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Original Article

AN OBSERVATIONAL STUDY OF EFFECT OF LABOUR INDUCTION ON MECONIUM ASPIRATION AND FOETAL OUTCOME

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ABSTRACT

Objective: Labor induction is a widely used procedure to initiate artificial uterine contractions, but its impact on meconium aspiration and fetal outcome needs further investigation, as meconium aspiration syndrome (MAS) poses significant risks to the newborn, including respiratory distress and other complications.

Methods: This prospective observational study evaluates labor induction and evaluate the occurrence of meconium aspiration and overall fetal outcomes. Data from a tertiary care hospital were analyzed, including mode of induction, gestational age, Bishop score, meconium-stained amniotic fluid, Apgar scores, NICU admissions, and other relevant parameters. Statistical analysis was conducted to identify significant associations.

Results: This observational study aimed to explore the relationship between labor induction and meconium aspiration, as well as their impact on fetal well-being. Data analysis identified correlations between labor induction techniques, meconium-stained amniotic fluid, and neonatal outcomes, offering valuable insights for clinical decision-making and optimizing fetal outcomes.

Conclusion: The impact of labor induction on meconium aspiration and fetal outcomes was investigated in this study, providing valuable insights for healthcare professionals and contributing to the improvement of safety guidelines for obstetric care.

Keywords: Labor induction, Meconium aspiration, Fetal outcome, Meconium-stained amniotic fluid

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INTRODUCTION

Induction of labor is a common procedure in obstetric practice that involves artificially initiating uterine contractions to facilitate the dilation and effacement of the cervix, ultimately leading to the birth of the baby. Recent studies have shown that the rate of labor induction varies between 9.5% and 33.7% of all pregnancies annually. In developed countries, approximately 19.8% of labors are induced, with a significant increase in elective induction of labor at term due to maternal or fetal indications [1].

Before induction, cervical ripening is a crucial step that is assessed using the Bishop's scoring system. A favorable cervix is defined by a modified Bishop score of more than 8, while an unfavorable cervix has a Bishop score of less than 4.2. The development of prostaglandins has revolutionized the management of cases with an unfavorable cervix as they improve the cervical score and induce contractions. Prostaglandin E2 analogs, such as Dinoprostone, have become important drugs in obstetric practice due to their ability to stimulate uterine contractions and prime the cervix. Among the different forms and preparations of prostaglandins, Dinoprostone gel, particularly Hens Dinoprostone gel, is considered the preferred method for labor induction. However, a careful risk-benefit analysis is necessary before any induction of labor [2].

To evaluate the efficacy of prostaglandin E2 gel, our study aims to observe the maternal and fetal outcomes of labor after a single versus double application of the gel. Various methods, including the use of Oxytocin, different prostaglandin cervical ripening agents, and cervical dilating agents, have been studied for labor induction [3]. Clinical trials have shown that prostaglandins effectively induce cervical ripening and stimulate uterine contractions. Currently, only two prostaglandin cervical ripening agents, Dinoprostone gel (Cerviprime) and Dinoprostone vaginal pessary are approved by the Food and Drug Administration (FDA). It's important to note that Cerviprime gel is expensive, requires refrigeration for storage, and necessitates endocervical administration. Successful induction of labor should fulfill three aims: adequate uterine contractions and progressive dilation of the cervix, culminating in a vaginal delivery, and achieving these goals with minimal discomfort and risk to both the mother and fetus, particularly in viable pregnancies [4]. Modern obstetric techniques have significantly improved the safety and reliability of labor induction, increasing confidence in achieving timely induction and reducing maternal and perinatal morbidity and mortality. Methods of labor induction can be broadly categorized into medical and surgical approaches. Medical methods involve the use of drugs such as Oxytocin, Prostaglandins PGE2 and PGE1, and Mifepristone. Surgical methods include artificial rupture of membranes (ARM), stripping the membranes, and mechanical methods like Foley's catheter, Laminaria tents, and bougies. Surgical and mechanical methods often lead to the local release of prostaglandins, which can induce and augment the process of labor [5].

Prostaglandins, first isolated by Von Euler in 1935 from seminal fluid, are 20-carbon atom body fatty acids with a five-membered cyclopentane ring and two side chains. They are divided into nine groups based on their chemical structure. The most commonly used prostaglandins in obstetrical practice are PGE2 and PGF2. Described as the "ultimate uterine stimulant" by Csapo, prostaglandins are believed to be the final link between the complex neuroendocrine pathway and their action on the uterus [6]. These compounds are locally produced in response to various stimuli, such as the rupture of membranes, stretching of the cervix, vaginal examinations, or the introduction of a catheter. This may explain why labor induction can be successful through such maneuvers. The human cervix is composed of collagen, water, and glycosaminoglycans (GAGs), particularly chondroitin and dermatansulfate. Prostaglandin E2 (PGE2) acts by altering the ratio of GAGs and proteoglycans in the cervix, leading to several important changes. Firstly, PGE2 facilitates collagen breakdown, which helps to soften and ripen the cervix. Secondly, it alters collagen binding and tissue hydration, contributing to the cervical ripening process. Thirdly, PGE2

stimulates the activity of the upper segment of the uterus while inhibiting the myometrial activity of the lower segment, establishing a fundal dominance that aids in the progression of labor [7]. Moreover, PGE2 promotes cervical relaxation, which is essential for the smooth delivery of the fetus. Extensive research has been conducted on the effectiveness of prostaglandins in cervical ripening and labor induction. In our study, we aim to assess the efficacy of prostaglandin E2 gel and evaluate the maternal and fetal outcomes following a single versus double application of the gel. By conducting this research, we hope to contribute to the existing body of knowledge on labor induction and provide insights into the optimal use of prostaglandin E2 gel in clinical practice [8].

Prostaglandins, particularly prostaglandin E2, play a crucial role in cervical ripening and labor induction. The development of synthetic prostaglandins has revolutionized the management of cases with an unfavorable cervix, providing a safe and effective method for inducing labor [9]. Our study aims to evaluate the efficacy of prostaglandin E2 gel and analyze the maternal and fetal outcomes following single versus double application. By expanding our understanding of the optimal use of prostaglandin E2 gel, we strive to enhance the safety and success of labor induction, ultimately benefiting both mothers and babies [10].

MATERIALS AND METHODS

It will be a hospital-based descriptive study to find out obstetric outcome of single versus double application of prostaglandin E2 for induction of labour in the department of Obstetrics and Gynaecology, Jhalawar Medical College and Hospital, year 2018-2019. After taking informed written consent of 200 women with singleton live pregnancy, fulfilling inclusion criteria all admitted for induction of labour will be recruited for our study. A detailed history will be taken and a thorough general abdominal and pelvic examination of the Patients to done. Digital cervical evaluation will be performed at the initiation of induction of labour and score will be assigned as per modified Bishop's scoring system.

Duration of study: Oct 2018-Sep 2019

Study design-Longitudinal

Sample size calculated

Sample size was calculated at 95% confidence level assuming response in 50% of study participant after 1 dose dinoprostone E2 gel. At relative allowable error of 5% minimum 200 patients are required as sample size.

$n= z^2p (1-p)$

e^2 = Where z-95% confidence interval (standard value 1.96)

P= 50% proportion when prevalence is not known (0.5)

e= allowed error (5%)

Effect of error

N= n+5%n

Approx. 202

Inclusion criteria

- A viable singleton pregnancy after as of viability in a cephalic presentation
- Normal foetal heart rate
- Intact membranes, Bishops Index ≤6
- Medical indication for labour induction
- No known contraindications for vaginal delivery.
- Informed consent.

Exclusion criteria

- Previously caesarean section.
- Evidence of cephalopelvic disproportion/contracted pelvis.
- Foctal distress
- Severe oligohydramnios
- Presence of absolute contraindications for use of prostaglandins E vaginal gel-for example, history of adverse reactions to prostaglandin preparations.
- Failure to obtain informed consent.
- Pregnancies with known foetal malformations or chromosomal aberration.

RESULTS

The table shows the results of the induction of labor duration based on the number of gel applications. The Chi-square test resulted in a p-value of 0.411, indicating no significant difference between the groups.

Table 1: Distribution of cases according to Instillation of gel to onset of labour interval and number of applications of PGE_2 gel

		No of gel		Total	Chi sq.	P. Value
		Single	Double			
Induction-Onset of Labour-Duration	Less than 8 H	89	86	175		
		89.0%	86.0%	87.5%		
	More than 8 h	11	14	25	0.411	0.521
		11.0%	14.0%	12.5%		
Total		100	100	200		
		100.0%	100.0%	100.0%		

Table 2: Distribution of cases according to duration of labour and number of application of PGE_2 gel

		No of gel		Total	Chi sq.	P. Value
		Single	Double			
Duration of Labour	Less than 4 H	82	83	165		
		82.0%	83.0%	82.5%		
	More than 4 h	18	17	35	0.035	0.852
		18.0%	17.0%	17.5%		
Total		100	100	200		
		100.0%	100.0%	100.0%		

The table displays the results of the duration of labor based on the number of gel applications. The Chi-square test yielded a p-value of 0.852, indicating a non-significant difference

Table 3: Distribution of cases according to mode of delivery and number of application of PGE_2 gel

		No of gel		Total	Chi sq.	P. value
		Single	Double			
Mode of Delivery	LSCS	26	27	53		
		26.05	27.0%	26.5%		
	ND	74	73	147	0.026	0.873
		74.0%	73.0%	73.5%		
Total		100	100	200		
		100.0%	100.0%	100.0%		

The table displays the results of the mode of delivery based on the number of gel applications. The Chi-square test yielded a p-value of 0.873, indicating no significant difference between the groups.

Table 4: Distribution of cases according to admission in NICU

		No of gel		Total	Chi sq.	P. Value
		Single	Double			
Admission of NICU	No	87	82	169		
		87.0%	82.0%	84.5%		
	Yes	13	18	31	2.089	0.130
		13.05	18.0%	15.5%		
Total		100	100	200		
		100.0%	100.0%	100.0%		

The table presents the results of NICU admission based on the number of gel applications. The Chi-square test resulted in a p-value of 0.130, indicating no significant difference between the groups.

Table 5: Distribution of cases according to meconium at aminotomy in newborns and number of application of PGE_2 gel

		No of gel		Total	Chi sq.	P. Value
		Single	Double			
Meconium at aminotomy	No	90	86	176		
		90.0%	86.0%	88.0%		
	Yes	10	14	24	1.049	0.306
		10.0%	14.0%	12.0%		
Total		100	100	200		
		100.0%	100.0%	100.0%		

Table shows that about 10% cases in single application group had nium at amniotomy while 14% cases double application group had nium at amniotomy.

Table 6: Distribution of cases according to meconium aspiration in newborns and number of applications of PGE_2 gel

		No of gel		Total	Chi sq.	P. Value
		Single	Double			
Meconium at delivery	No	91	88	179		
		91.0%	88.0%	89.5%		
	Yes	9	12	21	0.046	0.831
		9.0%	12.0%	10.5%		
Total		100	100	200		
		100.0%	100.0%	100.0%		

The table shows the association between the presence of meconium at delivery and the number of fetuses with single or double gestation. Out of 200 cases, 179 had no meconium and 21 had meconium present. There was a statistically significant association between the presence of meconium at delivery and single or double gestation (p-value = 0.046).

Table 7: Distribution of cases according to APGR score at 5 min and number of applications of PGE_2 gel

		No of gel		Total	Chi sq.	P. Value
		Single	Double			
APGAR 5 min	<7	22	24	46		
		22.0%	24.0%	23.0%		
	>7	78	76	154	0.113	0.737
		78.0%	76.0%	77.0%		
Total		100	100	100		
		100.0%	100.0%	100.0%		

Table shows that about 78% of new-borns in the single application had APGAR score of 27 and 76% in the double application had APGAR score of 27. In single application group newborns delivered with APGAR score<7 were 22% cases and in double application were 24%. The difference was not statistically significant.

DISCUSSION

The discussion centers around the topic of labor induction and its impact on various outcomes. Cervical ripening before labor induction, particularly in cases with a favorable cervix, has several benefits. It reduces the likelihood of not being delivered within 12 and 24 h, decreases the need for epidural analgesia, and lowers the rates of cesarean delivery and operative vaginal delivery. However, it can also increase the occurrence of uterine hypertonus [11].

The dosing regimen of prostaglandin (PGE2) gel, the level of monitoring required, and the use of oxytocin after PGE2 gel administration still lack sufficient information. The ideal dosing regimen for labor induction with a favorable cervix using prostaglandin is yet to be determined. When compared to oxytocin, prostaglandin has shown a reduced likelihood of failed induction and operative delivery. The decision to induce labor should consider the potential risks to both the mother and the fetus, and these factors should be discussed with the woman before initiating the induction process [12].

The study enrolled 200 patients who required labor induction, and all women were induced using cerviprime gel. Half of the participants received a single application of dinoprostone E2 gel 0.5 mg, while the other half received double application of dinoprostone gel 0.5 mg. The majority of women in both groups were booked at the hospital, which was consistent with previous studies in the region. There were no major differences in the characteristics of women such as rural or urban area, literacy, and parity [13].

The most common indication for induction in the study was postdatism, followed by PROM, PIH, oligohydramnios, and other factors. The response to the drug was positive, with a high percentage of women experiencing a latent interval of less than 8 h and delivering within 4 h of labor onset [14]. The success rate of induction, defined as achieving vaginal delivery, was comparable between the single and double gel groups. However, the double gel group had a slightly higher rate of cesarean section deliveries [15].

Meconium at amniotomy was observed in a small percentage of cases, and maternal side effects were minimal and similar in both groups. The data on secondary outcome variables showed no significant association between NICU admission and mean Apgar score in both groups, although NICU admission was slightly higher in the double gel group. Meconium aspiration syndrome was the primary indication for NICU admissions [16].

Overall, the study findings indicate that cervical ripening and labor induction with PGE2 gel can be effective in achieving vaginal delivery with minimal maternal side effects and favorable neonatal outcomes. However, further research is needed to determine the optimal dosing regimen, monitoring requirements, and the use of oxytocin after PGE2 gel administration. These findings contribute to the existing knowledge on labor induction and can assist healthcare professionals in making informed decisions and improving obstetric care safety guidelines [17].

CONCLUSION

In conclusion, the observational study on the effect of labor induction on meconium aspiration and fetal outcomes has provided valuable insights. While the results suggest a potential association between labor induction and meconium aspiration, further research is needed to establish causality. Understanding these findings can aid healthcare professionals in making informed decisions regarding labor induction and contribute to improved maternal and fetal outcomes.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INETRESTS

Declared none

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