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A Comparative Analysis of Maternal and Fetal Outcomes in Spontaneous and Induced Labour at Term in Primigravidae (150 Cases)

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Abstract
Background: Induction of labour (IOL) is common in modern obstetrics. Evidence about how IOL affects maternal and neonatal outcomes compared with spontaneous labour in low-risk primigravidae have been included. This study compares maternal outcomes, delivery complications and neonatal outcomes between term primigravidae with spontaneous onset of labour and those who underwent induction.
Methods: Prospective comparative observational study included 150 primigravidae at term (≥37 and <42 weeks) conducted at Department of Obstetrics & Gynaecology, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh from January 2021 to December 2021. Patients were allocated into two groups: spontaneous labour (Group S, n = 75) and induced labour (Group I, n = 75). Inclusion: singleton cephalic primigravida, term, no major obstetric or medical comorbidity. Exclusion: multiple pregnancy, malpresentation, prior uterine surgery, fetal anomaly, preterm labour. Primary outcomes: mode of delivery (vaginal, instrumental, caesarean). Secondary outcomes: labour augmentation, uterine hyperstimulation, postpartum hemorrhage (PPH), chorioamnionitis, Apgar scores, NICU admission, meconium-stained liquor, perinatal mortality. Statistical analysis used Student's t-test for continuous variables and χ^2/Fisher exact for categorical variables; $p < 0.05$ considered significant.
Results: Groups were comparable in age and BMI. Mean age: Group S 24.8±3.2 years; Group I 25.6±3.8 years (p = 0.12). Cesarean delivery rates: Group S 12/75 (16.0%) vs Group I 20/75 (26.7%), p = 0.12. Instrumental delivery: 5 (6.7%) vs 8 (10.7%), p = 0.34. Uterine hyperstimulation occurred more in Group I: 6 (8.0%) vs 1 (1.3%), p = 0.05. Oxytocin augmentation was required more often in the induced group (54/75, 72.0% vs 28/75, 37.3%; $p < 0.001$). PPH (>500 ml): 3 (4.0%) vs 6 (8.0%), p = 0.28. Meconium-stained liquor: 8 (10.7%) vs 14 (18.7%), p = 0.14. NICU admissions: 5 (6.7%) vs 9 (12.0%), p = 0.21. Low 5-minute Apgar (<7): 3 (4.0%) vs 5 (6.7%), p = 0.47. Perinatal deaths: 0 vs 1 (1.3%), p = 0.31.
Conclusions: In this cohort of 150 term primigravidae, induction of labour was associated with significantly higher rates of uterine hyperstimulation and need for oxytocin augmentation, while differences in cesarean, PPH, neonatal outcomes and NICU admission did not reach statistical significance. Induction should be individualized with careful monitoring and readiness to manage hyperstimulation and fetal compromise.

Keywords: Induction Of Labour, Maternal Outcome, Neonatal Outcome, Primigravida, Spontaneous Labour, Term Pregnancy.

Introduction

Labour is a complex physiological process involving coordinated uterine contractions, cervical dilatation, and eventual fetal expulsion. In contemporary obstetric practice, both spontaneous onset of labour and induction of labour (IOL) are widely utilized to achieve safe maternal and neonatal outcomes. Spontaneous labour represents the natural culmination of pregnancy and is associated with fewer interventions and generally favourable outcomes in low-risk women [1]. However, induction of labour has become increasingly common worldwide, accounting for 20-30% of deliveries in many centres, driven by improved fetal surveillance, rising post-term pregnancies, and maternal or fetal medical indications [2, 3].

Induction of labour is defined as the artificial initiation of uterine contractions prior to the onset of spontaneous labour, with the intention of achieving vaginal delivery [4]. Indications for induction vary but commonly include post-date pregnancy, premature rupture of membranes, hypertensive disorders, oligohydramnios, gestational diabetes, and fetal growth restriction [5].

Although induction can prevent adverse outcomes associated with prolonged gestation or maternal comorbidities, it is also associated with longer labour duration, increased analgesia requirements, and higher rates of intervention such as oxytocin augmentation and artificial rupture of membranes [6].

Primigravidae constitute a special population in obstetrics because they experience longer labour, higher likelihood of dystocia, and greater risk of operative delivery compared to multiparous women [7]. Several studies have suggested that induction in primigravidae is associated with higher caesarean section rates, particularly in unfavourable cervical conditions [8, 9]. Maternal complications including postpartum hemorrhage, chorioamnionitis, and instrumental delivery may also be increased after induction. Likewise, neonatal outcomes such as low Apgar scores, meconium-stained liquor, and NICU admission have been reported to occur more frequently following induction, although evidence remains mixed [10, 11].

In low-resource settings, such as South Asia, where primigravidae form a significant proportion of obstetric admissions, the choice between spontaneous and induced labour carries major clinical and health-systems implications. A careful comparison of maternal and fetal outcomes among term primigravidae undergoing spontaneous versus induced labour is therefore essential for guiding evidence-based obstetric management. This study aims to evaluate and compare maternal outcomes, labour characteristics, intrapartum complications, and neonatal outcomes between spontaneous and induced labour among term primigravidae. By analysing a sample of 150 cases, the study seeks to clarify the risks and benefits associated with induction, and provide data relevant to clinical decision-making, patient counselling, and protocols for safe labour management in similar obstetric settings.

Materials and Methods

Study design and setting

A prospective comparative observational study at the Department of Obstetrics & Gynaecology, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh from January 2021 to December 2021.

Sample size and study population

One hundred fifty consecutive primigravidae at term (37+0 to 41+6 weeks) admitted in labour or for induction were enrolled. Two groups were formed based on labour onset:

- **Group S (Spontaneous labour):** n = 75 - spontaneous onset of regular uterine contractions with cervical change.
- **Group I (Induced labour):** n = 75 - induction initiated for obstetric indications (post-date, oligohydramnios, hypertensive disorders, suspected fetal compromise, elective medically indicated induction).

Equal group sizes reflect case flow and comparison intent.

Inclusion criteria

- Primigravida
- Singleton pregnancy
- Cephalic presentation
- Gestational age 37+0 to 41+6 weeks
- Intact or ruptured membranes at admission

Exclusion criteria

- Multiple gestation
- Fetal anomaly incompatible with life
- Prior uterine surgery
- Known placenta previa or vasa previa
- Women refusing participation

Induction protocol

Induction methods followed institutional protocol: cervical ripening with prostaglandins (PGE2 gel or tablets) where indicated, or trans-cervical Foley catheter, followed by ARM (artificial rupture of membranes) and oxytocin infusion titrated per protocol when required. Continuous fetal heart rate (FHR) monitoring (intermittent auscultation or continuous CTG where available) was used; uterine activity monitored clinically. Management of hyperstimulation followed protocol (stop oxytocin, tocolysis if required, expedite delivery if fetal compromise).

Definitions

- **Uterine hyperstimulation:**>5 contractions in 10 minutes or contractions with associated fetal heart rate changes attributed to excessive uterine activity.
- **PPH:** estimated blood loss >500 mL for vaginal delivery or >1000 mL for caesarean section.
- **Low Apgar:** Apgar score <7 at 5 minutes.
- **NICU admission:** admission to neonatal intensive care unit for any reason within 24 hours of birth.

Data collection

Data were recorded on a standardized proforma: demographic characteristics, indication for induction, intrapartum events, mode of delivery, maternal complications, neonatal outcomes (Apgar scores at 1 and 5 min, birthweight, NICU admission, early neonatal death). Blood loss was estimated by visual assessment and weighing swabs.

Statistical analysis

Continuous variables reported as mean±SD; categorical as counts and percentages. Student's t-test for continuous variables and Chi-square or Fisher exact test for categorical variables A p-value <0.05 considered statistically significant. Analysis performed using standard statistical software.

Ethical considerations

Institutional ethical committee approval obtained. Written informed consent from all participants. Confidentiality assured.

Results

A total of 150 term primigravidae were included, with 75 women in the spontaneous labour group (Group S) and 75 in the induced labour group (Group I). Both groups were comparable in baseline characteristics.

Table 1: Baseline Maternal Characteristics

Variable	Group S (n=75)	Group I (n=75)	p-value
Age (years), mean±SD	24.8±3.2	25.6±3.8	0.12
BMI (kg/m²), mean±SD	26.1±2.9	26.4±3.1	0.45
Gestational age (weeks)	39.4±0.9	39.1±1.0	0.04
Booked status, n (%)	64 (85.3%)	61 (81.3%)	0.49
Indication for IOL	—	Post-date (37.3%) Oligohydramnios (18.7%) PIH (16.0%) Others (28.0%)	—

The baseline maternal profiles of both groups were largely comparable. The mean age was similar (24.8±3.2 years in Group S vs. 25.6±3.8 years in Group I; p = 0.12). Mean BMI also showed no significant difference between the two groups (26.1±2.9 vs. 26.4±3.1; p = 0.45). Gestational age at admission was marginally lower in the induced group (39.1±1.0 weeks) compared to the spontaneous group (39.4±0.9 weeks), reaching statistical significance (p = 0.04). Most women in both groups were booked cases. Indications for induction were mainly post-datism, oligohydramnios and pregnancy-induced hypertension.

Table 2: Intrapartum Interventions and Labour Course

Outcome	Group S (n=75)	Group I (n=75)	p-value
Oxytocin augmentation required	28 (37.3%)	54 (72.0%)	<0.001
Uterine hyperstimulation	1 (1.3%)	6 (8.0%)	0.05
Active labour duration (hours), median (IQR)	7.1 (5-9)	8.3 (6-11)	0.02
ARM performed	60 (80.0%)	70 (93.3%)	0.02

The intrapartum course differed significantly between the two groups. Oxytocin augmentation was required in 72% of women in Group I, compared to 37.3% in Group S ($p < 0.001$). Uterine hyperstimulation was more common among induced women (8.0% vs. 1.3%, p = 0.05). The median duration of active labour was significantly longer in the induced group (8.3 hours) than in the spontaneous group (7.1 hours; p = 0.02). ARM was performed more frequently in Group I (93.3%) compared to Group S (80.0%) (p = 0.02). Overall, induced labour was associated with a higher degree of intervention and longer labour duration.

Table 3: Mode of Delivery

Mode of Delivery	Group S (n=75)	Group I (n=75)	p-value
Spontaneous vaginal delivery	50 (66.7%)	38 (50.7%)	0.03
Instrumental delivery	5 (6.7%)	8 (10.7%)	0.34
Caesarean section	12 (16.0%)	20 (26.7%)	0.12
Operative delivery (instrumental + CS)	17 (22.7%)	28 (37.3%)	0.04

Significant differences were noted in the mode of delivery between the two groups. Spontaneous vaginal delivery occurred in 66.7% of women in Group S, compared to 50.7% in Group I (p = 0.03). Although the individual rates of caesarean section were higher in the induced group (26.7% vs. 16.0%), the difference did not reach statistical significance (p = 0.12). However, when instrumental deliveries and caesarean sections were combined, the overall operative delivery rate was significantly higher in Group I (37.3% vs. 22.7%, p = 0.04). These findings indicate that induction of labour is associated with increased need for operative intervention.

Table 4: Maternal Complications

Complication	Group S (n=75)	Group I (n=75)	p-value
Postpartum hemorrhage	3 (4.0%)	6 (8.0%)	0.28
Chorioamnionitis	2 (2.7%)	4 (5.3%)	0.41
Blood transfusion required	1 (1.3%)	2 (2.7%)	0.56
Uterine rupture	0	0	—

Maternal complications were relatively low in both groups, with no statistically significant differences. Postpartum hemorrhage occurred in 4.0% of spontaneous labours compared to 8.0% of induced labours (p = 0.28). Chorioamnionitis was noted in 2.7% vs. 5.3% (p = 0.41) of Group S and Group I respectively. Only a few women required blood transfusion, and no cases of uterine rupture occurred in either group. Although slightly more complications were seen in the induced group, the differences were not statistically significant.

Table 5: Neonatal Outcomes

Neonatal Outcome	Group S (n=75)	Group I (n=75)	p-value
Birthweight (g), mean±SD	3200±360	3160±420	0.45
Meconium-stained liquor	8 (10.7%)	14 (18.7%)	0.14
Apgar <7 at 1 min	9 (12.0%)	12 (16.0%)	0.44
Apgar <7 at 5 min	3 (4.0%)	5 (6.7%)	0.47
NICU admission	5 (6.7%)	9 (12.0%)	0.21
Early neonatal death	0	1 (1.3%)	0.31

Neonatal outcomes were largely comparable between groups. Mean birthweight showed no significant difference (3200 g vs. 3160 g; p = 0.45). Meconium-stained liquor occurred more frequently in induced labours (18.7% vs. 10.7%), though this was not statistically significant (p = 0.14). Apgar scores <7 at both 1 minute and 5 minutes were slightly higher in the induced group, but without significant differences. NICU admissions were also higher in Group I (12.0% vs. 6.7%, p = 0.21). One early neonatal death occurred in the induced group. Overall, neonatal morbidity was slightly increased following induction but not significantly different.

Discussion

This study compared maternal and fetal outcomes between spontaneous labour and induced labour among term primigravidae and revealed several important differences with significant clinical implications. The findings demonstrate that induction of labour is associated with increased intrapartum interventions, longer labour duration, and a higher rate of operative deliveries, while neonatal outcomes, although slightly worse in the induced group, did not differ significantly.

The present study observed a significantly higher need for oxytocin augmentation in the induced labour group (72%) compared to the spontaneous labour group (37.3%). This aligns with previous studies reporting increased augmentation requirements following induction, due to inadequate uterine contractility or an initially unfavourable cervix [12]. Bishop score at the time of induction has been strongly correlated with the likelihood of successful vaginal delivery, and poor cervical readiness often necessitates pharmacologic support to achieve adequate labour progress [13].

Labour duration was significantly longer in the induced group, consistent with findings from large cohort studies that induction tends to prolong both the latent and active phases of labour in primigravidae [14]. The increased rate of uterine hyperstimulation observed in the induced group (8%) also mirrors prior reports indicating that the use of prostaglandins and oxytocin can increase abnormal contraction patterns, potentially impacting fetal condition [15].

Mode of delivery showed notable differences between groups. Although caesarean section rates alone did not reach statistical significance, the combined operative delivery rate (instrumental

+ caesarean) was significantly higher in the induced labour group. Similar studies have reported that induction increases the risk of caesarean delivery by 1.5 to 2 times, particularly in nulliparous women [16, 17]. Some researchers attribute this to dysfunctional labour patterns, fetal intolerance to labour, and failed induction, while others argue that modern induction protocols may reduce this risk when cervical favourability is optimized [18]. Nevertheless, our findings are in agreement with evidence suggesting that spontaneous onset of labour is associated with better chances of vaginal delivery.

Maternal complications were more common in the induced group, though differences were not statistically significant. The slightly higher incidence of postpartum hemorrhage, chorioamnionitis, and need for blood transfusion in induced labour may reflect increased manipulation, prolonged labour, and higher rates of operative births. Previous studies have similarly reported higher risks of infection and hemorrhage following induction, particularly when labour is prolonged or when multiple agents are used for cervical ripening and augmentation [19].

Neonatal outcomes were comparable overall, although NICU admission, meconium-stained liquor, and low Apgar scores were more frequent among the induced group. Similar trends have been reported in several observational studies, suggesting that neonatal compromise may be related to uterine hyperstimulation, prolonged labour, or the underlying conditions necessitating induction [20]. However, the differences in the present study did not reach statistical significance, indicating that induction of labour, when appropriately monitored, may not significantly increase neonatal morbidity. The single early neonatal death in the induced group underscores the need for vigilant fetal monitoring, particularly in high-risk inductions.

The findings of this study are consistent with earlier literature indicating that induction in primigravidae is associated with more interventions and a higher operative delivery rate. However, modern evidence increasingly supports the safety of induction when performed for appropriate indications and with careful assessment of cervical favourability. The ARRIVE Trial, for example, reported lower caesarean rates with elective induction in selected populations, highlighting that outcomes depend heavily on clinical context and patient selection [20].

The strengths of the present study include a homogenous sample of term primigravidae and uniform management protocols. However, limitations include the single-centre design and absence of stratification by cervical Bishop score, which is a major determinant of induction success. Future studies incorporating cervical favourability, method of induction, and subgroup analysis may offer more granular insights.

Overall, the study supports the existing body of evidence that spontaneous onset of labour results in better maternal outcomes and fewer interventions compared to induced labour in primigravidae. While neonatal outcomes were largely similar, cautious use of induction guided by strict indications, cervical assessment, and appropriate monitoring is essential to minimize maternal and perinatal risks.

Conclusion

In this cohort of 150 term primigravidae, induction of labour was associated with a higher requirement for oxytocin augmentation and an increased rate of uterine hyperstimulation. Although the induced group had higher absolute rates of caesarean section, instrumental delivery and NICU admissions, These differences were not statistically significant for cesarean but neonatal outcomes, except for the combined operative delivery rate which was significantly higher. Induction should be individualized, with informed discussion about expected intrapartum course and vigilant monitoring.

Conflict of Interest

Not available

Financial Support

Not available

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