Journal of Biomedical and Pharmaceutical Research
Available Online at www.jbpr.in
CODEN: - JBPRAU (Source: - American Chemical Society)
NLM(National Library of Medicine): ID: (101671502)
Index Copernicus Value 2020: 76.36
Research Article
Volume 9, Issue 6: November-December: 2020, 66-73
ISSN (Online): 2279-0594
ISSN (Print): 2589-8752

STUDY OF FACTORS RESPONSIBLE FOR FAILURE OF INDUCTION OF LABOR IN TERM NULLIPAROUS WOMEN

Dr. Monika Hantodkar
Assistant Professor Dept. of Obstetrics and Gynecology Datta Meghe Medical College, Nagpur

Article Info: Received 15 November 2020; Accepted 27 December. 2020
Corresponding author: Dr. Monika Hantodkar
Conflict of interest statement: No conflict of interest

ABSTRACT:

BACKGROUND:

Worldwide, unsuccessful induction of labor is a public health concern. The unfavorable outcome of an emergency cesarean section is increased when labor induction attempts fail, and this is linked to an increased rate of morbidity in both the mother and the fetus. Additionally, it raises the possibility of a number of unfavorable outcomes for both the mother and the unborn child, including uterine rupture, unsettling fetal heart rate tracing, postpartum hemorrhage, stillbirth, and severe delivery asphyxia. Healthcare costs and maternal and newborn outcomes are impacted by unsuccessful labor induction, particularly in low-resource settings where the incidence of labor induction is low but the prevalence of failure induction is higher. One aspect of comprehensive obstetric care services that is being used more frequently in modern obstetrics to lower the risk of morbidity and mortality among mothers and newborns is induction of labor.

AIM: The purpose of the study was to evaluate the contributing factors to unsuccessful hospital inductions of labor (IOLs).

MATERIAL AND METHOD:

This cross-sectional investigation was done in the gynecology department. The entire study population consisted of 200 patients, 48 of whom had a CS and 152 of whom had a vaginal birth. Patients were split into two groups based on delivery mode: Group A (vaginal delivery) and Group B (CS). With the aid of long artery forceps and aseptic procedures, the patient was maintained in the lithotomy position while an intracervical Foley catheter 22-24 gauge was put under direct eyesight through Sim's speculum. A maximum of 50 milliliters of distilled water were pumped into the catheter's balloon. Prostaglandin E2 (PGE2) 3mg was inserted vaginally after 10–12 hours of foley's catheter placement, and the dose was repeated after 6 hours.

RESULTS:

The entire study population consisted of 200 patients, 48 of whom had a CS and 152 of whom had a vaginal birth. While mild preeclampsia was more significant in Group B, gestational diabetes was more prevalent in Group A. Following multinomial logistic regression analysis, patients with moderate preeclampsia had a threefold increased risk of developing CS. Throughout the entire study population, the average PGE dosage was 2.12 (±1.03) mg. Nevertheless, it was greater in the patients who had CS when taking into account the mode of delivery. The PGE dose was higher for individuals who delivered delivery vaginally only in the "preeclampsia" subgroup.

CONCLUSION:

Our results are particularly intriguing because the success rate was high even though we chose a group of patients who were at risk of not succeeding with labor induction. Thus, clinical problems including maternal diabetes, hypertension, isolated oligohydramnios, and PROM, as well as parameters like "nulliparity," "gestational age," "unfavorable Bishop score," and "kind of used dinoprostone," do not

individually affect the induction success. Then, in order to prevent needless CS, a number of maternal and fetal factors that affect the success of labor induction must be considered. As such, inducing labor is a highly responsible medical procedure that necessitates a comprehensive evaluation of the mother's and fetus's health.

KEYWORDS: Labor induction; Caesarean section; Failed induction and Associated factors

Introduction

The purpose of induction of labor (IOL) is to artificially start uterine contractions. IOL should only be performed when there is a strong medical justification and the anticipated advantages outweigh the risks.[1] The global rate of labor induction has been steadily rising over the last few years.[2,3] The induction of labor, or IOL, is a routine obstetric operation. It is recommended when waiting for labor to start on its own can endanger the health of the mother or the fetus. Despite the risk involved in cesarean delivery, the rate of cesarean sections is rising rapidly. Compared to spontaneous labor, induction of labor carries a two-fold higher risk of cesarean birth, according to the majority of research.[4,5] The rate of Induction of labor has doubled in the past decade from 10 to 20%.[6] The percentage of IOL in certain universities can reach 40%. A significant percentage of IOL appears to be accounted for by minimally indicated and elective inductions, despite the fact that the frequency of medically and obstetrically indicated inductions has increased. The worry that patients and healthcare professionals have regarding the potential danger of fetal death at term or post-term with expectant management is one of the additional reasons that contribute to a rising occurrence of IOL.[7]

Several factors are considered as predictors of induction failure such as Bishop's score \6, nulliparity, gestational age\41 weeks, maternal age 30 years, pregnancy complicated by preeclampsia, premature rupture of membranes (PROM), isolated oligohydramnios, gestational diabetes, and hypertension.[8,9] There are a few ways to induce labor, but vaginal prostaglandin (PGE) is the procedure of choice for these patients. It also stimulates myometrial activity and causes or expedites cervix maturation.[10]

Poor maternal and perinatal outcomes (perianal laceration, hysterectomy, admission to an intensive care unit, prolonged hospital stay, postpartum hemorrhage, and chorioamnionitis) were more likely when labor was induced.[11,12] When women are induced rather than going through spontaneous labor, the likelihood of a cesarean delivery increases by around two to three times, and the most frequent reason for a cesarean delivery is a failed induction.[13,14] Compared to vaginal delivery (59 USD), the cost of healthcare for delivery services was substantially greater for cesarean sections (270 USD).[15] In Ethiopia, the cesarean section is higher among induced women (38.44%)[16] compared to spontaneous labor (19.2%).[17] Due to the hazards involved in the process, it is advised that induction of labor be limited to medical and obstetric grounds.[18,19] By terminating the pregnancy in the face of numerous obstetrical and medical disorders that pose a hazard to the continuation of the pregnancy, this obstetrics care service has reduced the risk of morbidity and mortality among mothers and newborns.[20,21,22] The possibility of an increased risk of cesarean birth, iatrogenic preterm, and expense are the main issues with inducing labor. Maternal mortality, excessive blood loss, and postpartum infections are consequently linked to greater rates of emergency cesarean delivery when compared to straightforward vaginal delivery. Nulliparity, diabetes, and hypertension are recognized risk factors for unsuccessful IOLs. In IOL, the length of the induction is another risk factor for cesarean birth. During an induction, there is a linear increase in the probability of cesarean delivery; more vaginal deliveries occur in the early stages of IOL, and more cesarean deliveries occur in the latter stages. The chance

of a cesarean delivery is greatly increased by the influence of individual physician decision-making.[23] The most frequent contributing variables for a failed induction, according to study, include birth weight, post-term, past obstetric problems, parity, maternal age, gestational age, bishop score, and PROM. Nonetheless, the factors contributing to unsuccessful labor induction vary according on the healthcare facility and the socioeconomic standing of the community.

MATERIAL AND METHODS

This cross-sectional investigation was done in the gynecology department. The entire study population consisted of 200 patients, 48 of whom had a CS and 152 of whom had a vaginal birth. Patients were split into two groups based on delivery mode: Group A (vaginal delivery) and Group B (CS). With the aid of long artery forceps and aseptic procedures, the patient was maintained in the lithotomy position while an intracervical Foley catheter 22-24 gauge was put under direct eyesight through Sim's speculum. A maximum of 50 milliliters of distilled water were pumped into the catheter's balloon. Prostaglandin E2 (PGE2) 3mg was inserted vaginally after 10–12 hours of foley's catheter placement, and the dose was repeated after 6 hours. Depending on the Bishop score, up to three PGE2 doses could be injected. This was followed by augmentation using an amniotomy and an oxygen tocin infusion. If the patient delivered vaginally, the induction was deemed effective; if a Caesarean section was required, it was deemed unsuccessful. From the induction register and medical record files, data on demographic characteristics and specifics of induction of labor (indication, method, mode of delivery, complications, and newborn outcome) were gathered and recorded in a pre-made proforma.

The inclusion criteria were as follows:

singleton pregnancy, nulliparity, 37–40 week gestation, lack of active labor, use of dinoprostone gel that releases quickly, live fetus with cephalic presentation, and no reason why vaginal delivery cannot be performed. The following conditions led to the decision to induce labor: isolated oligohydramniosis, moderate preeclampsia, gestational diabetes (without consequences for the mother or fetus), hypertension, and PROM (spontaneous labor not started after 24 hours). The rate of cesarean sections (CSs) was the main outcome measure. The mean dosage of dinoprostone, the neonatal safety outcome, and the CS rate in relation to the patient's particular obstetric state were among the secondary outcomes.

Operational definition

Failure to achieve regular (e.g., every 3 minutes) uterine contractions and cervical change with artificial rupture of membranes occurs at least 6–8 hours after the maintenance dosage of oxytocin injection. This is known as failed induction. When a fetus is alive, artificial rupture of the membranes is used to induce labor. When inducing labor, artificial rupture of the membranes is not performed if intrauterine fetal death is present.

Post-term

Post-term is defined as a pregnancy that advances to or beyond 42 completed weeks or 294 days of gestation from the first day of the last normal menstrual period.

Protocol and implementation of induction of labor

Depending on the cervix's favorability, both medical (misoprostol and oxytocin) and mechanical (balloon catheter and Sweeping membrane) techniques are used to induce labor in the research area (all hospitals). For cervical ripening, 25 μg of vaginal misoprostol is administered every six hours if the cervix becomes unfavorable (bishop's score < 4). If no improvement is seen, the amount of misoprostol is increased to a maximum of 200 μg. Misoprostol is sometimes used by women to induce the active phase of labor prior to oxytocin infusion.[24] Induction of labor in our study setting follows the national guideline protocol in which 5 IU of oxytocin is added into 1000 ml of N/S or R/L solution and adjust the number of drops is every 30 min. A low dose of oxytocin is used to induce labor, and it is increased every 30 minutes until a sufficient uterine contraction is obtained. Electronic monitoring was used to assess the fetal's health during the first hour of observation and the first two hours following the

injection of inducing drugs. Every hour prior to the start of labor and every 30 minutes once labor started, intermittent auscultation was done. Constant electronic monitoring was done during labor if the fetal heart rate showed abnormalities during intermittent auscultation.

STATISTICAL ANALYSIS

The SPSS (17.0 for Windows) application was used to evaluate all of the data that was gathered from the instances. The outcomes were presented as rate or mean ± SD. An analysis of variance was used to compare groups and subgroups (one-way ANOVA). For continuous variables, the Student's test was utilized, while for categorical variables, Fisher's exact test was employed. Using logistic regression analysis, the relationship between CS and potential predictors was determined. A multinomial logistic regression analysis was used to look at the probability of CS in the subgroups while adjusting for the relevant covariates.

RESULT: -

200 patients comprised the whole study population, of whom 152 (76 %) had a vaginal delivery and 48 (24 %) underwent a CS. The characteristics of the study population were as follows: Mean maternal age: 32.81 (±5.66) years, mean gestational age: 38.32 (±1.34) weeks, Mean Bishop score pre-induction: 2.56 (±1.69), Mean birth weight: 3,177.22 (±545.08) g. Group A and B did not share the same newborn gender. There were 100 men (50%) and 52 women (26%), in Group A; in Group B, there were 18 men (9%), and 30 women (15%). Bishop's score, gestational age, and mean mother age varied between the two groups. Baby girls born to Group A mothers had higher Apgar scores. Maternal age was found to be one independent significant variable following logistic regression analysis.

Table 1: Characteristics of patients for the analyzed variables

	Group A (*n* = 152) 76 %	**Group B (*n* = 48) 24 %**	**CI 95 %**
Age	28.35 (±3.46)	31.22 (±4.81)	−2.55 to (−0.1)
Weeks of gestation	35.40 (±1.21)	34.85 (±1.31)	0.01–0.77
Bishop's score	1.58 (±1.58)	1.05 (±1.57)	0.05–1.10
PGE dose (mg)	2.10 (±1.1)	2.27 (±0.85)	−0.5 to 0.06
Birth weight	3201.55 (±513.25)	2055.1 (±610.38)	−31.2 to 304.47
Apgar score			
1st min	6.40 (±0.82)	7.10 (±1.12)	0.30–0.12
5th min	8.53 (±0.46)	8.30 (±0.63)	0.24–0.07

Table 2: Comparison of different maternal clinical conditions between the two groups

	Group A (%)	**Group B (%)**
Gestational diabetes	55 (36.18 %)	4 (8.33 %)
Gestational hypertension	18 (11.84 %)	2 (4.17 %)
Isolated oligohydramnios	34 (22.36 %)	12 (25 %)
Mild preeclampsia	5 (3.28 %)	8 (16.67 %)
PROM	40 (26.31 %)	22 (45.83 %)

Gestational diabetes was more present in Group A, while mild preeclampsia was more significant in Group B. After logistic regression multinomial analysis, patients affected by mild preeclampsia had a three times higher risk for CS. The mean dose of PGE was 2.12 (±1.03) mg (median 3 mg, minimum 1 mg, and maximum 7 mg) in the whole study population.

Table 3: Mean total PGE dose between the two groups with regard to maternal clinical conditions

Subgroups	Mode ofdelivery	Mean PGE dose
Gestational diabetes	Vaginal delivery	2.14
	CS	3
	Total	2.18
Gestational hypertension	Vaginal delivery	2.5
	CS	3
	Total	3
Isolated oligohydramnios	Vaginal delivery	2.27
	CS	2.5
	Total	2.26
Mild preeclampsia	Vaginal delivery	2.65
	CS	2
	Total	2.27
Prom	Vaginal delivery	2.9
	CS	2.23
	Total	2

In most cases, the start of labor required a maximum of 4 mg of PGE. Merely five patients needed a greater dosage but were still delivered vaginally. Although Group B generally required a larger mean total dose for PGE, the difference was not statistically significant. The subgroups' mean PGE dosages were similar. Nevertheless, it was greater in the patients who had CS when taking into account the mode of delivery. The PGE dose was higher for individuals who delivered delivery vaginally only in the "preeclampsia" subgroup.

DISCUSSION

With a diverse incidence ranging from 0.5 to 10%, extended pregnancy is the most prevalent reason for medical induction of labor.[25] However, induction may be tried at different gestational times for different medical purposes. For example, a number of authors recommend induction by the 39th week of gestation in individuals with gestational diabetes to lower the risks associated with fetal macrosomia.[26] Inducing labor is largely regarded as a means of preventing fetal infections in individuals with PROM at term.[27] To minimize adverse effects for both the mother and the fetus, moderate pre-eclampsia and gestational hypertension complicating pregnancies may be induced prior to the 40th week of gestation.[28] Conversely, there are differing views on whether or not patients with isolated oligohydramnios require induction of labor. A meta-analysis revealed no differences in fetal acidity but significantly higher incidence of congenital shock (CS) as a result of anomalies in fetal heart rate and poorer Apgar scores in women with oligohydramnios.[29] When a woman lives in a rural area as opposed to an urban one, there is a statistically significant correlation between her place of residence and the induction of labor failing. According to a Dessie Referral Hospital study, women who live in rural areas are four times more likely than those who live in urban areas to experience a failed induction of labor. This finding is consistent.[30] This is because they don't have proper access to transportation to get to medical facilities, which creates additional issues that could lead to an early or late start of labor. Additionally, it was consistent with study conducted at Aga Khan University and was two times higher in women with a gestational age of 42.[31] The fact that labor is typically induced at 40 weeks instead of waiting until 42 weeks, when most women may appear in spontaneous labor, may help to explain this.

Another well-known risk factor is the length of the induction. Over the duration of an induction, the risk rises linearly, with a greater number of

vaginal births occurring early and a greater number of cesarean deliveries occurring later.[18] Women who had a failed induction were shown to be 1.4 times more likely to have a protracted second stage and 2.9 times more likely to have a prolonged latent phase in our study. In **Michael Beckmann's study in 2007**, the increased length of the latent phase increased the likelihood of birth by c- section significantly.[32]

Women whose body mass index > 24 kg/m2 were 5.7 times more likely to have failed induction as compared with women whose body mass index ≤24 kg/m^2. Previous findings corroborate this one. Maternal obesity has been linked to a lower bishop score; women with lower bishop scores are more likely to experience an unsuccessful induction. Furthermore, obese women have a higher failure rate due to the fact that they require higher concentration, higher doses, and longer exposure times to uterotonics medication in order to achieve vaginal delivery. This is because all women with different BMIs require similar protocols and guidelines on labor induction. According to the current study, women who are morbidly obese have greater levels of uterine contractility impairment; this could result in an unsuccessful induction.[33]

The success of induction may also be linked to specific fetal features. It has been discovered that higher birth weights are associated with a higher risk of unsuccessful induction, which includes a higher rate of cesarean deliveries and a lower rate of vaginal deliveries. Macrosomic newborns were one of the risk factors for failing IOL that our investigation found. Compared to women who had successful induction, those who had failed induction were 2.5 times more likely to give birth to macrosomic children. Studies have discovered a correlation between certain birth weights, such as those weighing more than 3.5 kg, and induction failure. The extent to which various factors are associated with unsuccessful IOLs is demonstrated by this study.[34]

One factor that could contribute to the unsuccessful induction of labor could be the participants' financial circumstances. Nonetheless, the most of the women who took part in this research were housewives, and they were unable to recall the family's financial situation. If the sample size had been higher, some of the study variables may not have had wider confidence intervals. More precisely, the precise technique of IOL and the pre-induction conditions, with a focus on cervical status, must be carefully taken into account. For moms undergoing IOL, early detection and treatment of women with obstetric problems can enhance maternal and neonatal outcomes. Prior to starting IOL, careful monitoring of the mother's and fetus's condition is also essential. In conclusion, we suggest conducting long-term research to determine the actual cause of unsuccessful IOLs.

CONCLUSION:

Our results are particularly intriguing because the success rate was high even though we chose a group of patients who were at risk of not succeeding with labor induction. Thus, clinical problems including maternal diabetes, hypertension, isolated oligohydramnios, and PROM, as well as parameters like "nulliparity," "gestational age," "unfavorable Bishop score," and "kind of used dinoprostone," do not individually affect the induction success. Then, in order to prevent needless CS, a number of maternal and fetal factors that affect the success of labor induction must be considered. As such, inducing labor is a highly responsible medical procedure that necessitates a comprehensive evaluation of the mother's and fetus's health. In conclusion, the factors that were most strongly associated with failing IOL were nulliparity, a low Bishop score, and a protracted latent phase. Macrosomia, advanced age at delivery, a poor obstetric history, and premature membrane rupture prior to birth were other noteworthy risk factors for emergency cesarean sections in IOL.

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