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Original Research Article

Study of comparison of maternal and fetal outcomes in spontaneous labour and induced labour

Apurva A. Mankar^{1*}, Bhaskar K. Murthy², Vaibhav B. Patil²

¹Department of Obstetrics and Gynecology, Government Medical College, Nagpur, Maharashtra, India

²Department of Obstetrics and Gynecology, Government Medical College, Miraj, Maharashtra, India

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*Correspondence:

Dr. Apurva A. Mankar,

E-mail: drapurvamankar@rediffmail.com

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ABSTRACT

Background: There has been consistent proportionate increase in the cases of induction of labor, but both maternal and neonatal effects of it remain poorly analysed previously. The present study was undertaken with the objective of comparison of maternal and fetal outcomes between groups of patients undergoing induction of labor and those having spontaneous labor.

Methods: In this comparative prevalence study, the participants selected by predefined criteria were divided into 2 groups on the basis of progression of labor. They were spontaneous labor (group A) and induction of labor (group B). All the participants were assessed for various relevant maternal and neonatal outcomes and valid comparisons drawn.

Results: A total of 1300 participants were studied. Proportion of patients requiring caesarean section was significantly higher in induction group (39.17%) against the spontaneous labor group (15.37%), with fetal distress being the commonest indication in both groups. The commonest complication noted was postpartum hemorrhage (PPH) (2.96% in group A and 1.98% in group B, $p < 0.05$). Mean birth weight of babies was 2.76 ± 0.42 kgs in spontaneous labor group and 2.68 ± 0.48 kgs in induction of labor group ($p > 0.05$). Incidences of NICU admissions and neonatal deaths were significantly higher in induction of labor group.

Conclusions: Induction of labor should be employed judiciously by assessing the maternal and fetal condition and confirming relevant indication and should only be done if continuation of pregnancy is relatively more hazardous to either mother or baby.

Keywords: Induction of labor, Spontaneous labor, Maternal outcome, Fetal outcome

INTRODUCTION

Labor is a natural physiological process characterized by progressive increase in frequency, intensity and duration of uterine contractions resulting in effacement and dilatation of the cervix with descent of the fetus through the birth canal.¹ Labor could either be spontaneous or induced. Spontaneous labor is the physiological process by which the uterus expels the products of conception after period of 28 weeks gestation spontaneously termed as normal labor. Spontaneous labor is triggered by release of oxytocin and prostaglandin naturally and progressing to labor.² Induction of labor is the artificial initiation of

uterine contractions prior to their spontaneous onset leading to progressive dilatation and effacement of the cervix and delivery of the baby, after 28 weeks of gestation.³

The world has seen steady and significant rise in proportion of cases of induction of labor vis-à-vis spontaneous labor.^{4,5} Infact, the overall rate of induction of labor is rising faster than the rate of pregnancy complications that would lead to a medically indicated induction.^{4,6} Reasons for this disproportionate increase are complex and multifactorial. Better planning of birth by the obstetricians, patient and her family is the most common

reason. Other reasons include greater availability of cervical ripeners, more open attitude towards marginal or elective inductions and undue litigious constraints and considerations at the end of medical practitioners.^{4,6}

However, the incidences of maternal and neonatal effects of induction of labor in comparison to spontaneous labor were not studied well enough till now and remain largely presumptuous, especially in central India. Hence, the current study was planned with the objective of comparison of maternal and fetal outcomes in patients who went into labor spontaneously with the patients in whom induction of labor was undertaken at a tertiary care government facility in central India.

METHODS

This comparative prevalence study was conducted by the department of obstetrics and gynaecology of a tertiary care teaching hospital in Central India. The study was conducted over twenty one months (January 2017 to September 2018), after due approval from the institutional ethics committee.

The participants were enrolled for the study as per below mentioned selection criteria.

Inclusion criteria

Patients with singleton pregnancy with vertex presentation; all patients in latent and active labor with postdated cases, premature rupture of membranes, oligohydramnios, intrauterine growth restriction, pregnancy induced hypertension, abruption to be given trial of spontaneous labor (group A); all patients not in labor with postdated cases, premature rupture of membranes, oligohydramnios, intrauterine growth restriction, pregnancy induced hypertension, abruption to be induced (group B) were included in the study.

Exclusion criteria

Patients with previous caesarean section; patients with heart disease and bronchial asthma; intrauterine death and not willing to give consent were excluded from the study.

Written informed consent was obtained from all the eligible participants before commencement of the study. Detailed history was recorded including all complications in past and present pregnancy, if any. Clinical examination was done including general examination and per abdomen examination to check whether it was relaxed or contraction are present. Per speculum and per vaginal examination were undertaken to assess the Bishops score for induction.⁷ Routine investigation like haemoglobin, HIV testing, blood grouping were done for all the patients. Special investigations like liver function test, renal function test, bleeding time clotting time, prothrombin time, INR (International normalized ratio) were done wherever indicated clinically.

Patients in group A were monitored for spontaneous progression of labor. Patients in group B with unfavourable cervix received 0.5 mg of prostaglandin gel (PGE₂) in the cervical canal. If the cervix was still unfavourable after 6 hours, another dose of 0.5 mg PGE₂ gel was repeated up to a maximum of 1.5 mg PGE₂ gel or 3 doses to achieve optimal cervical ripening. Once the cervix became favourable, oxytocin infusion was started 6 hrs after the last dose.

Intrapartum fetal monitoring was done by intermittent auscultation of fetal heart sound and continuous electronic monitoring was done as per requirement. Maternal outcomes in the form of mode of delivery and indications for caesarean section were compared in the two groups. The duration of labor in the two groups were compared by assessing the labor delivery interval (in group A) with induction delivery interval (in group B). Various maternal complications in labor in both groups were compared. Fetal outcomes were compared by assessing the birth weight, neonatal intensive care unit admissions and neonatal deaths in both groups.

Statistical analysis was performed by Microsoft excel. Continuous variables were presented as mean±SD and categorical variables were presented as absolute numbers and percentage. Valid comparisons were drawn between the mentioned groups using Chi square test and unpaired t test. The level of significance was arbitrarily set at $p < 0.05$.

RESULTS

In the present study, a total of 1300 participants were finally enrolled as per mentioned selection criteria and considered for analysis; out of which 644 patients were in group A (patients who went into spontaneous labor) whereas 656 patients were in group B (patients where induction of labor was done).

Significant majority of the participants (694, 53.4%) were in the 21-25 years age group. The mean age was 22.62 ± 3.30 years in group A and 22.69 ± 2.80 years in group B and the difference was statistically insignificant. Majority of the patients in both the groups were primigravida (group A=55.44%, group B=59.45%), with no statistically significant difference between groups. As for the indications for termination of pregnancy, major ones were those with postdate pregnancy (40.07% in group A, 41.47% in group B), premature rupture of membranes (24.85% in group A, 18.75 % in group B), pregnancy induced hypertension (15.99% in group A, 13.56% in group B); the groups being statistically comparable with similar indications.

The labor delivery intervals/induction delivery intervals were compared between the 2 groups. The mean duration of labor in group A was 4.820 ± 3.48 hours and in group B was 10.302 ± 5.73 hours, significantly higher than in group A. Majority of patients in spontaneous labor (67.71%)

delivered in less than 6 hours while majority of patients after induction (37.66%) delivered between 6 to 11 hours.

The proportion of patients requiring caesarean section was very high in induction group (39.17%) in comparison to the spontaneous labor group (15.37%), the difference being statistically significant. Most common indication for caesarean section was fetal distress (88.89% in group A and 75.09% group B, $p < 0.05$). Failure of induction was noted in 46 cases in induction of labor group (Table 1).

There were no major complications in majority of patients (95.80% in group A and 96.49% in group B) in both groups. Most common complication noted was PPH (2.96% in group A and 1.98% in group B, $p < 0.05$). One patient had rash over body in the induction of labor group. (Table 2).

Majority of babies (53.10% in spontaneous labor group and 52.31% in induction labor group) weighed between

2.6-3 kgs at birth. Mean weight was 2.76 ± 0.42 kgs in spontaneous labor group and 2.68 ± 0.48 kgs in induction of labor group, the difference being statistically insignificant ($p > 0.05$) (Table 3).

In the present study, 260 out of 1300 total participants (20%) got admitted in neonatal intensive care unit (NICU) during the study. A total of 116 (9%) babies got admitted in NICU who were born to mothers who went into spontaneous labor and 144 (11%) babies admitted whose mother were induced. Majority of babies admitted in NICU were due to meconium aspiration syndrome and birth asphyxia (25.86% in group A and 29.16% in group B). Incidence of NICU admissions was significantly higher in induction of labor group. There were 24 neonatal deaths in all during study, 12 in each group. Birth asphyxia was the commonest cause of neonatal death (6 neonatal deaths in induction of labor group and 4 neonatal deaths in spontaneous labor group). Neonatal deaths were significantly higher in induction labor group (Table 4).

Table 1: Outcome comparison for mode of delivery and indications of caesarean section.

Variables	Spontaneous labor group (group A) (n=644) (%)		Induction of labor group (group B) (n=656) (%)	
Mode of delivery				
Normal delivery	529	82.15	390	59.46
Caesarean section	99	15.37	257	39.17
Instrumental delivery	16	2.48	9	1.37
Indication of caesarean section (group A=99, group B=257)				
Fetal distress	88	88.89	193	75.09
Failed induction	-	-	46	17.9
Prolonged PROM with nil draining liquor	7	7.07	16	6.23
Deep transverse arrest	4	4.04	2	0.78

PROM-premature rupture of membrane.

Table 2: Comparison of maternal complications.

Complications	Spontaneous labor group (group A) (n=644) (%)		Induction of labor group (group B) (n=656) (%)	
No complications	617	95.8	633	96.49
PPH	19	2.96	13	1.98
Perineal laceration	4	0.62	3	0.49
Need of blood transfusion	4	0.62	6	0.92
Fever/chills/rash	0	-	1	0.15
Maternal sepsis	0	-	0	-
Hysterectomy	0	-	0	-

Table 3: Fetal outcome-weight of newborn.

Birth weight (in kgs)	Spontaneous labor group (group A) (n=644) (%)		Induction of labor group (group B) (n=656) (%)	
≤1.5	2	0.31	1	0.15
1.6-2.0	36	5.60	37	5.65
2.1-2.5	119	18.48	146	22.27
2.6-3.0	342	53.10	345	52.31
≥3.0	145	22.51	127	19.37

Table 4: Incidence of NICU admissions and causes of neonatal deaths.

Neonatal outcome variables	Spontaneous labor group (group A) (n=116/644) (%)		Induction of labor group (group B) (n=144/656) (%)	
Indication of NICU admission				
Meconium aspiration syndrome	30	25.86	42	29.16
Birth asphyxia	30	25.86	37	25.70
Low birth weight	20	17.24	22	15.28
Respiratory distress syndrome	19	16.38	22	15.28
Congenital anomaly/heart disease	15	12.94	18	12.50
Others	2	1.72	3	2.08
Causes of neonatal deaths (group A=12/644, group B=12/656)				
Birth asphyxia	4	0.62	6	0.91
Meconium aspiration syndrome	2	0.31	3	0.45
Low birth weight	2	0.31	1	0.15
Congenital anomaly/heart	2	0.31	1	0.15
Respiratory distress syndrome	1	0.15	0	-
Others	1	0.15	1	0.15

DISCUSSION

Labor is the most crucial determinant of the fetomaternal outcome, especially in high risk pregnancies. It was of utmost importance to see the progress of labor as to who goes into spontaneous labor and who all were induced; as the clinical results may vary significantly. This was an observational, prospective study done to assess and compare the maternal and fetal outcomes in spontaneous and induction of labor in all high risk pregnancies.

The mean age was 22.62 ± 3.30 years in spontaneous labor group and 22.69 ± 2.80 years in induction of labor group, which was statistically comparable and similar to the age groups studied in earlier studies.^{2,8} Majority of the patients in both the groups were primigravida (55.44% in spontaneous labor and 59.45% in induction of labor group), which was on expected lines and means more primigravida needed induction of labor. Sarvanan et al Cammu et al and Kandemir et al amongst others, also reported the proportion to be in favour of primigravida with no significant difference between the studied groups.^{3,8-10}

The indications for termination of pregnancy were studied in detail. Postdated pregnancy, premature rupture of membranes, pregnancy induced hypertension were the major indications with no significant difference between the groups. Gardosi et al had reported that, after postdates, the hypertensive diseases of pregnancy were becoming more common indications for induction of labor as well as high risk in spontaneous labor.¹¹ Rest of the previously similar studies were also in agreement with this observation.^{3,12,13}

Majority of patients in spontaneous labor group delivered in less than 6 hours (mean 4.820 ± 3.48 hours) while those after induction mostly delivered between 6 to 11 hours (mean 10.302 ± 5.73 hours), the difference between two

groups being significant. Pant et al had observed that the Bishops score was related to the mean duration of labor and reported that patients who had induction of labor had significantly higher duration of labor than the patients who went into spontaneous labor.¹⁴ Observations of other previous similar studies were also corroborative of the finding.^{2,15,16}

In this study, proportion of patients requiring caesarean section was very high in induction labor group (39.17%) as compared to spontaneous labor group (15.37%). The greatest maternal risk of induction of labor was the potential risk of morbidity associated with caesarean section and the risk was observed to predictably increase with the decrease in parity and also with the decrease in the favourability of the cervix at induction. The observations of Stock et al Sujata et al and Pant et al were much in line with the relatively higher section rate amongst induction group.^{2,12,14} In another study by Xenakis et al of induced labor using an integrative approach (prostaglandin, amniotomy, oxytocin), it was found that the women had higher caesarean section rate (29% versus 15.4%). The findings of their study were close to that of our study but prostaglandin and initial amniotomy were not used in the present study.¹⁷ The most common indication for caesarean section in both the groups in the present study was fetal distress (88.89% and 75.09%), mostly in agreement with observations of Bueno et al (meconium stained liquor and/or fetal distress), Babu et al (fetal distress) and Tripathi et al (fetal distress, oligohydramnios and meconium stained liquor).^{13,18,19} Failed induction was one of the major indication of section in all these studies in the induction of labor group.

As far as incidence of complications was concerned, there were no major complications in majority of patients in the present study (95.80% in group A and 96.49% in group B), the commonest complication noted was PPH, with no maternal mortality. This was comparable to the study done

by Macer et al where there was no increase in intrapartum complications with induction of labor.²⁰ Very similar findings were observed by Stock et al and Tan et al with insignificant incidence of complications and PPH to be most commonly seen complication.^{3,21}

No statistically significant difference was observed with respect to birth weight of babies in the two groups, a finding in line with Sujata et al and Tripathy et al amongst others.^{12,13} NICU admissions were significantly higher in induction of labor group as compared to spontaneous labor group, with majority of admissions being due to meconium aspiration syndrome and birth asphyxia (25.86% in group A and 29.16% in group B). This was relatively much higher than what Macer et al in their study found out (0.8%).²⁰ In the study by Stock et al only about 20% newborns needed admission with very few (7.7%) needing stay more than a day.³ The reason for this disparities could be explained on the basis of the fact that both the above studies were conducted in tertiary care centres where all the deliveries were being attended by a specialist neonatologist, leading to better newborn related outcomes. There were 24 neonatal deaths, 12 in each group, in the present study. Birth asphyxia followed by meconium aspiration syndrome were the commonest causes of neonatal death in both the groups, in agreement with previous similar study by Menticoglou et al.²²

CONCLUSION

In conclusion it can be said that induction of labor is associated with comparatively more maternal risk of higher induction delivery interval, more cases of caesarean section due to failure of induction as compared with spontaneous labor apart from being associated with neonatal issues like more NICU admissions and fetal deaths in comparison with spontaneous labor. And hence induction should be employed judiciously by assessing the maternal and fetal condition and confirming relevant indication and should only be done if continuation of pregnancy is relatively more hazardous to either mother or baby.

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