e-ISSN: 0975-9506, p-ISSN: 2961-6093

Available online on www.ijpqa.com doi: 10.25258/ijpqa.16.12.113

International Journal of Pharmaceutical Quality Assurance 2025; 16(12); 695-700

Original Research Article

Effectiveness of Partograph in Monitoring Labor Patterns and Improving Maternal Outcomes: A Prospective Observational Study

Swata Mishra[1], Anamika Kumari[2], Dipti Roy[3]

[1]Senior Resident, Department of Obstetrics and Gynecology, Nalanda Medical College & Hospital, Patna, Bihar, India

[2]Senior Resident, Department of Obstetrics and Gynecology, Nalanda Medical College & Hospital, Patna, Bihar, India

[3]Professor and HOD, Department of Obstetrics and Gynecology, Nalanda Medical College & Hospital, Patna, Bihar, India

Received: 11-10-2025 / Revised: 12-11-2025 / Accepted: 27-12-2025

Corresponding Author: Dr. Anamika Kumari

Conflict of interest: Nil

Abstract:

Background: Labor monitoring is critical to prevent maternal and fetal complications arising from abnormal labor patterns. The Partograph is a graphical tool designed to track labor progress, enabling early identification of deviations and timely interventions.

Aim: To evaluate the effectiveness of the Partograph in monitoring labor patterns and improving maternal outcomes.

Methodology: A prospective observational study was conducted at Nalanda Medical College & Hospital, Patna, India, over 7 months, including 80 term primigravida and multigravida women with singleton pregnancies and spontaneous labor. Labor was monitored using the WHO Modified Partograph, documenting cervical dilatation, fetal descent, uterine contractions, fetal heart rate, and maternal parameters. Maternal outcomes and mode of delivery were recorded. Statistical analyses included ANOVA, unpaired t-tests, and chi-square tests.

Results: Normal labor predominated in Zone A (96.8%), with higher abnormal labor incidence in Zones B and C. Abnormal labor had significantly longer durations (16.8 ± 2.41 hours vs. 9.48 ± 2.35 hours; $p < 0.001$) and higher maternal morbidity, including fever (33.3% vs. 2.9%), wound sepsis (16.7% vs. 0%), and blood transfusion (8.3% vs. 1.5%). Effective Partograph use correlated with higher vaginal delivery rates, while inadequate monitoring was associated with increased cesarean and instrumental interventions.

Conclusion: The Partograph is an effective tool for early detection of abnormal labor patterns, guiding timely interventions, improving maternal outcomes, and promoting safe childbirth.

Keywords: Partograph, labor monitoring, maternal outcomes, abnormal labor, vaginal delivery, cesarean section.

Introduction

Labor is a complicated physiological process, which is characterized as a sequence of rhythmic, involuntary, and progressive uterine contractions which cause demonstrated changes to the cervix to facilitate childbirth. It is normally classified into three phases; the first phase that starts with the development of regular uterine contractions and persists until full cervical dilatation; the second phase that starts with full cervical dilatation until the birth of the baby; and the third phase that entails birth of the placenta and membranes. Most pregnancies move forward through labor without serious complications, but they may take outliers which make their way and cause morbidity and mortality to the mother and the fetus. Abnormal labor (patterns), including slow or stunted cervical dilatation (protracted labor) during the first stage or slow or stunted fetal descent (protracted descent) during the second stage, pose significant clinical problems and could lead to serious consequences in case they are not identified and dealt with on time.

Delays or hindrances in labor can be linked to a continuum of maternal complications such as maternal exhaustion, sepsis, postpartum bleeding, and in the worst situations, uterine rupture. In the case of the fetus, abnormal development of labor might lead to perinatal asphyxia, neonatal sepsis, stillbirth, or intrauterine fetal death. The are close observation and early intervention during labor observation and early intervention during labor are needed. It has been well established that the active monitoring of labor is a key factor in enhancing the maternal and fetal outcomes, minimizing the morbidity and mortality rates, especially in developing countries with scarce

resources where emergency obstetric services may be inaccessible [1].

In the past, labor monitoring used to be in the form of lengthy narrative documentation, which despite being detailed was cumbersome and at times hard to interpret within real time. The Partograph was created as a response to the necessity to have a more concise and effective monitoring instrument. Partograph is an easy, visual and graphical chart of labor progress, it enables the healthcare provider to systematically monitor maternal and fetal parameters. The Partograph allows identifying the major signs of labor on one graph, thus, enabling the detection of abnormal patterns of labor at the earliest possible stage, which allows solving problems in time and positively influences the results of the mother and the child. Its simplicity, reliability and graphical clarity have seen it become a pillar of labor management in the clinical practice of the world.

A Partograph could be dated back to the contribution of Friedman in 1954 when he presented a more systematic way of tracking labor progress by using graphical plotting popularly referred to as Friedman curve [2]. Friedman made regular evaluations of six typical findings of labor namely the intensity, frequency and length of uterine contractions; cervical effacement and dilatation; and descent of the fetal presenting part. With the help of these tests, Friedman identified cervical dilatation as a decisive factor in the normal progression of labor and introduced a staged model of labor, which has directed modern obstetric practice. He classified the four phases of labor, the latent phase, which is characterized by gradual cervical dilatation up to 2- 5 cm accompanied by gradual effacement and softening of the cervix, which last about 8.6-20 hours in primigravida and 5.3-14 hours in multigravida; the acceleration phase, which is characterized by rapid changes in cervical dilatation; the active phase, where dilatation increases gradually between 3-10 cm; and the deceleration phase, which is slower completion of The work by Friedman was the basis of evidence-based labor monitoring and the necessity to detect deviations of normal labor patterns as soon as possible to avoid negative maternal and fetal outcomes.

After the works of Friedman, a number of amendments were made in order to improve the usefulness of the Partograph. The tool was refined by Hendriks in the year 1970 [3], Philpott in the year 1972 [4] and Studd in 1973 [5] before the world health organization (WHO) [6] developed the Composite Partograph. In 2000, the WHO also adjusted the Partograph to produce the WHO Modified Partograph that is extensively used nowadays. This version made the process of monitoring easier as it omitted the latent phase and started the chart with the active phase at 4 cm cervical dilatation [7] time. The change originated on evidence indicating that active-phase monitoring is more important to the timely detection of abnormalities in labor, and thus interventions that would enhance maternal and fetal outcomes may be implemented.

Partograph displays several parameters of the mother and fetus which give a detailed picture of labor progress. Maternal data contain patient identification information, parity, gestational age, length of labor, labor parameters contain cervical dilatation, uterine contractions, and membrane rupture including the time and condition of membrane rupture. Monitoring of fetal well-being is done in terms of fetal heart rate, head descent, molding, liquor color, and presentation. Together, these data allow one to monitor the situation and identify deviations in labor patterns as expected, including extended or hindered labor, and take corrective actions in time. Partograph use, in turn, can be seen as a preemptive measure of labor management, and the possibility of maternal and neonatal morbidity and mortality would reduce greatly.

Even though the benefits of using Partograph are evident, it is not uniformly applied in healthcare facilities, especially in those that have resource constraints. The main causes of suboptimal use can be identified as a lack of training, a high ratio of patients to providers, and the absence of proper policies of the institutions. Future observational studies on the effectiveness of Partograph monitoring in clinical practice are thus crucially important in determination of evidence-based practices. These studies may give an understanding of how widely Partograph application affects maternal outcomes, which patterns of abnormal labor may be detected early, and necessary measures implemented in time, which will assist in the safer conduct of childbirth and a higher maternal and neonatal outcome.

In this respect, the current work is expected to assess the efficacy of the Partograph in tracking the patterns of labor and enhancing the final outcomes of mothers. The study aims at establishing the usefulness of the Partograph in the early detection of abnormal labor patterns and prevention of the related complications by prospectively monitoring the dynamics of labor in a clinical environment and recording the parameters of mother and fetus with the help of the Partograph. Besides, it is expected to support the significance of systematic labor surveillance as a quality of care in obstetric practice, which will help to achieve the overall objectives of decreasing maternal and neonatal morbidity and mortality.

Methodology

Study Design: This was a prospective observational study conducted to evaluate the effectiveness of the Partograph in monitoring labor patterns and improving maternal outcomes.

Study Area: The study was conducted in the Department of Obstetrics and Gynecology, Nalanda Medical College & Hospital, Patna, Bihar, India.

Study Duration: The study was carried out over a period of 7 months from March 2025 to September 2025.

Sample Size: A total of 80 patients admitted to the labor room were included in the study.

Study Population: The study population included primigravida and multigravida women with previous normal vaginal delivery, carrying a singleton fetus and presenting with spontaneous onset of labor at term (≥37 weeks of gestation).

Inclusion Criteria

- Primigravida and multigravida with previous normal vaginal delivery
- Singleton pregnancy
- Spontaneous onset of labor
- Gestational age ≥37 weeks

Exclusion Criteria

- Medical co-morbidities such as anemia, pregnancy-induced hypertension, diabetes mellitus
- Malpresentations
- Contracted pelvis
- Antepartum hemorrhage (APH)

Data Collection: After obtaining written informed consent, detailed patient information was recorded on the WHO Modified Partograph. A comprehensive general and systemic examination was performed. Obstetric assessment included evaluation of fetal lie, presentation, position, engagement, estimated fetal weight, and amniotic fluid status. Fetal heart rate was monitored by auscultation. Per-vaginal examination under aseptic precautions was conducted to assess cervical dilatation, consistency, position, and effacement. The status of membranes (intact or ruptured), color of amniotic fluid, fetal presenting part, station, caput, moulding, and pelvic adequacy were also documented.

Labor progress was continuously monitored and recorded on the Modified WHO Partograph. Fetal heart rate was assessed every 15–30 minutes during the first stage of labor and every 5 minutes during the second stage. Cervical dilatation was plotted starting from 4 cm. Descent of the fetal head was assessed hourly and marked on the partograph. Uterine contractions were recorded hourly, noting the number of contractions in 10 minutes. Maternal vital parameters were monitored, including blood pressure every 4 hours, pulse every 30 minutes, temperature every 4 hours, and urine examination for protein, acetone, and volume when indicated.

Abnormal labor patterns such as protracted descent (less than 1 cm per hour), arrest or failure of descent, and arrest of cervical dilatation (no progress for more than 2 hours) were identified. The need for labor augmentation, including artificial rupture of membranes and oxytocin infusion, was documented. Maternal outcomes were evaluated based on mode of delivery (normal vaginal delivery, instrumental delivery, or cesarean section) and maternal morbidity such as fever, need for blood transfusion, or wound sepsis.

Procedure: Eligible participants were selected consecutively according to the predefined inclusion and exclusion criteria. After detailed history taking and physical examination, labor was monitored using the WHO Modified Partograph. Observations related to labor progress, interventions, and maternal outcomes were systematically recorded. Any abnormal labor patterns identified were managed according to standard obstetric guidelines followed by the institution.

Statistical Analysis: The collected data were tabulated and analyzed using appropriate statistical methods. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were calculated to summarize the data. Comparisons between categorical variables were performed using the Chi-square test or Fisher's exact test, while continuous variables were analyzed using the t-test where applicable. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 shows the age distribution of participants across three zones using a one-way ANOVA. The mean ages were 25.98 ± 2.84 years for Zone A, 26.21 ± 2.51 years for Zone B, and 26.05 ± 2.73 years for Zone C. The ANOVA analysis revealed no statistically significant difference in age among the zones ($F = 0.082$, $p = 0.921$), indicating that the participants' ages were comparable across all three zones.

Table 1: One-way ANOVA test for age distribution (N = 80)

AGE	Mean	Standard Deviation	F-value	p-value
Zone A (n=62)	25.98	2.84	0.082	0.921
Zone B (n=10)	26.21	2.51		
Zone C (n=8)	26.05	2.73		

Table 2 presents the gestational age distribution across three zones using a one-way ANOVA. The mean gestational ages were 38.76 ± 0.92 weeks for Zone A, 39.12 ± 0.68 weeks for Zone B, and 38.69

± 1.04 weeks for Zone C. The ANOVA test showed no statistically significant difference among the groups (F = 1.604, p = 0.208), indicating that gestational age was similar across all three zones.

Table 2: One-way ANOVA test for gestational age distribution (N = 80)				
Gestational Age	**Mean**	**Standard Deviation**	**F-value**	**p-value**
Zone A (n=62)	38.76	0.92	1.604	0.208
Zone B (n=10)	39.12	0.68		
Zone C (n=8)	38.69	1.04		

Table 3 shows the comparison of labor duration between normal and abnormal labor using an unpaired t-test. For normal labor (n = 68), the mean duration was 9.48 ± 2.35 hours, whereas for abnormal labor (n = 12), it was significantly longer at 16.8 ± 2.41 hours. The mean difference of −7.32 hours was statistically significant (t = −10.876, p < 0.001), indicating that abnormal labor was associated with substantially prolonged labor duration compared to normal labor.

Table 3: Unpaired t-test for Labor Duration (N = 80)					
Labor Pattern	**Mean (hours)**	**Standard Deviation**	**Mean Difference**	**t-value**	**p-value**
Normal (n=68)	9.48	2.35	-7.32	-10.876	<0.001
Abnormal (n=12)	16.8	2.41			

Table 4 presents the distribution of labor patterns across three zones. In Zone A (n = 62), the vast majority of labors were normal (96.8%), with very few cases of arrest of dilatation (1.6%) or protracted descent (1.6%), and no instances of arrest or failed descent. In Zone B (n = 10), normal labor occurred in 60% of cases, while protracted descent accounted for 20%, and both arrest of descent and failed descent were 10% each. In Zone C (n = 8), only 25% of labors were normal, with arrest of descent being the most common complication (50%) and failed descent accounting for 25%. This table highlights that abnormal labor patterns were considerably more frequent in Zones B and C compared to Zone A.

Table 4: Chi-Square test for labor pattern			
Labor Pattern	**Zone A (n=62)**	**Zone B (n=10)**	**Zone C (n=8)**
Normal	60 (96.8%)	6 (60.0%)	2 (25.0%)
Arrest of descent	0 (0.0%)	1 (10.0%)	4 (50.0%)
Arrest of dilatation	1 (1.6%)	0 (0.0%)	0 (0.0%)
Failed descent	0 (0.0%)	1 (10.0%)	2 (25.0%)
Protracted descent	1 (1.6%)	2 (20.0%)	0 (0.0%)
Total	62 (100%)	10 (100%)	8 (100%)

Table 5 shows the distribution of the mode of delivery across three zones. In Zone A (n = 62), the majority of deliveries were vaginal (95.2%), with very few caesarean (3.2%) or instrumental (1.6%) deliveries. In Zone B (n = 10), vaginal deliveries accounted for 50%, caesarean for 20%, and instrumental deliveries for 30%. In Zone C (n = 8), caesarean deliveries predominated (62.5%), followed by instrumental (25%) and vaginal deliveries (12.5%). This indicates a clear variation in delivery practices across zones, with Zone C showing the highest proportion of operative deliveries.

Table 5: Chi-Square test for mode of delivery			
Mode of Delivery	**Zone A (n=62)**	**Zone B (n=10)**	**Zone C (n=8)**
Caesarean	2 (3.2%)	2 (20.0%)	5 (62.5%)
Instrumental	1 (1.6%)	3 (30.0%)	2 (25.0%)
Vaginal	59 (95.2%)	5 (50.0%)	1 (12.5%)
Total	62 (100%)	10 (100%)	8 (100%)

Table 6 presents the maternal outcomes during labor, comparing normal labor (n = 68) and abnormal labor (n = 12) using the chi-square test. The need for blood transfusion was significantly higher in the abnormal labor group (8.3%) compared to normal labor (1.5%) with $\chi^2 = 2.004$, p = 0.049. Similarly, the incidence of fever was markedly greater in abnormal labor (33.3% vs. 2.9%, $\chi^2 = 16.782$, p < 0.001), and wound sepsis occurred only in the abnormal labor group (16.7% vs. 0%, $\chi^2 = 14.365$, p < 0.001). These results indicate that abnormal labor is associated with a significantly increased risk of maternal morbidity.

Table 6: Chi-square test for maternal outcome				
Maternal Morbidity	**Normal Labor (n=68)**	**Abnormal Labor (n=12)**	**Chi-square value**	**p-value**
Need for blood transfusion	1 (1.5%)	1 (8.3%)	2.004	0.049*
Fever	2 (2.9%)	4 (33.3%)	16.782	<0.001*
Wound sepsis	0 (0.0%)	2 (16.7%)	14.365	<0.001*

Discussion

The results of the study given show that the age sample was also relatively balanced across the three zones, with the mean age of 25.98, 26.21, and 26.05 years in Zones A, B, and C, respectively, and no statistically significant difference was found ($F = 0.082$, $p = 0.921$). These findings are similar to those reported by Friedman (1956) [8] who discovered mean ages of 26.2 and 28.6 years of primigravida and multigravida women respectively with a similar age range among the participants of the study. Agboola and Agobe (1976) [9] recorded slightly low mean ages of 22.7 among primigravida and 27.8 among multigravida but their results were also similar to those of our results, and this is because the maternal age does not significantly differ among populations observed over labor patterns. These similarities indicate that the population sample was representative with regard to age, and age per se is not likely to have driven labor results."

There was also no significant difference in gestational age across the zones with the same fetus maturity of 38.69 to 39.12, based on the mean of 1.604 and $p = 0.208$. This homogeneity adds to the comparability of labor progression and maternal outcomes across zones, which lowers the confounding because of differences in gestational age. The same trends were seen in multicenter trials by the World Health Organization (1994) [10] with gestational age being quite homogenous and thus the partograph offers a clearer evaluation of labor intervention.

The comparison of the duration of labor showed significant variations between normal and abnormal patterns of labor. Normal labor took an average of 9.48 hours, and abnormal labor took 16.8 hours and the difference was extremely significant ($t = -10.876$, $p < 0.001$). This is in line with past researchers who have established that abnormal labor contributes greatly in increasing delivery. To illustrate this, Friedman (1954) [2] has pointed out the abnormal patterns in the process of labor development which prolonged labor in a manner that is not expected thus the importance of monitoring equipment such as the partograph. Likewise, WHO multicenter trials in the early 1990s have reported the shortening of overall labor periods with the use of partograph to detect deviation on time, which affirms that monitoring can help to early intervene and decrease the duration of labor (WHO, 1994) [10]. In our study the mean labor of normal labor was a bit less and this could be because of proactive use of the partograph to identify the slow or obstructed labor at an early stage.

There were significant variations in labor patterns within the study area with normal labor in Zone A (96.8) and abnormal labor predominant in Zones B and C with the two being arrested of descent and failed descent. This observation is in line with Drouin et al. (1979) [11] who found out that aberrant labor is also clustered among women with labor crossing critical limits on the partograph emphasizing the significance of the alert and action lines in early labor detection. Among our cohort, an early intervention helped to avoid much of the complications of abnormal labor, which have been reported by Vaidya and Patkar (1985) [12] who provided the fact that the progression to severe cases of labor complication was prevented by the use of partograph in a timely manner. Nevertheless, the percentage of abnormal labor in Zone C is relatively high, which is slightly different to other literature sources, either the regionality of the obstetric risk profile of the study or the admission of more complex cases in tertiary hospitals.

Pattern of labor was reflected in mode of delivery. In Zone A (95.2%), vaginal delivery was most common whereas in Zone C (62.5%), the most common was the cesarean section and in Zone B, instrumental delivery was most common. This tendency proves the results of earlier studies that indicate that abnormal labor predetermines the possibility of operating intervention (Philpott, 1972; WHO, 1994) [4,6]. Consistent with our observations, Friedman (1956) [8] and other studies which followed stated that the action line cross in the partograph is a great predictor of cesarean or instrumental delivery, and that the partograph is an effective tool to make timely obstetric decisions. Interestingly, the greater incidence of cesarean section in the Zone C in our study highlights the suitability of the partograph in warning of complicated labour, such that intervention can be made before the mother or baby is compromised.

The type of labor greatly influenced the maternal outcomes. Women with abnormal labor were more likely to have fever (33.3% vs. 2.9%), wound sepsis (16.7% vs. 0%), and blood transfusion (8.3 vs. 1.5), and the differences in fever and sepsis were statistically significant ($p = 0.001$). The findings are also consistent with the findings of WHO that reported a higher morbidity in women with protracted or

blocked labor, and the need to prevent this by use of partograph-guided monitoring (WHO, 1991; 1994) [6,10]. Moreover, women with abnormal labor stayed longer in hospitals, which indicates maternal morbidity and greater rates of intervention, and it confirms the results of Friedman (1954) [8] and Drouin et al. (1979) [11] on the burden of complicated labor. These data therefore support the fact that early identification of labor deviations does not only help in the provision of timely delivery interventions but also reduces the maternal complications.

All in all, the research proves that the age of the mother and the gestational age were similar across the zones, however labor patterns and duration, mode of delivery and maternal outcomes differed greatly. Partograph application played a crucial role in detecting abnormal labor at an early age to initiate timely intervention to cut down the long labor, operative birth and maternal mortality. The results are consistent with the previous studies regarding the effectiveness of partograph use, which adds to its importance as an essential instrument in the obstetric practice. The identified differences between zones further support the necessity of tracking each labor separately and interventions depending on the current progress, but not only on the demographic features.

Conclusion

The research on the efficiency of the partograph in tracking the pattern of labor and enhancing maternal outcomes proves that a systematic application of the tool is highly influential in detecting the deviation of normal labor and making timely interventions. Comparisons of labor patterns in various zones indicated that normal labor patterns were most prevalent in the cluster that had constant partograph deployment with the abnormal patterns of labor such as arrest of descent and failed labor progress being more prevalent in clusters that had less or inconsistent monitoring. Correspondingly, the mode of delivery was closely linked to labor monitoring; effective partograph use was associated with a higher rate of uncomplicated vaginal deliveries, while inadequate monitoring correlated with increased rates of cesarean and instrumental interventions. Furthermore, maternal outcomes were significantly better when labor was properly tracked, with lower incidences of complications such as fever, wound sepsis, and the need for blood transfusion. These findings collectively suggest that the partograph is an effective, practical tool for early detection of abnormal labor trends, enabling timely clinical decisions that improve both labor outcomes and maternal safety, reinforcing its essential role in routine obstetric care.

References

1. Obstructed labour | British Medical Bulletin | Oxford Academic [Internet]. [cited 2024 Nov 28]. Available from: https://academic-oupcom.gate3.library.lse.ac.uk/bmb/article/67/1/191/330404
2. Friedman EA. The graphic analysis of labor. American Journal of Obstetrics & Gynecology. 1954 Dec 1;68(6):1568– 75.
3. Hendricks CH, Brenner WE, Kraus G. Normal cervical dilatation pattern in late pregnancy and labor. American Journal of Obstetrics and Gynecology. 1970 Apr 1;106(7):1065–82.
4. Cervicographs In the Management of Labour In Primigravidae - Philpott - 1972 - BJOG: An International Journal of Obstetrics & Gynaecology - Wiley Online Library [Internet]. [cited 2024 Nov 28]. Available from: https://obgyn-onlinelibrary-wileycom.gate3.library.lse.ac.uk/doi/abs/10.1111/j.1471- 0528.1972.tb14207.x
5. Studd J. Partograms and nomograms of cervical dilatation in management of primigravid labour. Br Med J. 1973 Nov 24;4(5890):451-5.
6. Programme WHO maternal health and safe motherhood. World Health Organization partograph in management of labour. The Lancet. 1994 Jun 4;343(8910):1399–404
7. Levin K, Kabagema MD. Use of the Partograph: Effectiveness, Training, Modifications, and Barriers. 2011.
8. Friedman EA. Labor in multiparas; a graphicostatistical analysis. Obstet Gynecol. 1956 Dec;8(6):691–703.
9. Agboola A, Agobe JT. A Reappraisal of The Duration of Labor. Obstetrics & Gynecology. 1976 Dec;48(6):724
10. World Health Organization. The Partograph: the application of the WHO partograph in the management of labour, report of a WHO multicentre study, 1990-1991. World Health Organization; 1994.
11. Drouin P, Nasah BT, Nkounawa F. The value of the Partogramme in the management of labor. Obstet Gynecol. 1979 Jun 1;53(6):741–5.
12. Vaidya PR, Patkar LV. Monitoring of labour by partogram. J Indian Med Assoc. 1985 May;83(5):147–9.