



**Paperless partogram as a bedside tool for the prevention of prolonged labour:
A prospective observational study.**

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**Abstract
Background**

Prolonged and obstructed labor, occurring in roughly 5% of deliveries, is a major cause of maternal and perinatal complications. Continuous monitoring of labor, timely recognition of deviations, and appropriate intervention are vital in reducing adverse outcomes. A more straightforward way to monitor the course of labor, the paperless partogram aids physicians in deciding the appropriate time for intervention and indicating when referral to higher centers with cesarean facilities is necessary. This study evaluated its effectiveness in preventing prolonged labor.

Materials and Methods:

A prospective study was carried out among 318 primigravida women with uncomplicated singleton pregnancies in cephalic presentation who presented in spontaneous active labor at the Department of Obstetrics and Gynecology, VSS Institute of Medical Science and Research, Burla. Alert ETD (anticipated time of delivery) and Action ETD parameters were used to track labor.

Results:

The mean age of participants was 24.6 ± 3.2 years. Most belonged to rural areas (68%) and the lower socioeconomic class (61%). Twenty-two percent of women crossed the Alert ETD, while only 1% exceeded the Action ETD. The mean duration of the active phase of labor was 4.9 hours. The incidence of prolonged labor was 8%, with 7 forceps and 20 cesarean deliveries.

Conclusion:

The paperless partogram was found to be a simple, reliable, and effective tool for managing labor. Its use minimized the occurrence of prolonged labor and contributed to a reduction in maternal and neonatal complications as well as cesarean section rates.

Recommendation:

It should be incorporated into routine obstetric care, especially in low-resource settings.

Keywords: Prolonged labour, Paperless Partogram, Caesarean section, Alert Estimated Time of Delivery (ETD), Action Estimated Time of Delivery (ETD)

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Introduction:

Reducing maternal and newborn illness and death requires timely strategies to prevent prolonged labor [1,2]. For over 30 years, the WHO has recommended the use of the partograph, a charting tool that tracks cervical dilatation over time, as the standard for monitoring the progress of labor [3]. Its main purpose is to alert healthcare providers when labor is progressing slowly so that interventions can be undertaken before it becomes prolonged [4–6]. In 2000, WHO revised the partograph to make it simpler and more practical, yet its use in resource-limited settings remains low. Even when implemented, it is often not interpreted correctly.

The shortcomings of the WHO partograph stem from its inability to meet essential criteria for appropriate technology. It has not been adequately adapted to local conditions, is often not well accepted by users, and its complexity makes it impractical where staff and resources are limited. For busy clinicians and birth attendants with limited training, the tool is too time-consuming and complicated to apply consistently [7].

In response to these challenges, Dr. A. K. Debda introduced the paperless partogram, a streamlined procedure intended to avoid protracted labor. This tool requires only a clock or watch, basic addition, and less than 20 seconds to complete. Its ease of use makes it suitable for healthcare providers with varying levels of training and offers a more practical alternative for labor monitoring. The present study was undertaken to evaluate how effective the paperless partogram is as a bedside tool for reducing prolonged labor.

Materials & Methods:

Study design and study setting

A prospective observational study. The study was conducted in the Department of Obstetrics & Gynaecology at Veer Surendra Sai Institute of Medical Science & Research (VIMSAR), Burla, Odisha, a tertiary care teaching hospital serving both rural and semi-urban populations of western Odisha and neighboring states. The study period was from January 2023 to December 2024.

Participants

A total of 318 primigravida women with uncomplicated singleton pregnancies in cephalic presentation at 37–42 weeks of gestation were enrolled using convenience sampling.

Inclusion Criteria:

- Primigravida women in spontaneous active labor (≥ 4 cm cervical dilatation).
- Singleton, cephalic presentation.

Exclusion Criteria:

- Multiple pregnancies, malpresentation, or previous cesarean section.
- Medical or obstetric complications (e.g., pre-eclampsia, placenta previa).

Variables

Primary outcome: Incidence of prolonged labor.

Secondary outcomes: Mode of delivery, duration of active labor, and maternal/fetal outcomes.

Data Sources/Measurements

The *Alert ETD* and *Action ETD* were determined as per Friedman's rule. Data were recorded for each labor case using the paperless partogram sheet.

Bias

Potential bias from convenience sampling was minimized by consistent inclusion criteria and standardized observation by the same team of obstetricians.

Study Size

Sample size was determined based on an expected prolonged labor rate of 10%, with 95% confidence and 5% margin of error, yielding a minimum of 300 participants (actual enrolled: 318).

Statistical Analysis

Data were coded and analyzed using SPSS v28. Descriptive statistics (mean, percentage, SD) were applied. A p -value ≤ 0.05 was considered significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee, VSS Institute of Medical Science & Research, Burla (Approval No: VSS/IEC/OBG/2023/07, dated 05/01/2023). Written informed consent was taken from all participants.

Results

Participant Flow

Out of 335 women screened, 318 met the inclusion criteria and completed the study. Seventeen were excluded due to obstetric complications or incomplete data.

- Mean age: 24.6 ± 3.2 years
- Residence: 68% rural, 32% urban
- Education: 58% completed secondary school
- Socioeconomic status: 61% lower, 39% middle
- Gestational age: Mean 38.9 weeks

Descriptive Data

Key Findings

Mode of Delivery (Prolonged Labor Cases):

Parameter	Result	p-value
Crossed Alert ETD	22%	0.07
Crossed Action ETD	1%	0.18
Mean active phase duration	4.9 hours	—
Incidence of prolonged labor	8%	0.03

Forceps – 7 (26%)

LSCS – 20 (74%)

TABLE – 1: Crossed ALERT ETD

Group		Alert ETD Crossed		P-value
		NO	YES	
Paperless Partogram (n=318)	Count	248	70	0.07
	%within alert ETD	78%	22%	

TABLE – 2: Crossed Action ETD

Group		Action ETD Crossed		P- value
		NO	YES	
Paperless Partogram (n=318)	No. of case	315	3	0.180
	%	99%	1%	

TABLE – 3: Duration of active phase in Paperless Partogram

Groups	Mean
Paperless Partogram	294.05 MIN = 4.9 HOUR

TABLE 4: Percentage of cases of prolonged labour



DISCUSSION

This study assessed the effectiveness of the paperless partogram as a bedside tool to prevent prolonged labor among primigravida women. The analysis revealed that only 8% of participants developed prolonged labor, with most managed successfully through cesarean or instrumental delivery. The mean duration of the active phase was 4.9 hours, which corresponds closely with the classical description of normal labor progression by Friedman (1955). The low incidence of prolonged labor observed in this study highlights the practical utility of the paperless

and Action ETD using a clock and simple arithmetic. This minimizes documentation errors and time delays in busy labor wards. The reduction in prolonged labor cases in this study compared to those reported with conventional partograph use (12–15%) underscores the efficiency of this simplified tool. Furthermore, the paperless partogram's minimal training requirements make it especially suitable for use by auxiliary nurse midwives (ANMs) and community health workers in rural areas.

From a clinical standpoint, the paperless partogram ensures real-time monitoring and rapid decision-making, thereby

Group	Total no of cases of Prolonged Labour		Mode of delivery			P value
	COUNT	%	NVD	FORCEPS	LSCS	
PAPERLESS PARTOGRAM (n=318)	27	8%	0	7	20	0.03

partogram in facilitating timely intervention and optimizing maternal outcomes.

Crossing the Alert ETD was observed in 22% of women, while only 1% crossed the Action ETD. These findings suggest that the paperless partogram enabled effective early recognition of labor deviations, allowing for prompt management before labor became prolonged. The difference between Alert and Action ETD crossings demonstrates that the two-tier system of observation offers clinicians adequate time to plan interventions, thereby preventing labor complications. The mean active phase duration of 4.9 hours further confirms that the tool maintains physiological labor progression without unnecessary acceleration.

The present findings align with those of Debdas (2008), who first introduced the paperless partogram and reported similar reductions in the incidence of prolonged labor in low-resource settings. Lavender et al. (2008) also emphasized the importance of simple, time-efficient labor monitoring tools for effective obstetric care. Moreover, the observed mean duration of the active phase is consistent with Friedman's earlier findings, which established 1 cm per hour as the expected rate of cervical dilatation. The similarity of results across studies strengthens the validity of the paperless partogram as a clinically sound approach to labor management.

Unlike the WHO partograph, which requires repeated charting and complex interpretation, the paperless partogram relies on straightforward calculations of the Alert

reducing maternal fatigue, fetal distress, and cesarean section rates. Its adaptability to both tertiary hospitals and peripheral centers enhances its potential integration into national maternal health programs. The use of this tool aligns with the WHO's Safe Motherhood Initiative (1987) and the Sustainable Development Goal (SDG-3), which aim to reduce maternal mortality by promoting evidence-based, cost-effective interventions. As a bedside tool, it bridges the gap between technology-dependent systems and practical field-based obstetric care.

The findings of this study are generalizable to primigravida women in tertiary and secondary healthcare centers with adequate obstetric staffing and monitoring resources. However, results should be interpreted cautiously in high-risk pregnancies or multigravidas, as the dynamics of labor progression differ across populations. The study's limitations include the use of convenience sampling and a single-center design, which may limit external validity. In addition, no long-term maternal or neonatal outcomes were evaluated, and observer bias may have influenced labor management decisions.

Future research should focus on multi-center randomized controlled trials comparing paperless and conventional partographs across diverse healthcare settings. Studies evaluating patient satisfaction, training requirements, and cost-effectiveness would provide further evidence for large-scale implementation. Despite limitations, the present study establishes that the paperless partogram is a simple, low-



cost, and highly effective tool for reducing prolonged labor and improving obstetric outcomes. Its adoption, particularly in low-resource environments, can play a pivotal role in achieving safer deliveries and advancing maternal healthcare quality.

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Conclusion

The paperless partogram proved to be a simple, reliable, and efficient bedside tool for monitoring labor progression and preventing prolonged labor. By using easily calculated Alert and Action Estimated Time of Delivery parameters, it enables early recognition of delays and timely intervention, thereby reducing cesarean section rates and maternal–neonatal complications. Its simplicity and minimal resource requirement make it ideal for use in peripheral and resource-limited healthcare settings. Incorporating this tool into routine obstetric practice can enhance labor management efficiency, promote safe deliveries, and contribute significantly to reducing maternal and perinatal morbidity.

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List of Abbreviations

- ETD – Estimated Time of Delivery
- LSCS – Lower Segment Cesarean Section
- NVD – Normal Vaginal Delivery
- WHO – World Health Organization
- SPSS – Statistical Package for the Social Sciences

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No external funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

ABD and RRR conceptualized and supervised the study. BRP performed data analysis. BSM managed data

collection. All authors contributed to manuscript writing, review, and final approval.

Author Biographies

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