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Feto-maternal outcome of induced versus spontaneous labour: A prospective comparative study

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Abstract
Background: Induction of labor (IOL) is a common obstetric intervention used when the benefits of delivery outweigh the risks of continuing pregnancy. However, its impact on the mode of delivery and perinatal outcomes remains a subject of global debate.
Methods: A prospective comparative study was conducted on 300 women (150 induced, 150 spontaneous) at Shrimati Heera Kunwar Baa Mahila Hospital from February 2022 to January 2023.
Results: The induced labor group had a significantly higher rate of Cesarean sections (30%) compared to the spontaneous group (4.7%, $p<0.0001$). While the latent phase of labor was significantly shorter in the induced group (4.8 vs. 5.8 hours), there were higher rates of NICU admissions (20% vs. 6%) and maternal complications like PPH (7.3% vs. 5.3%).
Conclusion: Induction of labor is associated with increased operative interference and higher maternal and fetal morbidity compared to spontaneous labor, emphasizing the need for judicious case selection and careful monitoring.

Keywords: Feto-maternal, careful monitoring, global debate, spontaneous labor

1. Introduction
The ultimate outcome of good obstetric care is the delivery of a healthy baby to a healthy mother. While labor usually sets in spontaneously (parturition), there are times when the benefits of delivery outweigh the continuation of pregnancy, necessitating "induction of labor".
Induction of labor (IOL) is defined as the stimulation of regular uterine contractions before the spontaneous onset of labor (with or without rupture of membranes) after 28 weeks of gestation using mechanical or pharmacological methods. Current statistics show induction rates vary widely: 49.7% in Sri Lanka [1], 31.37% in the United States [2], and 5% to 22% in India[3].
This study aims to compare the "Feto Maternal Outcome of Induced Versus Spontaneous Labour" to clarify the pros and cons of induction, specifically looking at labor progression, mode of delivery, and associated morbidity.

2. Aims and Objectives
The study was carried out with the following objectives
- To compare the duration and progress of labor in spontaneous and induced labor.
- To compare the maternal outcome (complications).
- To compare the fetal outcome (APGAR scores, NICU admission).
- To compare the mode of delivery (Vaginal vs. Cesarean).
- To compare the need for oxytocin augmentation.

3. Material and Methods
3.1 Study Design and Setting
This prospective comparative study was conducted in the Department of Obstetrics and Gynaecology at Shrimati Heera Kunwar Baa Mahila Hospital (Associated with Jhalawar Medical College).

3.2 Study Duration and Sample Size
- **Study Period:** February 2022-January 2023 (Data collection: Feb 2022-Oct 2022).
- **Sample Size:** 300 women total.

- **Study Group:** 150 women who underwent induction of labor.
- **Control Group:** 150 women who underwent spontaneous labor.

3.3 Criteria for Selection
- **Inclusion Criteria:** Vertex presentation, completed 37 weeks or more, singleton pregnancy, and reactive fetal heart rate pattern.
- **Exclusion Criteria:** Multiple gestations, placenta previa, non-vertex presentation, previous cesarean section, abruptio placentae (urgent delivery), intrauterine death, cord prolapse, congenital anomalies, and cephalopelvic disproportion.

3.4 Procedure women were assessed using the modified bishop score
- **Induction Protocol:** If the Bishop score was < 6, induction was initiated using Prostaglandin E2 (PGE2) gel (0.5 mg intracervically). The patient was reassessed after 6 hours. If labor did not start or the score remained < 6, the dose was repeated (maximum 3 instillations).
- **Augmentation:** If the Bishop score was ≥ 6 (initially or after ripening), oxytocin augmentation was performed if necessary.
- **Failed Induction:** Defined as failure to progress or Bishop score < 6 even after the 3rd PGE2 gel instillation, resulting in LSCS delivery.

3.5 Statistical Analysis
Data was analyzed using SPSS 20.0. Categorical variables were analyzed using Chi-square or Fisher's exact tests. Continuous variables were analyzed using independent t-tests. A p-value of < 0.05 was considered statistically significant.

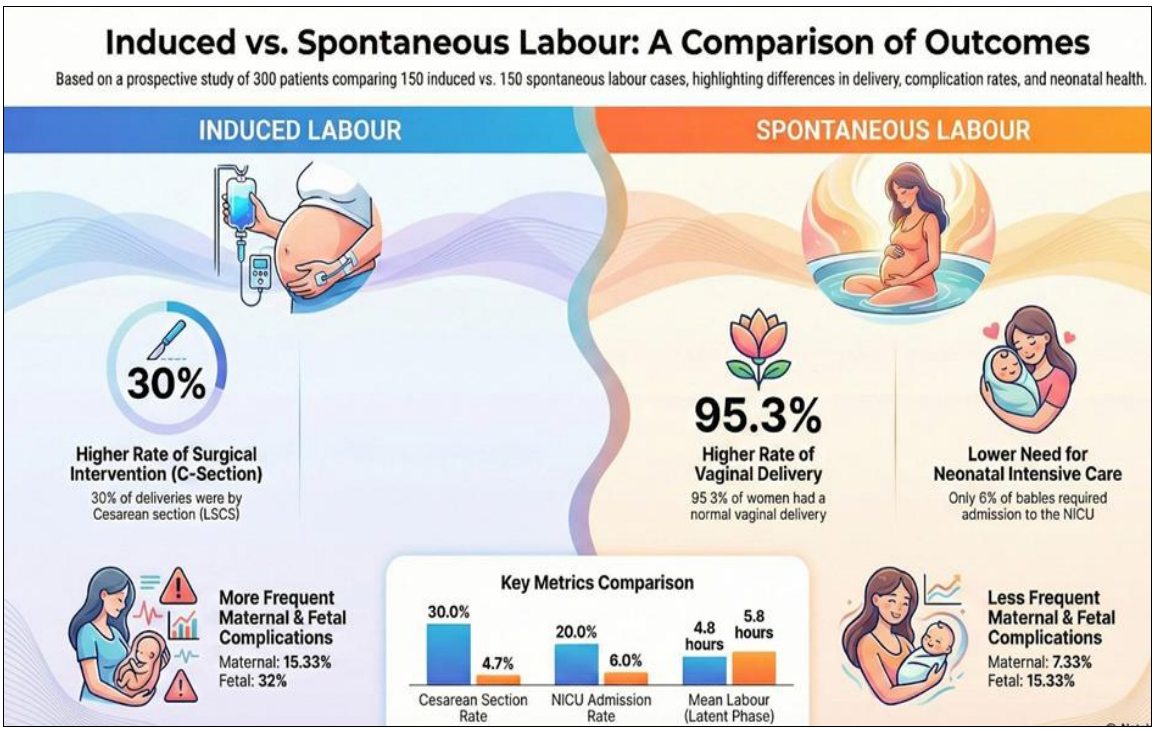
4. Observations and Results
4.1 Prevalence of Induction: During the 6-month data collection period, there were 1470 total deliveries.
- **Spontaneous Labor:** 993 (67.55%)
- **Induced Labor:** 477 (32.45%).

4.2 Demographic Characteristics
- **Maternal Age:** The mean age was comparable between groups (Spontaneous: 25.24±3.77 years vs. Induced: 25.69±3.11 years; P=0.264).
- **Parity:** There was no significant difference in the distribution of primigravida and multigravida women (P=0.208).
- **Gestational Age:** The mean gestational age was significantly higher in the induced group (40.34±1.39 weeks) compared to the spontaneous group (38.72±1.48 weeks; P=0.001).

4.3 Indications for Induction
The most common indications for induction were:
- **Post-term pregnancy:** 40 cases (26.66%).
- **Premature Rupture of Membranes (PROM):** 34 cases (22.66%).
- **Hypertensive disorders (Preeclampsia/Gestational HTN):** 32 cases (21.33%).
- **Intrauterine Growth Restriction (IUGR):** 18 cases (12%)

4.4 Labor Progression
- **Oxytocin Requirement:** Patients in the induced group required significantly higher rates of oxytocin acceleration (33.3%) compared to the spontaneous group (19%) (P=0.0059).
- **Latent Phase Duration:** The mean duration of the latent phase was **significantly shorter** in the induced group (4.80±8.24 hours) compared to the spontaneous group (5.83±2.28 hours), (p<0.0001).

4.5 Mode of Delivery
There was a highly significant difference in the mode of delivery (p<0.0001).
- **Spontaneous Group:** 95.3% Vaginal Delivery, 4.7% LSCS.
- **Induced Group:** 70.0% Vaginal Delivery, 30.0% LSCS.



4.6 Indications for Cesarean Section

In the induced group (45 cases of LSCS), the primary indications were

- **Fetal Distress:** 11.33% (vs 3.33% in spontaneous)
- **Prolonged PROM:** 10.00%
- **Failed Induction:** 6.66%

4.7 Fetal Outcomes

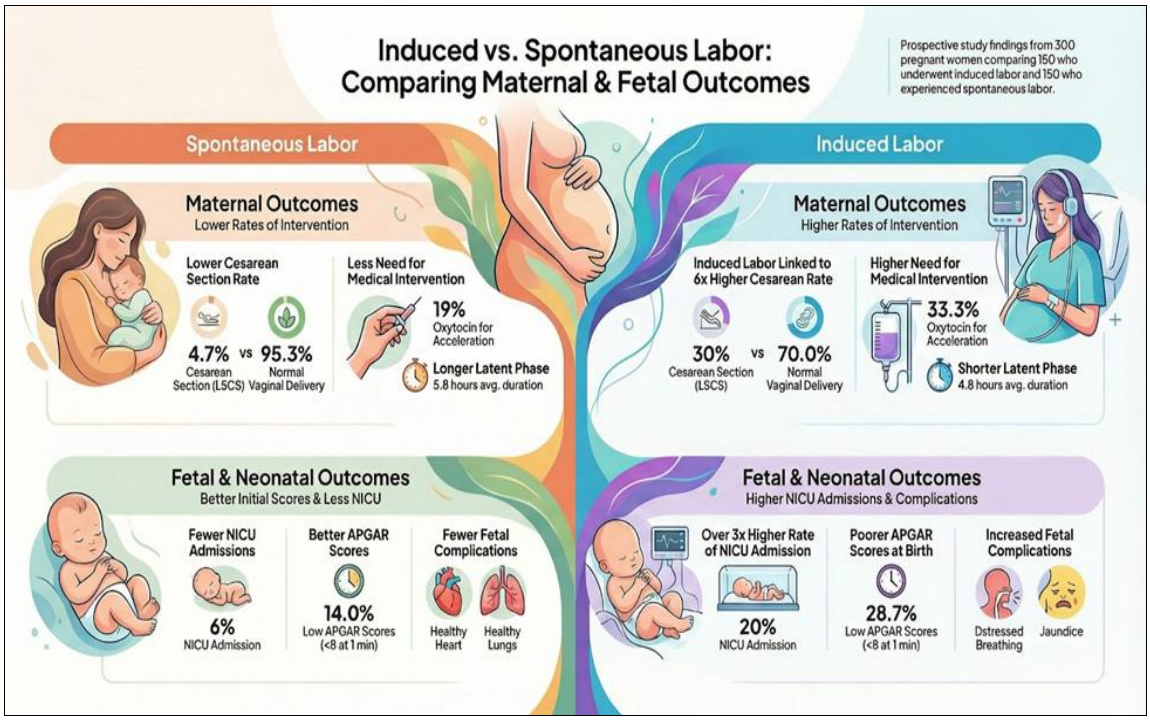
APGAR Scores

- **1 Minute:** 28.7% of induced babies had scores <8, compared to 14.0% of spontaneous babies (P=0.001).
- **5 Minutes:** 27.3% of induced babies had scores < 8, compared to 13.3% of spontaneous babies (P=0.003).
- **NICU Admission:** Admission to NICU was required for 20% of babies in the induced group compared to 6% in the spontaneous group (p<0.0001).
- **Specific Complications:** The induced group had higher rates of Birth Asphyxia (17.33% vs 8%) and Hyperbilirubinemia (11.33% vs 4.6%).

4.8 Maternal complications

Side effects were more commonly seen in the induced group (15.33% total) vs the spontaneous group (7.33%):

- **Postpartum Hemorrhage (PPH):** 7.3% (Induced) vs 5.3% (Spontaneous).
- **Cervical Tear:** 6.0% (Induced) vs 1.3% (Spontaneous).
- **Uterine Rupture & Cord Prolapse:** Rare cases (0.6% each) occurred only in the induced group.



5. Discussion

5.1 Labor Progression and Delivery Mode

Our study found that the latent phase of labor was shorter in the induced group (4.8 hours) than the spontaneous group (5.8 hours), likely due to the pharmacological agents used. However, despite faster initial progress, the rate of Cesarean section was significantly higher in the induced group (30% vs 4.7%). This aligns with findings by G. Suchika et al. [4] (2014) and Oshudi Y et al. [5] (2017). The primary contributors to LSCS in the induced group were fetal distress and failed induction.

5.2 Maternal Morbidity

The higher incidence of PPH (7.3%) and cervical tears (6%) in the induced group suggests that induction agents may cause supraphysiological contractions. These intense contractions can lead to uterine muscle fatigue (causing atonic PPH) or direct traumatic damage (cervical tears). Additionally, oxytocin use is an independent risk factor for PPH due to receptor desensitization.

5.3 Neonatal Morbidity

The study observed a significant increase in NICU admissions and lower APGAR scores in the induced group. A notable finding was the high rate of hyperbilirubinemia (11.33%) in induced babies. This is likely associated with the use of oxytocin. Oxytocin is an antidiuretic hormone that causes hyponatremia and hypo-osmolarity in the mother and fetus. This osmotic shift causes swelling of fetal red blood cells, making them more fragile and susceptible to hemolysis, which leads to jaundice [6-9].

6. Conclusion

From the above study, we conclude that induction of labor, when compared with spontaneous labor at term, significantly affects maternal and neonatal outcomes.

- **Operative Risk:** There is a statistically significant increase in the rate of Cesarean sections (30%) in induced labor.
- **Morbidity:** There is a higher incidence of NICU admissions (20%), birth asphyxia, and maternal complications like PPH and cervical tears in induced labor.
- **Recommendations:** While induction is necessary for high-risk conditions (preeclampsia, post-term), it should be used judiciously. The increased risks should be part of the informed consent discussion. Induction is a safe procedure only if labor is carefully monitored using a partograph.

Conflict of Interest

Not available

Financial Support
Not available

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