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Original Research Article

Evaluation of labor progression in induced and spontaneous labor using modified WHO partograph in term primigravida: a hospital-based comparative study

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ABSTRACT

Background: Induction of labor is commonly performed to improve maternal and neonatal outcomes; however, its effectiveness compared to spontaneous labor remains debated. Monitoring labor progress using the modified WHO partograph provides an objective way to assess outcomes. To compare the progress and outcomes of induced labor with spontaneous labor among primigravida women at term.

Methods: This cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, Chattogram Medical College Hospital, Bangladesh, from March 2018 to February 2019. A total of 130 primigravida women at term (41%–41% weeks) were selected using purposive sampling and divided equally into spontaneous labor (n=65) and induced labor (n=65) groups. Inclusion and exclusion criteria were applied to ensure comparability. Labor was monitored using the modified WHO partograph. Data on socio-demographic variables, labor progression, mode of delivery, maternal and neonatal outcomes were collected and analyzed using SPSS version 23. Statistical significance was set at $p < 0.05$.

Results: There was no significant difference in socio-demographic characteristics between the groups. The induced group had significantly higher mean gestational age (41.61 ± 0.48 vs 41.21 ± 0.01 weeks; $p < 0.001$) and BMI (24.07 ± 1.32 vs 22.63 ± 1.55 kg/m²; $p < 0.001$). The rate of normal vaginal delivery was slightly higher in the spontaneous group (86.2%) compared to the induced group (78.5%), though not statistically significant. Caesarean section rates were comparable (9.2% vs 12.3%). Labor progression assessed by partograph showed no significant difference between groups, with most women remaining within the alert line. However, the duration of labor was significantly shorter in the induced group, with a reduced first stage (7.59 ± 0.85 vs 10.53 ± 1.04 hours; $p < 0.001$) and second stage (45.05 ± 8.28 vs 49.10 ± 7.99 minutes; $p = 0.001$). Maternal complications were minimal and comparable between groups. Neonatal outcomes, including Apgar scores, birth asphyxia, meconium aspiration and NICU admission, showed no statistically significant differences.

Conclusions: Induced labor is comparable to spontaneous labor in terms of maternal and neonatal outcomes among primigravida at term. Although induction shortens the duration of labor, it does not significantly increase adverse outcomes or operative delivery rates.

Keywords: Induced labor, Modified WHO partograph, Maternal outcome, Neonatal outcome, Primigravida, Spontaneous labor

INTRODUCTION

Labour is a complex physiological process characterized by coordinated uterine contractions leading to cervical dilatation and delivery of the fetus. In modern obstetrics, ensuring optimal maternal and neonatal outcomes remains a primary goal and interventions such as induction of labour (IOL) are frequently employed to achieve this objective. Induction of labour refers to the artificial initiation of uterine contractions before the spontaneous onset of labour when the benefits of early delivery outweigh the risks of continuing pregnancy.¹ Induction of labour is one of the most common obstetric interventions worldwide, with rates increasing steadily in both developed and developing countries due to improved fetal surveillance and evidence-based clinical guidelines.^{2,3} Globally, the rate of labour induction has increased significantly, reflecting evolving clinical practices and improved monitoring techniques.

Despite its widespread use, the outcomes of induced labour compared with spontaneous labour remain a subject of ongoing debate. Some studies suggest that induction is associated with prolonged labour, increased need for augmentation and higher rates of operative delivery, including caesarean section.⁴ Similarly, recent prospective studies have reported higher caesarean section rates in induced labour, while spontaneous labour is often associated with higher rates of successful vaginal delivery.⁵ However, other evidence indicates that when appropriately managed, induction does not significantly worsen maternal or neonatal outcomes compared with spontaneous labour.^{1,6} Monitoring labour progression plays a crucial role in improving outcomes. The WHO recommends the use of the modified partograph as a simple, cost-effective tool for assessing labour progress and identifying deviations from normal patterns.⁷ The partograph enables timely clinical decision-making by tracking cervical dilatation, fetal wellbeing and uterine activity, thereby reducing complications associated with prolonged or obstructed labour.^{4,8}

Furthermore, differences in labour dynamics between induced and spontaneous labour have been highlighted in recent clinical guidelines. For instance, induced labour is often associated with a longer latent phase, although the active phase may be comparable between the two groups.⁹ These variations necessitate careful monitoring to ensure safe delivery outcomes. Given the conflicting evidence and the increasing prevalence of labour induction, comparative evaluation of induced and spontaneous labour using standardized tools such as the modified WHO partograph is essential. Such studies are particularly important among primigravida women at term, where labour patterns and outcomes may differ significantly. In Bangladesh and other South Asian countries, comparative evidence regarding labour progression among primigravida women undergoing induction versus spontaneous onset of labour remains limited, highlighting the need for context-specific studies utilizing standardized

monitoring tools such as the modified WHO partograph.^{10,11} Therefore, this study aims to assess and compare the progress of labour and fetomaternal outcomes between induced and spontaneous labour using the modified WHO partograph.

METHODS

This cross-sectional comparative study was conducted in the Department of Obstetrics and Gynaecology, Chattogram Medical College Hospital, Bangladesh, over a one-year period from March 2018 to February 2019. The study population comprised primigravida women at term pregnancy (41% to 41% weeks of gestation) admitted for delivery. A total of 130 participants were selected using purposive sampling and were equally divided into two groups: spontaneous labor (n=65) and induced labor (n=65).

Inclusion criteria included primigravida women with singleton pregnancy, cephalic presentation and gestational age within the specified term period. Women with multiple pregnancies, malpresentation, previous uterine surgery or obstetric complications were excluded to ensure comparability between groups. Induction of labor was performed using standard hospital protocols, primarily with oxytocin infusion, while the spontaneous group progressed naturally without intervention. All participants were monitored during labor using the modified WHO partograph, which recorded cervical dilatation, fetal heart rate, uterine contractions and maternal parameters. Data were collected using a structured data collection sheet, including socio-demographic characteristics, gestational age, body mass index (BMI), duration of labor stages, mode of delivery and maternal and neonatal outcomes. Neonatal outcomes were assessed using Apgar scores at 1 and 5 minutes, presence of birth asphyxia, meconium aspiration and requirement for neonatal intensive care unit (NICU) admission.

Data analysis

Statistical analysis was performed using SPSS version 27. Quantitative variables were expressed as mean±standard deviation and compared using Student's t-test, while qualitative variables were analyzed using the chi-square test. A p value of <0.05 was considered statistically significant. Ethical approval was obtained from the institutional review board and informed consent was taken from all participants.

Operational definitions

Induced labor

Induced labor is defined as the artificial initiation of uterine contractions using pharmacological methods (e.g., oxytocin infusion) in primigravida women at term (41%–41% weeks) before the spontaneous onset of labor, with the aim of achieving vaginal delivery.

Spontaneous labor

Spontaneous labor refers to the natural onset of regular uterine contractions leading to progressive cervical dilatation and delivery, without any medical or surgical intervention to initiate labor.

Modified WHO partograph

The modified WHO partograph is a graphical tool used to monitor labor progress by plotting cervical dilatation, fetal heart rate, uterine contractions and maternal parameters over time. In this study, it is used to assess labor progression relative to alert and action lines.

Progress of labor

Progress of labor is operationally defined as the rate of cervical dilatation and descent of the fetal head over time, assessed using the modified WHO partograph and categorized as within the alert line or between alert and action lines.

RESULTS

Table 1 shows that out of 65 pregnant women in each group 18 (27.7%) women each belonged to <20 years age in both sides whereas 47 (72.3%) each belonged to ≥20 years age category in both the groups. This similar scenario in both groups was observed due to matching of maternal age in both sides. Interestingly, the mean age of spontaneous and induced onset of labor group women were 20.26±1.11 (age range: 18-22) years and 20.14±1.03 (age range: 18-22) years respectively (p=0.51). Educational profile of the participants showed that there were 41 (63.2%) and 34 (52.3%) women out of 65 achieved primary education in spontaneous and induced onset group respectively. Subsequently, majority (24.5% vs 32.3%) in spontaneous and induced onset group achieved education JSC and above.

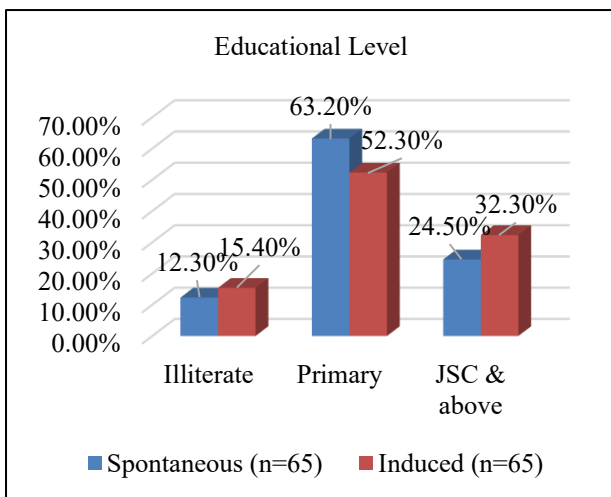


Figure 1: Educational level of the study participants (n=130).

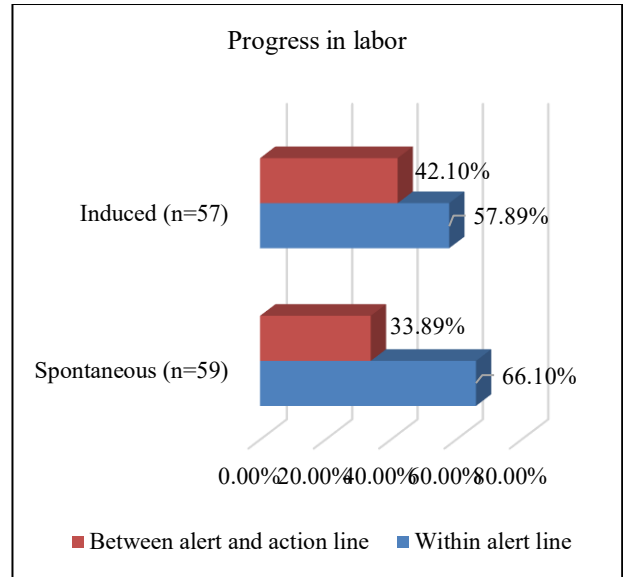


Figure 2: Evaluation of progress in labor using modified WHO partograph (n=116).

Table 2 shows that mean gestational age of spontaneous group women was 41.21±0.01 weeks, whereas induced onset women group was 41.61±0.48 weeks (p=<0.001). BMI of the participants revealed that the mean BMI of spontaneous group women was 22.63±1.55 kg/m² whereas the same in induced onset group women was 24.07±1.32 kg/m² (p=<0.001). Table 3 shows that out of 65 spontaneous labor women, 56 (86.2%), 6 (9.2%) and 3 (4.6%) had mode of delivery were normal vaginal delivery, cesarean section and ventouse extraction respectively. On the contrary, out of 65 induced onset labor women, 51 (78.5%), 8 (12.3%) and 6 (9.2%) had mode of delivery were normal vaginal delivery, cesarean section and ventouse extraction respectively.

Figure 2 shows that among 59 vaginal delivered cases in spontaneous group the partograph showed within alert line in case of 39 (66.10%) women whereas between alert and action line status was observed in case of 20 (33.89%) women. On the contrary, out of 57 vaginal delivered induced onset women 33 (57.89%) had partograph status within alert line whereas 24 (42.10%) showed their partograph status between alert and action line. Table 4 shows that the mean of 1st stage in both spontaneous and induced onset groups were 10.53±1.04 (range: 6-12) hours and 7.59±0.85 (range: 6-9) hours respectively (P=<0.001). Besides, the same variable in 2nd stage were 49.10±7.99 (range: 40-60) minutes and 45.05±28 (range: 40-50) minutes respectively. Table 5 shows that out of 65 women in spontaneous labor group 3 (4.61%), 2 (3.07%) and 1 (1.54%) neonate had NICU requirements, birth asphyxia and meconium aspiration respectively. On the contrary, out of 65 induced onset labor women 2 (3.07%) neonates had birth asphyxia. One (1.54%) each had meconium aspiration and NICU requirements. Besides mean Apgar score between the groups showed no statistically significant difference (p=>0.05).

Table 1: Comparison of socio-demographic variables between two groups (n=130, 65 in each group).

| Variables | Spontaneous (n=65) | Induced (n=65) | P value |
|--------------------------|--------------------|----------------|---------------------|
| Age (in years) | | | |
| <20 | 18 (27.7%) | 18 (27.7%) | 1.0 ^{NS} |
| ≥20 | 47 (72.3%) | 47 (72.3%) | |
| Mean±SD | 20.26±1.11 | 20.14±1.03 | |
| Range | 18-22 | 18-22 | 0.513 ^{NS} |
| Educational level | | | |
| Illiterate | 8 (12.3%) | 10 (15.4%) | |
| Primary | 41 (63.2%) | 34 (52.3%) | 0.371 ^{NS} |
| JSC & above | 16 (24.5%) | 21 (32.3%) | |

NS: Not significant, p value was significant at <0.05.

Table 2: Comparison of gestational age and BMI of the patient between groups (n=130; 65 in each group).

| Variables | Spontaneous (n=65) | Induced (n=65) | P value |
|-----------------------------------|--------------------|----------------|---------------------|
| Gestational age (in weeks) | 41.21±0.01 | 41.61±0.48 | <0.001 ^S |
| BMI, (Kg/m²) | 22.63±1.55 | 24.07±1.32 | <0.001 ^S |

P value was calculated by student's t test. S: Significant, p value was significant at <0.05.

Table 3: Comparison of mode of delivery between two groups (N=130; 65 in each group).

| Mode of delivery | Spontaneous (n=65) | Induced (n=65) | P value |
|--------------------------------|--------------------|----------------|--------------------|
| Normal vaginal delivery | 56 (86.2%) | 51 (78.5%) | 0.25 ^{NS} |
| Ventouse extraction | 3 (4.6%) | 6 (9.2%) | 0.18 ^{NS} |
| Caesarean section | 6 (9.2%) | 8 (12.3%) | 0.57 ^{NS} |

P value was calculated by chi square test. NS: Not significant, p value was significant at <0.05.

Table 4: Comparison of duration of labor (1st and 2nd stage) between two groups (n=116).

| Stage of labor | Spontaneous (n=59) | Induced (n=57) | P value |
|------------------------------|--------------------|----------------|---------------------|
| 1st stage, in hours | | | |
| Mean±SD | 10.53±1.04 | 7.59±0.85 | <0.001 ^S |
| Range | 6-12 | 6-9 | |
| 2nd stage, in minutes | | | |
| Mean±SD | 49.10±7.99 | 45.05±8.28 | 0.001 ^S |
| Range | 40-60 | 40-50 | |

P value was calculated by student's t test. S: Significant, p value was significant at <0.05.

Table 5: Comparison of neonatal outcome between two groups (n=130; 65 in each group).

| Variables | Spontaneous (n=65) | Induced (n=65) | P value |
|--------------------------------|--------------------|----------------|---------------------|
| Birth asphyxia | 2 (3.07%) | 2 (3.07%) | 1.00 ^{NS} |
| Meconium aspiration | 1 (1.54%) | 1 (1.54%) | 1.00 ^{NS} |
| NICU admission | 3 (4.6%) | 1 (1.54%) | 0.47 ^{NS} |
| Apgar score @ 1 minute | 6.35±1.45 | 6.22±1.46 | 0.356 ^{NS} |
| Apgar score @ 5 minutes | 8.40±1.37 | 8.33±1.28 | 0.567 ^{NS} |

P value was calculated by chi square test (qualitative) & student's t test (quantitative). NS: Not Significant, p value was significant at <0.05.

DISCUSSION

The present study compared the progress of labour and fetomaternal outcomes between induced and spontaneous labour using the modified WHO partograph. The findings demonstrated that induction of labour significantly shortened the duration of both the first and second stages

of labour, while maternal and neonatal outcomes remained comparable between the two groups. The shorter duration of labour observed in the induced group is consistent with several recent studies. A comparative study by Fatema et al reported reduced labour duration among induced cases due to active management and augmentation protocols.¹² Similarly, Gadhavi et al found that induction facilitated

faster cervical dilatation and progression when carefully monitored.¹³ However, some studies have reported contrasting findings, suggesting that induced labour may prolong the latent phase, although the active phase remains comparable to spontaneous labour.⁹

In terms of mode of delivery, this study found no statistically significant difference between the groups, although spontaneous labour showed a slightly higher rate of vaginal delivery. This aligns with findings by Alalem et al, who reported higher normal vaginal delivery rates in spontaneous labour but without significant differences in overall outcomes.¹⁴ Conversely, some studies have demonstrated higher caesarean section rates among induced labour cases due to failed induction or fetal distress.¹ These variations may be attributed to differences in patient selection, induction methods and institutional protocols. The use of the modified WHO partograph in this study showed no significant difference in labour progression patterns between the two groups. Most women remained within the alert line, indicating satisfactory labour progress. This finding is supported by earlier research demonstrating that partographic monitoring enables early identification of abnormal labour and reduces unnecessary interventions.⁸ The partograph remains a valuable, low-cost tool, particularly in resource-limited settings.

Regarding neonatal outcomes, this study observed no significant differences in Apgar scores, birth asphyxia or NICU admissions between induced and spontaneous labour groups. Similar findings have been reported in studies from Ethiopia and Bangladesh, where neonatal outcomes were comparable when labour was properly monitored.^{10,15} Additionally, systematic reviews have concluded that induction at term does not significantly increase adverse neonatal outcomes when appropriately indicated.^{16,17} This study was limited by its cross-sectional design, which restricts the ability to establish causal relationships. The use of purposive sampling and a single-center setting may limit the generalizability of the findings. Additionally, some clinical parameters and outcomes were subject to observer variation and potential measurement bias.

Overall, the findings of this study support the growing body of evidence that induction of labour, when performed under proper monitoring using the WHO partograph, is a safe and effective intervention. Although induction may influence labour duration and intervention rates, it does not appear to adversely affect maternal or neonatal outcomes.

CONCLUSION

Induction of labour in primigravida at term is comparable to spontaneous labour in terms of maternal and neonatal outcomes. Although induced labour was associated with a shorter duration of labour, it did not significantly increase operative delivery rates or complications. The use of the modified WHO partograph proved effective in monitoring

labour progress in both groups. These findings support the safe use of labour induction when clinically indicated. Further large-scale studies are recommended to validate these results and improve clinical decision-making.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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