

Efficacy of Paperless Partogram and Who Modified Partogram in Labour Management – A Comparative Study

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Abstract

Background: In intrapartum care, partogram is a vital tool which offers an objective and visual account of the progression of labour and fetal-mother wellbeing. Partogram as modified by World Health Organization (WHO) has been extensively applied in enhancing obstetric decisions and the alleviation of complications in case of extended labour. Nevertheless, its practical restriction like time, workload, and complexity have constrained its daily use particularly in resource-constrained environment. The paperless partogram was created because of its simplification and time saving features on the use of estimated delivery times (ETDs) instead of graphical plotting. The current research will assess and compare the effectiveness of WHO modified partogram and paperless partogram in managing labour.

Methods: Comparative observational study was done on 200 labouring women who were admitted in the Department of OBGYN, GMC, Ananthapur, Andhra Pradesh, India, between July 15th, 2023 to January 15th 2024. They had been chosen at random into two groups 100 monitored with the WHO modified partogram (Group A) and 100 monitored with the paperless partogram (Group B). The results of labour were mediated against alert line crossing, oxytocin augmentation, mode of delivery, perinatal outcomes and maternal complications. Chi-square and t-tests were used to test the statistical significance with $p < 0.05$ regarded significant.

Results: The age of the participants was equal to 25.14 ± 3.59 , with the vast majority of the respondents being multigravida. The augmentation of Oxytocin was also significantly less in the paperless group (41%) than in the WHO group (64%) ($p = 0.001$). Time of labour was shorter in paperless group (3.71 ± 1.96 hrs) and statistically different only with the WHO (4.07 ± 1.93 hrs) but not with the paperless. There were similar rates of Caesarean section to those in each group (30 % vs. 27 % , $p = 0.019$), whereas no difference in perinatal outcome, including Apgar scores, NICU admissions, and birth weights. All in all, using paperless partogram improved effective monitoring without undermining maternal and fetal outcomes.

Conclusion: The paperless partogram is a valid, easy to use and efficient substitute of WHO modified partogram. It makes labour monitoring easier, it is less demanding in augmentation, and it also continues to have similar maternal and neonatal outcomes, which goes especially well in busy or low-resource environments.

Keywords: Labour Management, WHO Modified Partogram, Paperless Partogram, Obstetric Outcomes, Intrapartum Monitoring, And Comparative Study.

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Introduction

Labour is a physiological process, and it has to be carefully monitored to make sure that the maternal and fetal outcome is best. One of the major causes of maternal and perinatal morbidity and mortality is prolonged or obstructed labour especially in low and middle-income nations where obstetric manifestations requiring timely interventions may be unavailable [1,2]. With the initiation of the partogram in the 1950s by Friedman, intrapartum care became transformed as it offered a graphic representation of cervical dilatation versus time as

an aid to enable clinicians to notice abnormal patterns of labour early in the process and take necessary action [3]. Later, the world health organization (WHO) popularized the partogram and modified the tool to develop a standardized labour monitoring tool throughout the world [4]. The WHO simplified partogram, which was implemented in the year 2000, has alert and action lines which help the obstetricians in evaluating the progress that the labour is going through and decide on interventions to be administered including

augmentation or operative birth [5]. The alert line is the predicted rate of cervical dilatation (1 cm/hour) and the action line is 4 hours right of the alert, it denotes the threshold of the watchful waiting of non-satisfactory labour progress [6]. It has been proven by numerous studies that the implementation of the WHO partogram can minimize the length of labour, unreasonable interventions, and negative maternal and perinatal outcomes [7,8]. Nonetheless, its demonstrated effectiveness, its practical application in a busy obstetrics unit is less than ideal because this technique takes time, plotting is complicated, and regular check-ups and updating of the charts are required [9,10].

To overcome these difficulties the paperless partogram was proposed as an alternative, simple, and time saving variant. It does not use the permanent graphical plotting, grounded on the proved 1 cm/h hour rate of cervical dilatation, but calculates two Estimated Times of Delivery (ETDs) an Alert ETD, which is determined by the presumed expected rate of cervical dilatation, and an Action ETD established four hours earlier [11].

In this system, clinicians can estimate the estimated time of delivery, the possible delays, and what interventions to execute without the intensive records. Most useful than simplified partogram, where there is inadequate resource to support computing paperless partogram, rural hospitals, and understaffed labour ward is simply the ease of the paperless partogram [12,13].

Although the WHO modified partogram is the gold standard, comparative researches have revealed that the paperless partogram is equally as effective in the management of labour with improved compliance among health care providers [14,15].

Other reports also propose that it also minimises any unnecessary augmentation and enhances decision making through a brief view of anticipated labour progression [16]. Though such benefits are present there is little large scale comparative study within Indian context where variation in staffing, patient load and resources can also influence the outcomes.

This paper was thus done to compare the effectiveness of WHO modified partogram and paperless partogram in labour management. It mainly concerned the assessment of their influence on such paramount parameters as the alert/action line crossing, caesarean section rate, oxytocin augmentation needed, perinatal and maternal outcomes. The results of such a comparative study should inform clinicians and policymakers to choose the most viable and efficient instrument available to them in monitoring the intrapartum events in a variety of clinical settings.

Materials and Methods

Study Design and Setting: It was a prospective comparative observational study that was carried out within the Department of OBGYN, GMC, Ananthapur, Andhra Pradesh, India, between July 15th, 2023 to January 15th, 2024. The research lasted for 6 months and involved 200 labouring women who executed the inclusion criteria. All participants were informed and given the informed written consent before they could be enrolled, and the Institutional Ethics Committee provided ethical clearance.

Study Population

The eligibility criteria were determined in all pregnant women admitted in labour. Two hundred individuals were enrolled and randomly placed into 2 groups:

- Group A: 100 women followed on the WHO Modified Partogram.
- Group B: 100 women who were followed with the use of Paperless Partogram.

Simple alternation was done to assure equal allocation of groups. The decisions made by management were based on the normal obstetric guidelines and clinical judgment of an attending obstetrician.

Inclusion Criteria

- Singleton pregnancy, both primigravida and multigravida.
- Cephalic presentation.
- Term gestation between 37–42 weeks.
- Spontaneous or induced labour.
- Women admitted in active phase of labour (≥ 4 cm cervical dilatation).

Exclusion Criteria

- Non-cephalic presentations.
- Preterm (<36 weeks) or post-term (>42 weeks) pregnancies.
- Previous caesarean section or any uterine surgery.
- Maternal comorbidities such as hypertension, diabetes mellitus, cardiac disease, or epilepsy.
- Antepartum haemorrhage or multiple gestation.

Data Collection Procedure: A pre-designed proforma was used to assess the eligible mothers at admission whereby demographic information, obstetric history, antenatal care, and the clinical findings were registered.

Mother examination involved general physical, systemic and obstetric surveys. Intermittent cardiotocography (CTG) and foetal monitoring through intermittent auscultation were done when necessary.

Group A – WHO Modified Partogram: The WHO modified partogram that had a starting point of 4 cm cervical dilatation was used to plot labour progress. Cervical dilatation (X) and foetal descending of the head (O) were recorded every 4 hours.

The action line which was four hours to the right of the alert line showed normal progress at 1 cm/hour, and going over the action line made one rush to the intervention. Maternal and foetal parameters were monitored and recorded at fixed time intervals and they included: pulse, blood pressure, temperature, foetal heart rate, and uterine contractions.

Group B – Paperless Partogram: The Alert Estimated Time of Delivery (ETD) and Action ETD of the participants in Group B was estimated by use of Friedman formula, 1cm/hr and Alert ETD was determined as the time when the cervix had reached 4 cm from initial time of vaginal examination and four hours later to generate Action ETD.

These were put in the case sheet of the patient (Action ETD in red, Alert ETD in blue). The method did not involve the use of graphical plotting, which gave the clinicians time indicators to consider reassessment and intervention.

Outcome Measures

The comparison of the two groups was done based on:

1. Count of labours passing alert line/alert ETD.
2. Labours that cross action line/action ETD.
3. Duration of labour.
4. Need of oxytocin augmentation.

5. Mode of delivery (spontaneous, augmented, operative or caesarean).
6. Perinatal (Apgar scores, NICU admission, birth weight) outcome.
7. Mother complications / outcomes as such.

Statistical Analysis: All the data were loaded into the Microsoft Excel and analyzed with the help of the SPSS version 21.0 (IBM Corp, Armonk, NY). The variables under continuous measurement, including age, gestational age, and duration of labour were represented in the form of mean standard deviation (SD) and checked by means of Student t-test. The chisquare test was used to test the categorical variables, parity, augmentation and mode of delivery. The p-value of less than 0.05 was regarded as significant.

Results

Two hundred women who met the inclusion criteria were recruited and divided in 2 groups of 100 women each, namely Group A (WHO Modified Partogram) and Group B (Paperless Partogram). The two groups became similar in their sociodemographic aspects, parity, and booking status, and gestational age.

General Characteristics: The average age amounted to 24.94 WHO modified partogram with a standard deviation of 3.44 and paperless partogram with a standard deviation of 3.75 with a p-value of 0.676. The majority in both groups (41.5%), were within the 21-25 years age group, mostly women. The difference in parity within groups was not significant ($p = 0.671$). Booked cases (75.5%) and a term gestation (37-40 weeks) were majorities of women during the time of their admission ($p > 0.05$).

Table 1: Baseline Demographic and Obstetric Characteristics

Variable	WHO Modified (n=100)	Paperless (n=100)	Total (n=200)	Statistical Test	p-Value	Interpretation
Mean Age (years)	24.94 $\pm$ 3.44	25.34 $\pm$ 3.75	25.14 $\pm$ 3.59	$\chi^2 = 1.529$	0.676	NS
Primigravida	45 (45%)	39 (39%)	84 (42%)	$\chi^2 = 0.799$	0.671	NS
Booked Cases	76 (76%)	75 (75%)	151 (75.5%)	$\chi^2 = 0.027$	0.869	NS
Mean Gestational Age (weeks)	38.38 $\pm$ 1.15	38.45 $\pm$ 1.13	38.41 $\pm$ 1.14	$\chi^2 = 0.407$	0.816	NS

Cervical Dilatation at Admission: Most patients entered the study at 4 cm cervical dilatation — 61% in Group A and 76% in Group B ($p = 0.071$), indicating that the majority were in early active labour.

Oxytocin Augmentation: A large discrepancy in the need to use oxytocin augmentation was noted between the two groups.

The percentage who had to be augmented was 64% in the WHO modified group and 41% in the paperless group, which was statistically significant ($p = 0.001$).

Table 2: Oxytocin Augmentation and Duration of Labour

Parameter	WHO Modified (n=100)	Paperless (n=100)	p-Value	Interpretation
Oxytocin Augmentation	64 (64%)	41 (41%)	0.001**	Significant
Mean Duration of Labour (hours)	4.076 $\pm$ 1.938	3.716 $\pm$ 1.960	0.119	NS

Although the mean duration of labour was slightly shorter in the paperless group (3.71 hours) than in the WHO group (4.07 hours), the difference was not statistically significant ($p = 0.12$).

Progress of Labour: The alert and action line crossings were compared but no difference was found between the two groups. The WHO group

had 12 percent of those who crossed the alert line compared to 13 percent in the paperless group ($p = 0.831$).

Likewise there was an equal crossing of the action line between the two groups at by 5% ($p = 0.030$) which showed both equal efficiency in the detection of prolonged labour.

Table 3: Comparison of Alert and Action Line/ETD Crossings

Parameter	WHO Modified (n=100)	Paperless (n=100)	Total (n=200)	χ^2 Value	p-Value	Interpretation
Crossed Alert Line/ETD	12 (12%)	13 (13%)	25 (12.5%)	0.046	0.831	NS
Crossed Action Line/ETD	5 (5%)	5 (5%)	10 (5%)	4.711	0.030	NS

Mode of Delivery: There were important findings about the mode of delivery distribution. WHO group (31%) had more instances of spontaneous vaginal delivery as opposed to 16% in paperless

Table 4: Mode of Delivery

Mode of Delivery	WHO Modified (n=100)	Paperless (n=100)	Total (n=200)
Spontaneous Vaginal	31 (31%)	16 (16%)	47 (23.5%)
Augmented Vaginal	34 (34%)	54 (54%)	88 (44%)
Emergency LSCS	30 (30%)	27 (27%)	57 (28.5%)
Outlet Forceps	5 (5%)	3 (3%)	8 (4%)

χ^2 -9.991 ; p-value - 0.019* , Interpretation-Significant

Indications for Operative Delivery: Cephalopelvic disproportion (CPD) and fetal distress was indicated as the mostly common indication of caesarean section in both groups.

group, and augmented vaginal delivery occurred more than 34% in the paperless group. The rates of the caesarean section were similar in the groups (30% vs. 27%, $p = 0.019$).

Within the WHO group, 11 cases were CPD, 12 case fetal distress and 7 case non-progression of labour.

The same proportions were observed in the paperless group (11 CPD, 10 fetal distress, 5 non-progress).

Perinatal Outcomes: The average Apgar score measured 1 minute was 7.43 and standard deviation equal to 1.08 in the WHO group and 7.61 and standard average deviation 0.72 in the paperless group ($p = 0.169$).

The 5-minute Apgar score was 8.40(1.16) and 8.61(0.72), respectively ($p = 0.127$).

There was no difference in the mean birth weight between the two groups (3.129 +0.335 vs. 3.163 +0.292, $p=0.445$). NICUs were necessary among 31% and 25% of the WHO group and paperless group neonates respectively ($p = 0.345$) which was statistically not significant.

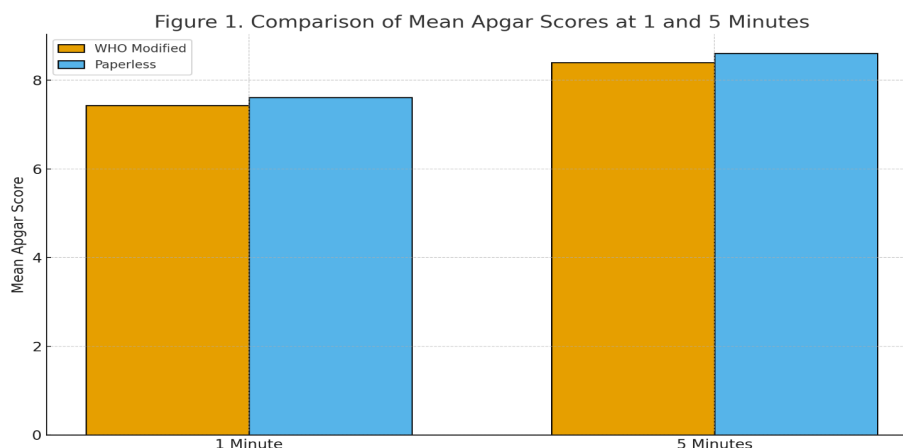


Figure 1: Comparison of Mean Apgar Scores at 1 and 5 Minutes

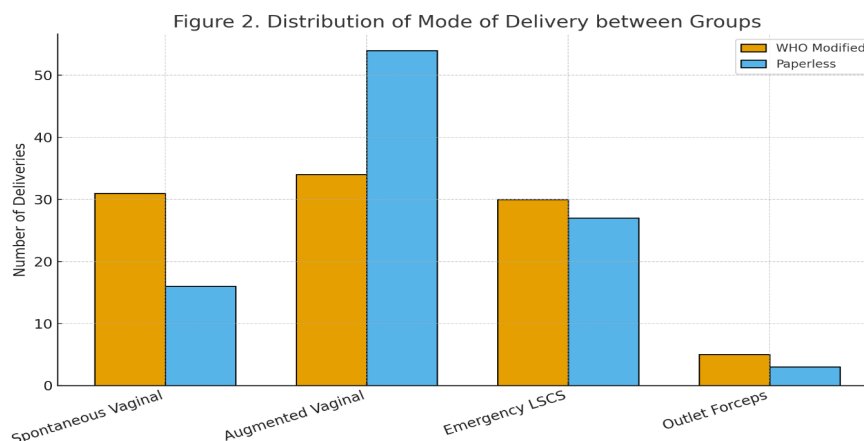


Figure 2: Distribution of Mode of Delivery between Groups

Discussion

The current comparative analysis evaluated the effectiveness of the WHO modified partogram and the paperless partogram in labour management that compared maternal and perinatal outcome in 200 women in active labour. Both of the partograms were also identified as effective in measuring the process of labour with similar maternal and infant outcomes. Nevertheless, paperless partogram proved to have practical benefits, such as less accurate oxytocin augmentation and less complex implementation into the activities of busy obstetric units.

The average age of the participants (25.14 ± 3.59 years) and high proportion of multigravida women in the present study is matched as per the demographic details in studies of Mahalakshmi et al. [1] and Tiwari et al. [2] which imply that the sample represents normal obstetric communities in tertiary hospitals. Majority of the participants were booked cases which could have led to positive maternal and perinatal outcomes.

In the paperless group, oxytocin augmentation was required considerably less often than in the WHO modified partogram group (41 % and 64% respectively). This observation is in accordance with those of Akhter et al. [3] and Soni et al. [4], who have stated that simplified partogram models enhance clinical vigilance and unnecessary augmentation. The paperless partogram, which its time-named intuitive method presumably allows anticipating the progress of labour earlier and reducing excessive dependence on the effects of pharmacological stimulation. The average of the labour time in the paperless group (3.71 ± 1.96 hours) was lower than that of the WHO group (4.07 ± 1.93) though not statistically significant. The findings can be compared to the study by Mahalakshmi et al. [1] and Tiwari et al. [2], who revealed the same time periods between the two surveillance techniques. The slightly reduced time might be attributed to better decision making with

the help of the ETD (Estimated Time of Delivery) model that enables immediate mind tracking of anticipated labour progression. There were hardly any differences in crossing through the alert and action lines (or ETDs) between the two groups (12 % & 13% alert lines)and 5% & 5% action lines respectively) in comparison to the reports about studies that were carried out in India and Bangladesh [3,5]. These findings substantiate that the simplified paperless process does not reduce the validity of the detection of delayed or prolonged labour. Notably, both partograms assisted in pointing out abnormal developments early enough therefore ensuring healthy maternal and fetal results.

The distribution of mode of delivery showed statistically significance difference between the two groups. More of the WHO group were spontaneously delivering their babies (31%), and the paperless group delivered their babies with augmentation (54%). The rates of caesarean section did not differ between the two groups (30% vs. 27%), which also echoed the results of previous singular comparative works done by Dangal [6], Fawole et al. [7], and Abebe et al. [8], who also found that there were no differences in the operational delivery among conventional and simplified partogram methods. The similarity in the caesarean rates is an indication that the simplified model does not benefit surgical interventions but instead maximizes the time of decision. No statistical significant differences were found in perinatal results such as Apgar score 1 and 5 minutes, body weights at birth and hospitalization in a NICU. Similar results were obtained by Philpott and Castle [9], more recently, Opoku and Nguah [10], who determined that proper monitoring, either graphical or time-based, can guarantee timely intervention, thereby preventing distress in the fetus. [11-13] Analyses in the current study revealed that the mean Apgar scores as well as birth weights in both of the two groups were normal with the paperless partogram showing that

the paperless partogram does not have a disadvantage over other birth weight-assessment tools as far as fetal wellbeing is concerned.

The current findings indicate that the paperless partogram has a variety of practical advantages. Its simplicity of use that involves only a little documentation and no graphical plotting makes it less prone to error and time saving. Due to its ease, as mentioned by Soni et al. [4] and Akhter et al. [3], it increases compliance among healthcare staff members, particularly in the resource-restrictive or high-volume labour wards. Alert and Action ETDs make it simple to have an up-to-date information source on the expected delivery time that facilitates preemptive solutions and reduces anxiety levels among the employees and the patients. [14-16]

Moreover, the paperless partogram can support team-based care as the ETDs can be easily observed in the patient records to maintain continuity of the monitoring in spite of changes in shifts. These characteristics render it a perfect tool to use in the district hospitals and peripheral centres which have a low ratio of skilled personnel to patients.

The results of the current research prove that the paperless partogram should remain one of the standard options of monitors, especially in the context of low-resource settings. Being easy to use and equally effective, it might be a good supplement or alternative to the WHO partogram in a clinical setting. Midwife and junior obstetricians training on the importance of using this technique may lead to a better acceptance of intrapartum monitoring practice and fewer delays relating to referral or intervention.

This study has **limitations** such as the single-centre design as the study may not be generalizable. More so, the labour management was not blinded and as such this may create observer bias. The long-term neonatal outcomes were not studied which may give additional information regarding the comparative safety of the two tools. To verify these results and investigate the possibilities of electronic or mobile-based parts of the partogram, bigger multicentric randomized trials are required.

Conclusion

The given comparative analysis proves that the WHO modified partogram along with the paperless partogram can be taken as the effective means that will help to manage the labour progress and guarantee the positive maternal and neonatal outcomes. However, paperless partogram has specific benefits that are simplicity, less documentation time, and enhanced clinical use, especially in high-workload settings that have resources limitations. It will considerably decrease oxytocin supplements and not raise the operative

and caesarean rates. The paperless partogram may be recommended as a convenient and effective alternative in the routine intrapartum care in both tertiary and peripheral healthcare centres because it is easy to use and has a similar effectiveness as the WHO modified partogram.

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