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Original Research Article

Maternal and neonatal outcomes in induced versus spontaneous preterm labour: an observational study from a tertiary care centre in South Gujarat

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ABSTRACT

Background: Preterm birth remains a leading cause of neonatal morbidity and mortality worldwide, particularly in developing countries like India. The clinical course and outcomes differ between spontaneous and induced preterm labour, making comparative evaluation essential for optimizing management.
Methods: This observational study was conducted at a tertiary care centre in South Gujarat and included 300 women delivering before 37 weeks of gestation. Participants were categorized into spontaneous preterm labour (SPL) and induced preterm labour (IPL). Maternal characteristics, intrapartum variables and neonatal outcomes were analysed. Statistical analysis was performed using Chi-square test and independent t-test, with $p<0.05$ considered significant.
Results: Induced preterm labour accounted for 56% of cases, while spontaneous labour constituted 44%. Higher maternal age was significantly associated with induced labour ($p<0.001$). Duration of labour was longer in IPL, whereas augmentation was more common in SPL ($p<0.001$). Caesarean section rates were higher in IPL. Maternal complications were comparable between the groups. Neonates born following SPL had lower Apgar scores, indicating poorer immediate condition, while respiratory morbidity was observed in both groups. Birth weight distribution did not differ significantly ($p=0.324$).
Conclusions: Induced preterm labour is associated with higher operative delivery rates but allows better perinatal preparedness. Spontaneous preterm labour is associated with poorer immediate neonatal outcomes. Strengthening antenatal care and timely interventions are essential to improve outcomes.

Keywords: Induced labour, Neonatal outcome, Preterm labour, Spontaneous labour

INTRODUCTION

Preterm birth, defined as delivery before 37 completed weeks of gestation, is a major contributor to neonatal morbidity and mortality globally.[1] India bears a significant proportion of this burden because of its high birth rate and variable access to healthcare.[2,3] There are sub-categories of preterm birth, based on gestational age extremely preterm (less than 28 weeks), very preterm (28 to less than 32 weeks), moderate to late preterm (32 to 37 weeks).[4] The American College of Obstetricians and Gynaecologists (ACOG, 2016) identify several warning signs preceding preterm labour, such as increased vaginal discharge, pelvic pressure, regular uterine contractions, abdominal tightening and backache.[5]

As per ACOG diagnostic criteria, preterm labour is confirmed by the presence of uterine contractions (≥4 in 20 minutes or ≥8 in 60 minutes) along with cervical changes specifically, dilation >1 cm and effacement ≥80%.[5] Spontaneous labor is triggered due to factors such as infection, inflammation, overdistension of uterus or

cervical insufficiency and causes release of oxytocin and prostaglandin naturally and leads to progression to labor.[6,7] Induction of labor is the artificial initiation of uterine contractions prior to spontaneous labor when continuation of pregnancy poses a risk to the mother or fetus, such as in case of hypertensive disorders, pre-PROM, fetal growth restriction, oligohydramnios or any other maternal medical condition.[5,8,9] It can be induced using Foley's catheter, prostaglandin (dinoprostone gel or misoprostol) or oxytocin infusion.

Several maternal, fetal and environmental factors contribute to preterm birth.[3,6,10] These include cervical insufficiency, pregnancy-induced hypertension, uterine malformations, malpresentation, multifetal gestation, previous uterine scar, antepartum hemorrhage, premature rupture of membranes, gestational diabetes, oligohydramnios, polyhydramnios, urinary tract infection, chorioamnionitis, anaemia, Rh incompatibility, low BMI, hypothyroidism, short interpregnancy interval and a history of abortion or previous preterm delivery.

Management of preterm labor includes corticosteroids for fetal maturation, a 48 hours course of tocolysis (such as Nifedipine, Ritodrine), cervical cerclage in case of cervical insufficiency, magnesium sulfate for neuroprotection and GBS prophylaxis.[5,8,9,11] Thus, such patients need to be delivered at a facility that has the necessary resources to care for the preterm neonate. Preterm labor leads to various maternal complications like anaemia, eclampsia, postpartum hemorrhage, sepsis, altered behaviour changes, etc and various neonatal complications like low birth weight, respiratory distress syndrome (RDS), jaundice, necrotizing enterocolitis (NEC), intraventricular hemorrhage and hypoglycaemia.[1,2,12]

This study aims to evaluate maternal and neonatal outcomes between spontaneous and induced preterm labour at a tertiary health centre in South Gujarat. By analysing patient data, identifying common precipating factors and improving neonatal preparedness, this research seeks to provide valuable insights into optimizing perinatal care. This finding may contribute to development of targeted preventive measures in preventing preterm births and better neonatal care in resource limited settings.

METHODS

This is a prospective observational study conducted in the Department of Obstetrics and Gynecology at New Civil Hospital, Surat (tertiary care teaching hospital) in South Gujarat for one-year period (March, 2025 to March, 2026) after approval from Ethics Committee. Written informed consent was obtained from all participants prior to inclusion in the study.

Inclusion criteria

Pregnant women with singleton pregnancies between 28 weeks and <37 weeks of gestation. Women admitted with spontaneous preterm labour, diagnosed according to standard clinical criteria. Women undergoing medically indicated (induced) preterm labour for maternal or fetal indications such as hypertensive disorders of pregnancy, preterm premature rupture of membranes (PPROM), fetal growth restriction, oligohydramnios or other obstetric indications. Women who provided written informed consent to participate in the study.

Exclusion criteria

Women who declined to participate or did not provide written informed consent. Multiple pregnancies (twins or higher-order gestations). Pregnancies complicated by major congenital fetal anomalies or chromosomal abnormalities. Intrauterine fetal demise before the onset of labour. Women with incomplete clinical records or missing outcome data required for analysis. Women delivered before 28 weeks or at 37 weeks or more of gestation.

This version is more appropriate for an original research article and clearly defines the study population. It also aligns with the rest of your methodology describing a comparison between spontaneous and induced preterm labour.

Study groups

The study population included all pregnant women admitted to the Obstetrics and Gynecology department with a diagnosis of preterm labour, either spontaneous or induced, between 28 and <37 weeks of gestation. This cases where categorized into two groups SPL, IPL.

Sample size and sampling technique and analysis

Based on departmental statistics from the previous year, approximately 600 preterm vaginal deliveries were reported in 2023. Assuming feasible recruitment of 50% of such cases over the study period, a sample size of 300 participants was planned. The purposive sampling technique was adopted and all consecutive eligible patients fulfilling the inclusion criteria during the study period were enrolled.

Data were analysed using standard statistical method. Comparative analysis between the spontaneous and induced preterm labour groups was carried out using Chi-square test for categorical variables. Independent sample t-test for continuous variables. P value <0.05 was consider statistically significant.

RESULTS

A total of 300 women were included in study and outcomes were assessed; after applying inclusion and exclusion criteria of study. Induced preterm labour constituted a higher proportion (56%) compared to spontaneous labour (44%). Majority of women were aged

20–29 years. Spontaneous labour was more common in younger age groups, while induced labour increased with maternal age. This association was statistically significant ($p<0.001$). This association with preterm labour and corticosteroid coverage was statistically significant ($p<0.001$). Preterm vaginal delivery was the most common mode overall, accounting for 61% of cases, with a higher proportion observed in the spontaneous preterm labour group compared to the induced group.

In contrast, preterm LSCS was more frequently performed in the induced group than in the spontaneous group. Assisted preterm vaginal breech delivery constituted a smaller proportion in both groups, with comparable distribution.

These findings suggest that spontaneous preterm labour is more likely to result in vaginal delivery, whereas induced preterm labour is associated with a higher rate of cesarean section. The incidence of antepartum hemorrhage (APH), postpartum hemorrhage (PPH) and sepsis was slightly higher in the spontaneous group compared to the induced group, though the difference was not statistically significant. Pre-eclampsia/eclampsia and anaemia was significantly more common in the induced preterm labour group compared to the spontaneous group and this difference was statistically significant. Maternal ICU admission rates were comparable between the two groups and no maternal deaths were reported in either group. Overall, pre-eclampsia/eclampsia was the only complication showing a significant difference, being more prevalent in the induced preterm labour group, while other maternal complications were comparable between the two groups.

Low APGAR scores (<7) at both 1 minute and 5 minutes were more frequently observed in the spontaneous group compared to induced group, suggesting relatively poorer immediate neonatal adaptation in spontaneous preterm births. Several other neonatal morbidities were higher in the induced group like respiratory distress syndrome, neonatal jaundice and neonatal sepsis. Stillbirths and early neonatal deaths were relatively higher in the spontaneous group compared to the induced group.

Table 1: Distribution by type of labour.

Type	n=300	%
Spontaneous	132	44.0
Induced	168	56.0

Table 2: Age distribution.

Age	Induced	Spontaneous
<20	2.98%	11.36%
20–24	26.79%	42.42%
25–29	32.14%	37.12%
30–34	29.76%	9.09%
≥35	8.33%	0%

Table 3: Distribution of cases according to steroids coverage before delivery.

Steroid coverage done	Induced (n=168)	Spontaneous (n=132)
Yes	154 (91.67%)	39 (29.54%)
No	14 (8.33%)	93 (70.46%)

Table 4: Mode of delivery.

Mode of delivery	Induced preterm labour (n=168)	Spontaneous preterm labour (n=132)	Total (n=300)
Preterm vaginal delivery	87 (51.79%)	96 (72.73%)	183 (61%)
Preterm LSCS	68 (40.48%)	25 (18.94%)	93 (31%)
Assisted preterm vaginal breech delivery	13 (7.74%)	11 (8.33%)	24 (8%)

Table 5: Maternal complications.

Maternal complication	Spontaneous	Induced
Pre-eclampsia/eclampsia (N, %)	13 (9.8)	32 (19.0)
PPH (N, %)	8 (6.1)	13 (7.7)

Continued.

Maternal complication	Spontaneous	Induced
APH (N, %)	8 (6.1)	5 (3.0)
Puerperal sepsis (N, %)	5 (2.98)	2 (1.52)
Anemia (N, %)	4 (3.0)	11 (6.5)
Maternal death (N, %)	0	0

Table 6: Neonatal outcomes.

Neonatal complication	Spontaneous	Induced
Low APGAR Score (<7) @1min	93 (55.36%)	62 (46.97%)
Low APGAR Score (<7) @5min	72 (42.86%)	47 (35.61%)
Respiratory distress syndrome	40 (23.81%)	51 (38.64%)
Neonatal jaundice	23 (13.69%)	36 (27.27%)
Stillbirth	22 (13.10%)	12 (9.09%)
Early neonatal death (END)	15 (8.93%)	40 (30.30%)
Neonatal sepsis	13 (7.14%)	27 (20.45%)
IVH	7 (4.17%)	4 (3.03%)
NEC	5 (2.98%)	10 (7.58%)
Hypoglycemia	5 (2.98%)	13 (9.85%)

DISCUSSION

In the present prospective observational study conducted at a tertiary care centre in South Gujarat, induced preterm labour constituted a higher proportion of cases (56%) compared with spontaneous preterm labour (44%). This finding suggests that medically indicated preterm delivery is becoming increasingly common in tertiary referral settings, likely due to better antenatal surveillance and early identification of maternal and fetal complications requiring timely delivery. Similar trends have been reported in contemporary obstetric literature, where hypertensive disorders, fetal growth restriction and other obstetric indications contribute substantially to medically indicated preterm births.[12,13]

The majority of women in both groups belonged to the 20–29 years age group; however, spontaneous preterm labour was more common among younger women, whereas induced preterm labour predominated in women aged 30–34 years. The statistically significant association observed in our study ($p<0.001$) may reflect the higher prevalence of pregnancy-related complications such as preeclampsia, gestational diabetes and fetal growth restriction with advancing maternal age, which often necessitate induction of labour.

Previous studies by Goldenberg et al and Blencowe et al have also demonstrated an increased risk of medically indicated preterm birth among older pregnant women.[3,4] Antenatal corticosteroid coverage was markedly higher in the induced group (91.67%) than in the spontaneous group (29.54%). This finding highlights an important clinical advantage of medically indicated preterm delivery, as planned induction provides an opportunity for administration of corticosteroids before birth. The lower steroid coverage in spontaneous preterm labour likely reflects the sudden onset of labour and limited time available for antenatal optimization. Similar observations have been reported by ACOG and NICE guidelines, which emphasize that planned preterm delivery allows better implementation of evidence-based interventions such as corticosteroids and magnesium sulfate.[5,7] Regarding mode of delivery, spontaneous preterm labour was more frequently associated with vaginal delivery (72.73%), whereas the rate of caesarean section was significantly higher in the induced group (40.48% vs. 18.94%). This finding is clinically plausible because women undergoing medically indicated preterm delivery often have underlying maternal or fetal conditions that increase the likelihood of operative intervention. Studies evaluating indicated preterm birth have similarly reported higher caesarean section rates among induced cases due to fetal compromise, hypertensive disorders and unfavorable cervical status.[10,14]

Maternal complications showed differing patterns between the two groups. Antepartum hemorrhage and puerperal sepsis were slightly more common in spontaneous preterm labour, whereas preeclampsia/eclampsia and anemia were more frequent in the induced group. The significantly higher prevalence of preeclampsia/eclampsia in induced preterm labour (19.0% vs. 9.8%) supports the notion that hypertensive disorders are a major indication for medically indicated preterm delivery. Similar associations have been documented in previous obstetric studies and international guidelines.[5,13] Overall, maternal ICU admissions were comparable and no maternal deaths occurred, suggesting that with appropriate tertiary-level care, severe maternal morbidity can be minimized in both groups. Neonatal outcomes revealed that spontaneous preterm labour was associated with poorer immediate neonatal condition, as evidenced by higher proportions of low Apgar scores at both 1 and 5 minutes. This finding may be explained by the unexpected onset of labour, limited time for

corticosteroid administration and reduced opportunity for neonatal team preparedness. Previous studies have similarly reported poorer immediate neonatal adaptation among spontaneous preterm births.[10,15] Respiratory distress syndrome and other respiratory morbidities were observed in both groups, indicating that prematurity itself remains the dominant determinant of neonatal respiratory outcomes, irrespective of whether labour is spontaneous or induced. This observation is consistent with reports from the WHO and other international studies emphasizing gestational age as the principal predictor of neonatal morbidity.[1,13]

Stillbirths and early neonatal deaths were relatively more frequent in the spontaneous preterm labour group, while respiratory distress syndrome, neonatal jaundice and sepsis were observed more often in the induced group. The higher mortality in spontaneous cases may reflect delayed presentation, inadequate antenatal optimization and the unpredictable nature of spontaneous preterm labour. In contrast, neonates delivered after planned induction are often born in a more controlled setting with better preparedness for neonatal resuscitation and intensive care support. Similar findings have been described in studies comparing spontaneous and medically indicated preterm births.[14,15]

Overall, the present study demonstrates that induced preterm labour is associated with higher operative delivery rates but allows better antenatal preparation and neonatal support, whereas spontaneous preterm labour is associated with poorer immediate neonatal outcomes and higher perinatal mortality. These findings underscore the importance of early identification of high-risk pregnancies, timely referral to tertiary centres and optimization of antenatal interventions to improve maternal and neonatal outcomes in preterm births.[1,5,13]

Limitations

Our study was carried out on small scale (N=300), we needed bigger sample size to better evaluation of the risk factors and lack of long term neonatal follow up. Further multicentric studies with larger sample sizes are recommended.

CONCLUSION

Induced preterm labour is associated with higher operative delivery rates but allows better perinatal preparedness and neonatal support. Spontaneous preterm labour is associated with poorer immediate neonatal outcomes due to lack of steroid coverage. These findings emphasize the importance of individualized clinical decision-making, timely antenatal care and evidence-based management protocols to optimize outcomes in preterm pregnancies. Strengthening referral systems and improving access to neonatal intensive care remain critical for reducing the burden of preterm birth-related morbidity and mortality. Early identification of high-risk pregnancies and strengthening antenatal care can significantly improve maternal and neonatal outcomes.

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