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Various modalities of induction of labour and its fetomaternal outcomes: An observational study

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ABSTRACT

Introduction: In order for induction to be successful, it should result in labour with adequate uterine contraction and progressive dilatation of cervix with the outcome of a vaginal delivery with minimal risk to both mother and foetus. Primary outcome of the current study was to compare various modalities of Induction of Labour, alone or in combination & to evaluate the different outcomes of mother and baby.

Materials and Methods: History, general, obstetrical, vaginal examination to record Modified Bishop score, basic investigations and recent obstetric ultrasound was noted of 200 pregnant mothers and the results were analyzed. Foetal monitoring was done in all except those with confirmed IUFD cases. Methods used were Dinoprostone, Misoprostol, Oxytocin, Amniotomy and Mechanical Dilatation with Foley's catheter; single or in combination with each other.

Results: Among the 200 mothers, 118(59%) delivered vaginally and 82 (41%) mothers underwent LSCS. Dinoprostone gel was the dominant method used followed by misoprostol and oxytocin respectively. NICU admissions were required in 21.7%, 25.8% & 33.3% of the mothers who were induced with Dinoprostone, Misoprostol and Oxytocin respectively. 14 babies were diagnosed with IUFD, all delivered vaginally, out of which 10 were induced with misoprostol and 4 were induced with mechanical dilatation. Majority of the patients who underwent induction with dinoprostone alone delivered by LSCS (63.4%) but Dinoprostone with ARM & oxytocin for induction had a better outcome. Induction with Dinoprostone followed by misoprostol lead to more LSCS than SVD and there were 1%(2 babies) of perinatal mortality due to Meconium Aspiration Syndrome.

Conclusion: Misoprostol and Mechanical induction were the most preferred method in cases of IUFD. Induction with a combination of Dinoprostone with ARM or Oxytocin lead to more vaginal delivery than Dinoprostone alone, so this should be preferred. Induction with Dinoprostone followed by misoprostol lead to more LSCS and perinatal mortality so a combination of them should be given cautiously.

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1. Introduction

Labour induction is a clinical intervention which benefits the mother or new-born when continuation of pregnancy poses a risk or danger to the outcome of pregnancy. Induction of labor (IOL) is certainly one of the most frequently performed obstetric procedures in the world.

The goal of success in induction of labour is to achieve a spontaneous vaginal delivery with the possibility to initiate adequate uterine contractions, favourable cervical changes without hyperstimulation, foetal compromise or distress within reasonable time frame and with minimum maternal discomfort. With this background, the present study was planned.

The primary endpoint of the study is to compare various modalities of induction of labour and evaluating the

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different outcomes of the mother and baby in developing countries. The search for an induction method that modulates the unfavourable to favourable cervix without stimulating any foetal or maternal complications and which improves the ultimate goal of induction almost eliminating the risk to the foetus remains the Holy Grail.

2. Materials and Methods

This was a prospective observational study carried out on 200 pregnant mothers admitted to the labour room in the Department of Obstetrics & Gynecology, Institute of Medical Sciences, Banaras Hindu University (BHU), Varanasi, India between July 2018 and June 2020 requiring induction of labour and fulfilling the inclusion criteria were selected. The study was initiated after approval by the institutional ethics committee.

All the pre-requisite before induction of labour was done. General history, obstetrical, pelvic assessment, vaginal examination to record modified Bishop score, basic investigations and recent obstetric ultrasound was recorded and analyzed. Fetal monitoring was done; except for those with confirmed Intrauterine fetal demise (IUF) cases.

Materials used were Dinoprostone gel 0.5mg (repeated up to 3 doses, 6 hourly), Misoprostol (25 mcg vaginally; 4 hourly up to maximum 5 doses), Oxytocin (standard low dose), Early Amniotomy (<4cm dilatation) and Mechanical Dilatation with Foley's Catheter. Though method of induction was decided by the consultant, as a general rule with a Modified Bishop score of ≤ 5 , induction with prostaglandins or mechanical dilatation were done. Oxytocin and amniotomy was preferred with a more favourable cervix. As this was a purely observational study, all agents single or in combination were included and the results were analyzed. Monitoring & progress of labour was done with the help of WHO modified Partograph and cardiotocography (CTG). If patient had inadequate uterine contractions then augmentation was done with oxytocin, which was not included as a part of induction of labour.

2.1. Inclusion criteria

200 pregnant mothers who were undergoing induction of labour were selected in this study.

2.2. Exclusion criteria

Refusal of consent for inclusion in study.

3. Results

3.1. Incidence

Around 5072 mothers delivered in Sir Sunderlal Hospital, BHU, Varanasi, India between July 2018 & June 2020. Incidence of induction of labour was around 20.36%, i.e., 1033 cases. 200 pregnant mothers were included in this

study.

3.2. Indication

The most common indication of induction was crossing of dates (47%), followed by oligohydramnios (16%), premature rupture of membranes (14%) & obstetric cholestasis (14%), pregnancy induced hypertension (10%), IUF (7%) etc. Elective induction was done in 10% of the cases.

3.3. Mode of delivery

59% of the mothers had spontaneous vaginal delivery (SVD) whereas 41% of the mothers had to undergo Lower segment Caesarean Section (LSCS). Majority (90%) of the LSCS group were primigravida. Therefore, there was a strong association between parity and mode of delivery. 84% of the mothers who delivered vaginally and 97.6% who underwent LSCS were term pregnancy. Only 2 mothers had to undergo pre-term LSCS, which depicts that there is a strong relation between gestational age and mode of delivery.

Out of vaginally delivered babies, 15.3% were admitted to Neonatal Intensive Care Unit (NICU). Out of the 82 mothers that underwent LSCS, 68.3% of babies were handed over to mother and 31.7% were admitted to NICU. This depicts that there were more complications in the babies who required LSCS. All the pregnant mothers who were induced for Intra-uterine fetal demise were delivered vaginally. Therefore, there was a strong association between outcome of baby and mode of delivery.

Table 1: Shows outcome of baby in association with mode of delivery

Outcome of baby	SVD		LSCS	
	No.	%	No.	%
Handed Over to Mother	86	72.9	56	68.3
NICU	18	15.3	26	31.7
IUF	14	11.9	0	0.0
Total	118	100.1	82	99.9

3.4. Time taken

In our study, mean duration for active phase of first stage of labour to delivery was 2.93 hours after induction by single agent; while about 4.48 hours in combination methods used. Time taken by a single agent is much less than combination method from active phase to delivery which is statistically significant ($p=0.009$).

3.5. Method of induction

Induction of Labour was done with Dinoprostone gel in 73%, Misoprostol in 31%, Oxytocin in 13%, Amniotomy

6% and Mechanical Dilatation 2%; single or in combination.

After induction with Dinoprostone, 74% of babies were handed over to mother but 21.7% required NICU admissions. After Misoprostol, 25.8% were admitted in NICU. Out of 14 USG diagnosed intrauterine fetal demise, 12 were induced with misoprostol (all delivered vaginally). Oxytocin was method of induction in 12 pregnant mothers, 33.3% were admitted in NICU. Amniotomy was done in concurrent with another method, 15.4% of babies were admitted to NICU. Mechanical dilatation was done only in 4 IUFD babies and were successful (100%).

Majority of the mothers who underwent induction with dinoprostone alone delivered by LSCS (63.4%). There were 18 cases in which induction with Dinoprostone followed by Misoprostol, in which 12.2% had to undergo LSCS while only 6.8% delivered vaginally depicting that the combination of the two yields to more complex outcomes. Dinoprostone with ARM is more successful at delivering vaginally (10.2%).

Higher rates of CTG abnormalities were seen with Misoprostol (29%) than with Dinoprostone (20.5%). Higher rates of MSAF were observed in Misoprostol (19.4%) than in Dinoprostone (16.4%). Higher rates of FIOL were observed with Dinoprostone (13.7%). Few LSCS were done due to Failed progress of labour and Chorioamnionitis as well.

3.6. Outcome of baby

Out of 22% of babies requiring NICU, 19% were discharged after minimum of 8 hours to a maximum of 5 days of NICU. 15% of babies required Room Air and were kept under observation. Some baby required High Flow Nasal Cannula (4%) followed by Nasopharyngeal Airway (1%), bubble CPAP (1%) and 1% required Mechanical Ventilator. 2% were shifted to Pediatric surgery who had congenital anomalies. However, there was a perinatal mortality of 1% of the total number of babies delivered. Both were due to Meconium Aspiration Syndrome.

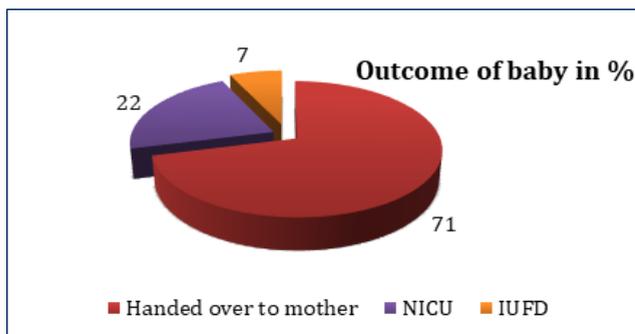


Fig. 1: Shows outcome of baby in percentage

4. Discussion

Induction of labour is a stressful situation for the mother and the obstetrician. There is a dilemma and controversy about why to induce, where to induce, when to induce and how to induce? With the apparent rising trends in Induction of Labor in the last few decades, the use and abuse of induction has become a source of heated controversies. There are various controversies regarding the relation of Bishop score and method of induction, advantages of induction over spontaneous labour, appropriate gestational age for induction, single or combination of method, method of induction in specific circumstances and the outcomes of mother and foetus.

After comparison with other studies and our study, we conclude that maternal age is an independent predictor of labor induction success affecting the duration of labor and mode of delivery. Being a tertiary referral hospital, our study comprised of mainly unbooked patients (66%). This is in contrast with study done by Osaheni Lucky Lawani¹ (2014), where the vast majority (86.2%) were booked and received antenatal care. In our study, most of the induced age group was in between 20-30 years of age with primigravida being 62%. 41 pregnant women underwent LSCS after induction of labour, out of which majority (90.2%) were primigravida. Same was observed in various studies done by Bukke.²

In 200 induced pregnant mothers in our study, 59% delivered vaginally whereas 41% undergone Caesarean section. There was no instrumental delivery in our study. This is in contrast of two recent study done in 2017 by Chawla S³ and Acharya,⁴ where only 27.1% and 33.2% respectively underwent LSCS; whereas in our study caesarean section was done in 41% of total induced women. Therefore, we can conclude that the rate of Caesarean section after induction in our hospital is higher (41%) than other studies compared.

In our observational study, we analysed different methods for induction of labour. Dinoprostone has been the agent of choice for induction for cervical ripening for several decades. That is the reason why in our study, majority (73%) women were induced with Dinoprostone gel. In our study, the success rate of only 56.2% was observed after Dinoprostone; 43.8% underwent Caesarean section. In contrast to our finding, in a study done by Maggi C,⁵ 74% of women delivered vaginally following induction of labor with dinoprostone.

In our study, vaginal misoprostol (25 mcg) was applied (31%) maximum up to 5 doses; mostly in cases of rupture of membranes, crossing of dates, IUFD etc. After evaluating our study, we found a successful vaginal delivery only in 58.06% with the use of Misoprostol. This is in contrast with a study done by Sharma DD⁶ who found vaginal delivery was successful in 72% after Misoprostol.

Oxytocin was used in only 12 patients for induction of labour, mostly in combination with prostaglandins or

Table 2: Shows mode of delivery in relation to the single or combination of the method used

Methods used	Mode of delivery in percentage	
	SVD	LSCS
Dinoprostone gel	47.5	63.4
Misoprostol	18.6	17.1
Oxytocin	3.4	0
ARM	1.7	0
Dinoprostone gel & Misoprostol	6.8	12.2
Dinoprostone gel & Oxytocin	3.4	0
Dinoprostone gel & ARM	10.2	2.4
Dinoprostone gel & Mechanical Dilatation	1.7	0
Misoprostol & ARM	3.4	2.4
Misoprostol & Mechanical Dilatation	1.7	0
Oxytocin & ARM	1.7	2.4
Total	100.1	99.99

amniotomy in our study; mostly in cases of favourable cervix. Low dose regimen was used in our hospital which was then titrated to reach an effective contraction. In a study done by Acharya,⁴ there was a success rate of 66% with oxytocin. In contrast, our study had a better success rate with oxytocin (83.33%), but since only 12 patients were given oxytocin, we need to study a larger population.

Amniotomy was used in 13% of pregnant mothers mostly in combination with another agent. A study done by S M Cooley,⁷ in total 80.5% had a spontaneous vaginal delivery after amniotomy with or without oxytocin. A similar of 76.9% was observed in our study. In our study, only 4 IUFD women were induced via Foley's catheter with other prostaglandins, a success rate of 100% as both delivered vaginally. Since only four patients were induced by mechanical dilatation; it is difficult to compare with other studies.

We can conclude that in our study, MSAF (19.4%), Pathological CTG (29%), Tachysystole was observed more in Misoprostol but failed induction was seen more in Dinoprostone (13.7%). Similar findings were observed in a study done by Kumari S⁸ (2015).

In a study done by Rajiv M⁹ (2011), using dinoprostone for cervical priming followed by vaginal misoprostol not only hastened the progress of labor, with a greater percentage of women delivering vaginally and consequent reduction in caesarean section rate, but also reduced the adverse effects encountered with misoprostol when used alone, namely, tachysystole, uterine hyperstimulation and fetal heart abnormalities. Although this was not observed in our study. 9 women received a combination of Dinoprostone and Misoprostol, 4 delivered vaginally and 5 women were shifted for caesarean section due to Pathological CTG and MSAF. There were 2 cases of perinatal mortality with this combination as well.

22% were admitted in NICU in our study. In contrast to this, a study done by Lamichhane S¹⁰ (2016) reported 2.07% and 5.5% of born babies needed NICU admission

respectively. We can say that a higher rate of NICU admissions were seen in our study after inductions. In our study, 7% required a respiratory support; in the form of nasopharyngeal airway, HFNC, bubble CPAP or mechanical ventilator which was in contrast to a systematic review done by Robert M¹¹ (2020), where only 3.1% required neonatal respiratory support.

However, there was a perinatal mortality of 1% of the total number of babies delivered. Both babies had Apgar score of <7 in 5 minutes. One of the babies required intubation and mechanical ventilator support, the other was on bubble CPAP in NICU. Despite all necessary interventions within 48 hours both babies expired and cause of death was Meconium Aspiration Syndrome (MAS). Both these cases were induced both by Dinoprostone followed by Misoprostol. So, we can conclude that combination of prostaglandins should not be used for induction of labour. Study done by Robert M¹¹ (2020) reported 0.1% of neonatal death in induction groups. Therefore, in our study the perinatal mortality was higher (1%) than other studies.

5. Conclusion

Labour induction should be done after carefully assessing it's risks to the mother and the foetus. The variables involved in induction of labour are many and ideally should be evaluated on a case-by-case basis. In our study, combination method (4.48 hours) took longer than single method of induction (2.93 hours) from active phase to delivery. Misoprostol and Mechanical induction were the most preferred method in cases of IUFD. Majority of the patients who underwent induction with dinoprostone alone delivered by LSCS (63.4%) but Dinoprostone with ARM & Oxytocin had a good outcome; so, this should be preferred.

Induction with Dinoprostone followed by misoprostol lead to more LSCS than SVD and there were 1% of perinatal mortality (due to Meconium Aspiration Syndrome), so a combination of Dinoprostone and Misoprostol should be given cautiously according to our study.

6. Source of Funding

None.

7. Conflict of Interest

None.

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