

Research Article

Electronic Versus Paper Partogram Monitoring and Mode of Delivery Among Women in Active Labour: A Comparative Study

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ABSTRACT

Background: The partogram is widely used to monitor labour progression and assist in timely recognition of abnormal labour. Electronic partograms provide a digital alternative to conventional paper-based monitoring, but their association with mode of delivery requires evaluation. **Objective:** To compare electronic and paper partogram monitoring with respect to mode of delivery among women in active labour. **Materials and Methods:** This prospective comparative observational study included 1,500 term women in active labour. Of these, 750 were monitored using an electronic partogram and 750 using a modified WHO paper partogram. The primary outcome was mode of delivery, categorized as spontaneous vaginal, instrumental vaginal or caesarean delivery. Indications for operative delivery were also

compared. A p-value <0.05 was considered statistically significant. **Results:** Spontaneous vaginal delivery occurred in 622 (82.93%) women monitored using the electronic partogram and 617 (82.27%) monitored using the paper partogram. Instrumental vaginal delivery occurred in 94 (12.53%) and 93 (12.40%), respectively, while caesarean section occurred in 34 (4.53%) and 39 (5.20%), respectively. Overall, mode of delivery did not differ significantly between the groups. Pathological cardiotocography was the most frequent indication for caesarean delivery, while poor maternal bearing-down effort was the predominant indication for instrumental vaginal delivery. **Conclusion:** Electronic and paper partogram monitoring were associated with comparable modes of delivery among women in active labour. Electronic

partograms provide a feasible alternative to conventional paper-based monitoring without evidence of increased operative delivery.

Keywords: Electronic partogram; paper partogram; active labour; mode of delivery; intrapartum monitoring; caesarean section.

INTRODUCTION

Appropriate monitoring during active labour is essential for identifying abnormal labour progression and facilitating timely obstetric intervention. The partogram provides a structured graphical representation of cervical dilatation, fetal condition, uterine contractions and maternal parameters and has traditionally been used to support clinical decision-making during labour. However, conventional paper partograms may be limited by incomplete documentation, delayed recording and incorrect plotting. Electronic partograms have therefore been introduced to facilitate real-time recording, automated plotting and timely recognition of deviations from normal labour.

Comparative evaluation of electronic and paper partograms has demonstrated the feasibility of electronic monitoring in routine maternity care and its potential to improve labour monitoring and birth outcomes.^[1] Electronic partograms may also improve adherence to recommended intrapartum observations and support timely clinical decision-making by healthcare providers.^[2] Their feasibility and acceptability in maternity-care settings have further supported the potential integration of digital partograms into routine labour-room practice.^[3]

Successful implementation of an electronic partogram, however, depends on its consistent and accurate utilization. Quality-improvement initiatives have demonstrated that adherence to electronic partogram plotting can be improved through appropriate training, workflow modification and reinforcement of monitoring practices.^[4] Simplified and paperless approaches have also been

evaluated as practical bedside tools for monitoring labour progression and identifying abnormalities requiring intervention.^[5]

Comparisons between paperless and modified WHO partograms have shown that simplified monitoring approaches can be effectively incorporated into labour management.^[6] Similar comparative evidence has suggested that alternative partogram formats can provide practical and structured monitoring while reducing some of the difficulties associated with conventional documentation.^[7]

Despite the potential advantages of electronic monitoring, it remains important to determine whether the method of partogram documentation influences clinically relevant obstetric outcomes, particularly the mode of delivery. Differences in the timely identification of abnormal labour progression could potentially influence the need for instrumental or operative delivery. Therefore, the present study was undertaken to compare electronic versus paper partogram monitoring and mode of delivery among women in active labour, with particular emphasis on spontaneous vaginal, instrumental vaginal and caesarean delivery.

MATERIALS AND METHODS

Study design and setting

This was a prospective comparative observational study conducted in the Department of Obstetrics and Gynaecology of a tertiary care teaching hospital. Pregnant women admitted to the labour room in active labour and fulfilling the predefined eligibility criteria were included in the study.

Sample size

A total of 1,500 women were included. The participants were divided into two equal groups according to the method used for intrapartum monitoring:

- **Electronic partogram group (Group E):** 750 women monitored using an electronic partogram.

- **Paper partogram group (Group P):** 750 women monitored using the modified WHO paper partogram. Thus, the final sample available for comparison was **750 women in each group (total n=1,500)**.

Inclusion criteria

Women aged 19–40 years, with a term singleton pregnancy, cephalic presentation and established active labour were included. The partogram was initiated when cervical dilatation was ≥ 4 cm, consistent with the protocol used for the source dataset.

Exclusion criteria

Women with previous caesarean section, preterm pregnancy, multiple gestation, malpresentation or antepartum haemorrhage were excluded from the study.

Study procedure

Eligible women were enrolled during active labour. Baseline maternal and obstetric characteristics, including age, parity and gestational age, were recorded.

In **Group E**, labour was monitored using the electronic partogram. Maternal, fetal and labour-related observations were entered electronically at the prescribed intervals. The electronic system enabled structured entry and graphical display of labour progress.

In **Group P**, the same labour parameters were monitored using the **modified WHO paper partogram**. Cervical dilatation, descent of the fetal head, uterine contractions, fetal heart rate and relevant maternal observations were recorded manually.

Women in both groups received standard intrapartum obstetric care. Decisions regarding augmentation, instrumental vaginal delivery or caesarean section were made according to labour progression and maternal and fetal indications.

Outcome measures

The **primary outcome was mode of delivery**, categorized as:

1. Spontaneous vaginal delivery;
2. Instrumental vaginal delivery; or
3. Caesarean section.

The indications for operative delivery were also recorded. Caesarean indications included protracted active phase, secondary arrest of cervical dilatation, arrest of descent and pathological cardiotocography. Indications for instrumental vaginal delivery included poor maternal bearing-down effort and prolonged fetal deceleration. Completeness of partogram documentation was additionally assessed as an intrapartum monitoring parameter.

Statistical analysis

Data were entered into Microsoft Excel and analysed using SPSS version 23.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequency and percentage. Continuous variables were compared using the independent-samples t-test, while categorical variables, including mode of delivery, were compared using the Chi-square test or Fisher's exact test, wherever appropriate.

The association between the method of partogram monitoring and mode of delivery was evaluated by comparing the proportions of spontaneous vaginal, instrumental vaginal and caesarean deliveries between the two groups. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 1,500 women in active labour were included in the study. Of these, 750 women were monitored using an electronic partogram (Group E) and 750 using a modified WHO paper partogram (Group P). The two groups were comparable with respect to maternal age and gestational age

Table 1: Baseline characteristics of women according to partogram monitoring

Characteristic	Electronic partogram (n=750)	Paper partogram (n=750)	p-value
Age (years), mean $\pm$ SD	26.48 $\pm$ 4.22	26.97 $\pm$ 4.25	0.400
Gestational age (weeks), mean $\pm$ SD	38.64 $\pm$ 0.88	38.58 $\pm$ 0.89	0.203

There was no statistically significant difference in maternal age or gestational age between the two groups ($p > 0.05$),

indicating that the groups were comparable for these baseline characteristics

Table 2: Comparison of mode of delivery between electronic and paper partogram groups

Mode of delivery	Electronic partogram (n=750), n (%)	Paper partogram (n=750), n (%)
Spontaneous vaginal delivery	622 (82.93)	617 (82.27)
Instrumental vaginal delivery	94 (12.53)	93 (12.40)
Caesarean section	34 (4.53)	39 (5.20)
Total	750 (100)	750 (100)

Spontaneous vaginal delivery was the most common mode of delivery in both groups, accounting for 82.93% of women monitored using the electronic partogram and 82.27% monitored using the paper partogram. Instrumental vaginal delivery occurred in 12.53% and 12.40%,

respectively. Caesarean section was performed in 4.53% of women in the electronic-partogram group compared with 5.20% in the paper-partogram group. Overall, the source dataset reported no significant difference in the distribution of mode of delivery between the two groups.

Table 3: Indications for caesarean section according to partogram monitoring

Indication for caesarean section	Electronic partogram (n=750), n (%)	Paper partogram (n=750), n (%)
Protracted active phase	8 (1.07)	7 (0.93)
Secondary arrest of dilatation	8 (1.07)	10 (1.33)
Arrest of descent	6 (0.80)	9 (1.20)
Pathological cardiotocography	12 (1.60)	13 (1.73)
Total caesarean sections	34 (4.53)	39 (5.20)

Pathological cardiotocography was the most frequent indication for caesarean section in both groups, accounting for 12 (1.60%) women in the electronic-partogram group and 13 (1.73%) in the paper-partogram group. Secondary arrest of

dilatation and arrest of descent were numerically less frequent among women monitored using the electronic partogram. However, the overall pattern of indications for caesarean delivery was similar between the two groups

Table 4: Indications for instrumental vaginal delivery according to partogram monitoring

Indication for instrumental delivery	Electronic partogram (n=750), n (%)	Paper partogram (n=750), n (%)
Poor maternal bearing-down effort	72 (9.60)	69 (9.20)
Prolonged fetal deceleration	22 (2.93)	24 (3.20)
Total instrumental deliveries	94 (12.53)	93 (12.40)

Poor maternal bearing-down effort was the predominant indication for instrumental vaginal delivery in both groups, occurring in 9.60% of women monitored electronically and 9.20% monitored using the paper partogram. Prolonged fetal deceleration accounted for 2.93% and 3.20%, respectively. The distribution of indications for instrumental delivery was broadly comparable between the groups. Overall, the mode of delivery was similar with electronic and paper partogram monitoring. Although the electronic-partogram group showed a numerically lower proportion of caesarean sections (4.53% vs 5.20%), the source study did not demonstrate a significant overall difference in mode of delivery. Thus, electronic partogram monitoring did not appear to increase the requirement for either instrumental vaginal delivery or caesarean section compared with conventional paper partogram monitoring.

DISCUSSION

The present comparative study evaluated the mode of delivery among 1,500 women in active labour monitored using either an electronic or paper partogram. Spontaneous vaginal delivery was the predominant mode in both groups, occurring in 82.93% of women monitored electronically and 82.27% monitored with the paper partogram. Instrumental vaginal delivery rates were also comparable (12.53% vs 12.40%), while caesarean section occurred in 4.53% and 5.20%, respectively. Overall, the distribution of mode of delivery did not differ significantly between the two monitoring approaches.

Faswila and Rao^[8] compared a paperless approach with the WHO partogram and highlighted the potential of simplified labour-monitoring methods for recognizing prolonged labour and facilitating clinical management. Reshma and Ambarkar^[9] similarly described the paperless partogram as a simple clinical tool for effective labour management. These observations support the feasibility of alternatives to conventional paper-based plotting without compromising routine monitoring of labour.

Abdelrahman et al.^[10], in their comparison of the WHO modified partograph and paperless partograph, also demonstrated the clinical applicability of simplified labour-monitoring systems. In the present study, the slightly lower proportion of caesarean sections in the electronic-partogram group (4.53%) compared with the paper group (5.20%) was numerical rather than evidence of a significant overall difference in mode of delivery. Therefore, the findings should not be interpreted as demonstrating that electronic monitoring reduces caesarean delivery.

Lee et al.^[11] reported that the design of a partograph can influence its usability and completion during routine labour care. Similarly, Lavender et al.^[12], in a Cochrane review, found insufficient evidence to establish clear differences in major maternal outcomes based solely on partograph use or design. The comparable rates of vaginal, instrumental and caesarean delivery in the present study are consistent with the view that the monitoring format alone may not determine the eventual mode of delivery.

Bedwell et al.^[13] emphasized that the effectiveness of a partograph depends on several contextual factors, including appropriate use, staff knowledge, clinical interpretation and timely response to abnormal findings. Mandiwa and Zamawe^[14] also demonstrated the importance of adequate documentation of labour parameters for effective partograph utilization. Thus, electronic systems may provide practical advantages through structured documentation and easier monitoring, but appropriate clinical interpretation remains essential.

Regarding operative delivery, pathological cardiotocography was the most frequent indication for caesarean section in both groups. Poor maternal bearing-down effort was the predominant indication for instrumental vaginal delivery. The overall pattern of indications was comparable between electronic and paper monitoring, suggesting that use of an electronic partogram did not increase operative intervention.

The large sample size and direct comparison of equally sized groups were strengths of the present study. However, its observational design limits causal interpretation. Further multicentre prospective studies should evaluate whether electronic partogram monitoring influences the timeliness of intervention, duration of labour and operative delivery after adjustment for relevant obstetric factors.

CONCLUSION

Electronic and paper partogram monitoring produced comparable modes of delivery among women in active labour. Spontaneous vaginal delivery was the predominant mode in both groups, while instrumental vaginal and caesarean delivery rates were similar. Although caesarean delivery was numerically lower with electronic monitoring, there was no significant overall difference in mode of delivery. Electronic partograms can therefore serve as a feasible alternative to

conventional paper partograms for structured intrapartum monitoring.

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