tests was established at 95%, while the level of significance was set at 5%.

Results

Throughout the duration of the study, a total of 2,598 deliveries were recorded. A total of 625 women underwent induction, resulting in an induction of labour rate of 24%. Upon examining the outcomes of induction in the study group, the rate of vaginal deliveries was recorded at 56.25%(N=90) while the rate of caesarean sections stood at 43.75%(N=70).

The vaginal delivery rate among multiparous women was recorded at 76.44%, while it stood at 55.55% for primigravidae. The vaginal delivery rate stood at 47.27% for those delivering between 37 and 40 weeks, in contrast to a significantly higher rate of 76% for deliveries occurring beyond 40 to 42 weeks (see Table 1). The rate of vaginal delivery among women with premature rupture of membranes (PROM) and those who are postdates was notably high at 68.42% (see Table 2). A Bishop score of less than 5 was linked to a notably elevated rate of caesarean sections, while a score of 5 or higher correlated with a high rate of vaginal deliveries, reaching 93.75% (Table 3).

The majority of women experienced no complications. In the observed cases, post-partum haemorrhage occurred in 2.5% of instances, while 3rd degree perineal tears were noted in 0.8% of cases. The Apgar score at 5 minutes for newborns was recorded at ≥ 7 in 98.98% of those delivered vaginally, compared to 95.05% in the caesarean section group. The vaginal delivery rate was observed to be 75% for infants with a birth weight of less than 2.5 kg, in contrast to a rate of 45% for those weighing more than 3.5 kg, with the difference being statistically significant (Table 5). Only 3.5% of newborns required NICU admission for more than 24 hours.

Table 1: Gestational age and mode of delivery

Gestational age	Mode of delivery		P value
	Vaginal delivery N (%	Caesarean section N (%)	
37-40 weeks	52 (47.27)	58 (52.72)	0.03*
>40-42 weeks	38 (76)	12 (24)	

*** Indicate statistically significance at p≤0.05**

Table 2: Indication of induction and mode of delivery

Indication of induction	Mode of delivery		P value
	Vaginal delivery N (%)	Caesarean section N (%)	
Oligohydramnios	26 (43.3)	34 (56.6)	0.002*
PROM	26 (68.42)	12 (31.57)	
Gest age > 40 weeks	17 (70.83)	7 (29.16)	
PIH	7 (27)	19 (73)	
GDM	2 (33.3)	4(66.6)	
Prolonged latent phase	1 (25)	3 (75)	
Non-reactive NST	1 (50)	1 (50)	

*** Indicate statistically significance at p≤0.05**

Table 3: Bishop score and mode of delivery

Mode of delivery	Bishop score		P value
	<5	≥5	
Vaginal delivery	60 (46.87)	30 (93.75)	0.03*
Caesarean section	68 (53.12)	2 (6.25)	

*** Indicate statistically significance at p≤0.05**

Table 4: Mode of delivery and 5 min APGAR score

Gestational age	Mode of delivery		P value
	Vaginal delivery N (%	Caesarean section N (%)	
< 2.5 kg	15 (75)	5 (25)	0.03*
≥ 2.5 kg to 3 kg	49 (60.49)	32 (39.50)	

>3 to 3.5 kg	21 (42)	29 (58)	
>3.5 kg	5 (45.45)	6 (54.5)	

*** Indicate statistically significance at p≤0.05**

Discussion

The study focused on a cohort of 160 women who experienced induction of labour within the Obstetrics and Gynaecology department. Notably, the rate of induction at our institution was recorded at 24% throughout the duration of the study. In developed countries, the rates of induction are notably high, ranging from 20% to 30%.[9,10] The criterion we adhered to for a successful induction was the attainment of vaginal delivery. In this study, 56.4% of participants had vaginal deliveries. A recent study conducted in Pakistan revealed an 18% failure rate associated with induction procedures.[11]

In the 20-25 age group, the vaginal delivery rate stood at 63.25%, while for women over 30 years, it was notably lower at 32.8%. A prior investigation revealed that the average age at which induction occurred was 22.3 years, with a vaginal delivery rate of 51.32%.[12] Nevertheless, the body of research examining the relationship between age and the induction of labour remains limited.[13,14] This aligns with findings from other studies, although the research conducted by MacDorman et al., which examined a decade of induction practices in the United States, reported no impact of age on the prevalence of induction.[15]

The study revealed that 62%(99) of the participants were primigravidas, while 38%(61) were multigravidas. The rate of vaginal delivery among nulliparous women stood at 51.55%(51), while for multiparous women, it was higher at 73.8%(45). A study conducted by Khan et al. in Pakistan revealed that 61% of the women involved were nulliparous. The findings indicated a vaginal delivery rate of 74.7% among nulliparous women, compared to 93.2% for those who were multiparous. In nulliparous women, the likelihood of failed induction was found to be 4.6 times greater.[11]

The study revealed that 76% of women were at a gestational age of 37 to 40 weeks, while 24% were in the range of over 40 to 42 weeks. The induction of labour at an advanced gestational age tends to correlate with a heightened risk of caesarean delivery. In our study, the rate of vaginal delivery for early gestational age (37 to 40 weeks) was observed to be 47.27%, compared to a significantly higher rate of 76% for late gestational age (over 40 to 42 weeks). This observation aligns with ACOG guidelines, which indicate that elective induction prior to 39 weeks of gestation typically leads to increased Caesarean section rates. However, Khan et al. presented opposing findings, likely attributable to elective induction occurring at 40 weeks.[11]

Numerous factors can warrant the induction of labour. The predominant reasons for intervention include oligohydramnios, pre-labor rupture of membranes, and post-dated pregnancy, which collectively represent 75% of cases. This is followed by gestational hypertension and gestational diabetes. Women with oligohydramnios, premature rupture of membranes (PROM), and those who are post-dated experienced higher rates of vaginal delivery. However, the rates of Caesarean sections were elevated among women with gestational hypertension and gestational diabetes mellitus (GDM). A systematic review conducted in 2009 identified post-dated pregnancy, premature rupture of membranes (PROM), and oligohydramnios as the most prevalent reasons for induction, aligning with the findings of the current study.[16] A study has provided evidence that the induction of

labour in post-dated pregnancies is linked to successful induction outcomes.[14] Yawn and colleagues reported a noteworthy decline in the incidence of induction due to premature rupture of membranes during the period from 1980 to 1995. In France, the primary reason for intervention was post-dates pregnancy, closely followed by cases of ruptured membranes. Several factors contributed to this outcome, including maternal age, parity, the gestational age at which the women were induced, Bishop score, the indication for induction, and the method of induction, all of which have been previously discussed. A study conducted in 2016 revealed that 63.5% of participants experienced vaginal delivery, while 36.5% underwent caesarean section after labour induction[20].

No notable maternal complications were reported. In the observed cases, postpartum haemorrhage occurred in 2.5% of women, while 0.8% experienced a third-degree perineal tear. Limited research has documented complications experienced by mothers. A study conducted in Bangladesh reported that cervical tear and postpartum haemorrhage (PPH) were observed in 4% of cases each. Additional research has indicated that the initiation of labour may be linked to a higher likelihood of caesarean deliveries and negative perinatal results.[21,22] In cases of induced delivery, birth asphyxia was observed in 16% of instances. However, our study revealed that only six infants required admission to the NICU for more than 24 hours.[23] This aligns with the findings from research carried out in South Carolina and at the Addis Ababa Military Hospital in central Ethiopia.[24,25] Additional research from Jordan and Ethiopia corroborates this finding, indicating that cases without foetal heartbeat abnormalities demonstrate a higher success rate compared to those exhibiting abnormal foetal heartbeat patterns.[26]

The study's limitation lies in its small sample size, which restricts the ability to generalise the findings effectively. Given that the research was carried out at a single institution, caution is warranted when extrapolating the findings to the broader population.

Conclusion

The study reported a success rate of 56.25% for achieving vaginal delivery following the induction of labour. Women under 30 years of age, Multigravidas, gestational age between 40 and 42 weeks gestation, Bishop Score above 5 showed a significant correlation with successful labour induction. Factors such as nulliparity, the indication for induction, gestational age of 40 weeks or less, a pre-induction Bishop score below 5, and a higher birth weight exceeding 3 kg have been linked to a rise in the rate of caesarean sections. Induction of labour did not result in any notable maternal or perinatal complications. Additional efforts are essential to enhance the effectiveness of labour induction by evaluating and tracking both maternal and foetal conditions prior to starting the induction process. Furthermore, it is essential to focus on induction protocols and established guidelines to enhance the success rates of labour induction.

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