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Original Research Article

ROLE OF PARTOGRAPH IN EVALUATING OUTCOME OF LABOR

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ABSTRACT

Background: Timely and accurate monitoring of labor is critical for preventing maternal and fetal complications. The WHO-modified partograph is a visual tool designed to aid in assessing labor progression and identifying deviations that may necessitate intervention. This study aimed to evaluate the effectiveness of the WHO-modified partograph in monitoring labor patterns and improving maternal outcomes.

Materials and Methods: A prospective observational study was conducted over 18 months at Northern Railway Central Hospital, New Delhi, involving 100 women (50 primigravida, 50 multigravida) with uncomplicated singleton term pregnancies and spontaneous labor onset. Labor progression was recorded using the WHO-modified partograph. Patients were categorized based on labor progression zones: Zone A (left of alert line), Zone B (between alert and action lines), and Zone C (right of action line). Outcomes were analyzed in terms of labor duration, mode of delivery, and maternal morbidity.

Results: Normal labor progression was seen in 85% of cases, with 97.4% in Zone A having normal labor pattern. Abnormal labor patterns (15%) were significantly associated with delivery in Zones B and C. Cesarean and instrumental delivery rates increased markedly beyond the alert line, with maternal morbidity (fever, wound sepsis) significantly higher in the abnormal labor group ($p < 0.001$). The average labor duration was significantly shorter in the normal group (9.57 hours vs. 17.05 hours, $p < 0.001$).

Conclusion: The WHO-modified partograph is a reliable, low-cost, and effective tool for monitoring labor. It enables early detection of deviations from normal labor, facilitating timely interventions that can reduce the risk of complications and improve maternal outcomes.

Keywords: Partograph, Maternal outcomes, Abnormal labor.

INTRODUCTION

Labor is defined as a series of rhythmic, involuntary, and progressive contractions of the uterus that cause demonstrable changes in the cervix, favouring childbirth. It is a three-stage process, 1st stage starting from the beginning of regular uterine contractions to full dilatation of the cervix, 2nd stage from full dilatation of the cervix to delivery of the foetus and 3rd stage being delivery of the placenta and membranes.

Most pregnant women experience normal labor without complications. However, some encounter abnormal patterns of progress at any stage, such as slow or arrested cervical dilatation (protracted labor) during the first stage or slow or arrested foetal descent (protracted descent) during the second stage. These abnormalities can lead to complications such as prolonged labor, maternal exhaustion, maternal sepsis, obstructed labor, or uterine rupture. For the foetus, it can result in perinatal asphyxia, neonatal sepsis, stillbirth, or intrauterine foetal death. Post-partum haemorrhage and sepsis are also more common and increase maternal mortality.[1]

Many of these complications can be prevented through meticulous labor monitoring, ensuring better maternal and foetal outcomes. Lengthy labor records have now been replaced by concise, pictorial

graphical representations of various labor parameters, known as the Partograph. It is a simple and accurate tool to monitor labor patterns, detect impending complications, and adopt necessary measures to prevent adverse outcomes.

Friedman's Contribution

In 1954, Friedman plotted various labor parameters on a graph known as Friedman's curve or Partograph.[2] He conducted periodic assessments of six characteristic manifestations of labor: the intensity, frequency, and duration of contractions; cervical effacement and dilatation; and descent of the foetal presenting part. His study identified cervical dilatation as an important factor in normal labor progress.

He divided labor into four phases: Phase 1- Latent phase: Slow cervical dilatation up to 2-2.5 cm, with effacement and softening of the cervix. Duration ranges from 8.6-20 hours in primigravida and 5.3-14 hours in multigravida. Phase 2 - Acceleration phase: Marked by rapid changes in the slope of cervical dilatation. Phase 3 - Active phase: Dilatation progresses from 3-10 cm.

Phase 4 - Deceleration phase: Full dilatation of the cervix, reached more slowly than during the acceleration phase.

The Partograph was later modified by Hendriks in 1970,[3] Philpott in 1972,[4] Studd in 1973,[5] and the WHO in 1994, which developed a Composite Partograph,[6] further modified in 2000. The WHO Modified Partograph, the most commonly used version today, removed the latent phase and begins the active phase at 4 cm cervical dilatation.[7]

Partograph Observations: Partograph records the details of patient for identification including registration number, name, age, date, parity, LMP, EDD, gestational age, ROM (time/date), and labor duration, the foetal Heart rate, head descent, membrane status, liquor color, and molding and also the uterine Contractions.

MATERIALS AND METHODS

The study was conducted in the Department of Obstetrics and Gynaecology at NRCH, New Delhi, over 18 months to verify the effectiveness of Who modified partograph in evaluating the pattern and outcome of labor. All patients admitted to the Labor room of NRCH after 37 weeks of gestation were included

Inclusion Criteria

Primigravida and multigravida with previous normal vaginal delivery (NVD), single foetus and spontaneous onset of labor.

Exclusion Criteria

Patients with medical co-morbidities (e.g., anaemia, PIH, DM), contracted pelvis, mal-presentations, and APH.

A total of 100 cases (50 primigravida, 50 multigravida) were enrolled using consecutive patient selection method. After obtaining consent, patient details were documented on the WHO Modified Partograph. A detailed general and systemic examination assessed fetal lie, presentation, position, engagement, estimated foetal weight, and amniotic fluid. Fetal heart rate was also auscultated. Per-Vaginal examination was done under all aseptic precautions and the following points were recorded: Position, consistency, effacement, and dilatation of cervix, state of membranes: if absent, nature, and colour of liquor. Presenting Part: Position and station. Caput Formation and presence of Moulding and Pelvic Assessment. Patients were monitored in the labor room for the progress of labor, and observations were recorded on the Modified WHO Partograph. Foetal heart rate recorded for one minute every 15-30 minutes after a contraction in the first stage of labor and every 5 minutes in the second stage of labor.State of Membranes and colour of liquor were "I" for intact membranes "C" for clear and "M" for meconium-stained liquor. Thick meconium suggested foetal distress and closer monitoring of foetus was done (every 30 minutes) M — moulding was graded from 0 to +3. 0 - Bones are separated and sutures can be easily felt, +1- bones are just touching each other, +2- bones are overlapping but can be reduced and +3- bones are severely overlapping and cannot be reduced. Cervical Dilatation: Assessed at each vaginal examination and marked as 'x' on Y axis, beginning at 4cms. Descent of Head: Assessed per abdominally - one hourly and was expressed as the number of fifths of descent of the head in the pelvic cavity. The station of the head was plotted on the Y axis and time was plotted on the X axis.Uterine Contractions: The number of uterine contractions in 10 minutes was noted and hourly monitoring was done. Any drugs administered, oral and IV fluids, and Oxytocin drip, if given - were recorded. Blood Pressure was recorded every 4 hours and marked with arrows on the axis PULSE: Recorded every 30 minutes and marked with a dot (.).Urine Analysis for protein, acetone and volume: Ideally recorded every time when urine is passed. Temperature was recorded in centigrade every 4 hours.

Partographs of the patients were then analysed and placed in the following Classification of Zones on the Partograph: Zone A: Patients who delivered when the partograph was on the left of Alert line. Zone B: Patients who delivered when the partograph was between the alert and the action line and Zone C: Patients who delivered when the partograph was on the right of Alert line

Maternal outcomes were recorded based on mode of delivery- vaginal, instrumental, or caesarean delivery. Patterns of abnormal labor -Dilatation disorder, Descent disorder. The abnormal labor patterns observed were: Protracted descent: Less than 1 cm per hour. Arrest of descent i.e. no descent for over 1 hour, failure of descent i.e. cessation of descent and arrest of dilatation i.e. no cervical dilatation for over 2 hours. The need for augmentation of LABOR by Artificial Rupture of Membrane or oxytocin was assessed in cases of

abnormal LABOR and an augmentation done with Oxytocin in cases of Uterine inertia. Patients were monitored and operative decision if any was taken by the consultant. Maternal morbidity was studied in terms of: Fever, need for blood transfusion and wound sepsis. All data was tabulated and statistically evaluated.

RESULTS & DISCUSSION

Most pregnancies culminate uneventfully, but a small proportion have an adverse outcome. The Partograph is evaluated as a tool for early detection of abnormal labor patterns, enabling timely intervention to improve maternal outcomes.

Age: The mean age in our study was 25.58 years for primigravida and 27.02 years for multigravida, (range -21 yrs to 37 yrs). There was no significant correlation between age and labor outcomes.

The mean age of Primi and multigravida in Friedmans cohort was 26.2 and 28.6 years respectively,[8] while Agboola and Agobe reported 22.7 and 27.8 respectively.[9] They had findings similar to our study.

Also, the mean age of women in Zone A, B, and C were not significantly different. [Table 1].

Table 1: One-way ANOVA test for age distribution.

AGE				
	Mean	**Standard Deviation**	**F-value**	**p-value**
Zone A	26.24	3.033	0.071	0.932
Zone B	26.58	2.429		
Zone C	26.22	2.819		

Gestational age: Also, the mean gestational age of women in Zone A, B and C were not significantly different. [Table 2]

Table 2: One-way ANOVA test for gestational age distribution.

Gestational age				
	Mean	**Standard Deviation**	**F-value**	**p-value**
Zone A	38.87	0.93	1.715	0.185
Zone B	39.38	0.60		
Zone C	38.80	1.08		

Duration of Labor: The mean duration of Labor was 9.57 and 17.95 hours in the normal and abnormal labor groups respectively and the difference was significant. By using a partograph, timely intervention was done in our study, and resultantly total duration of labor was decreased, and complications prevented.

Table 3: Unpaired t-test for Labor duration

Labor Duration					
Labor pattern	**Mean**	**Standard deviation**	**Mean difference**	**t-test value**	**p-value**
Normal	9.57	2.40	-7.48	-11.138	<0.001
Abnormal	17.05	2.33			

WHO study in 1990-91,[10] also showed a significant decrease in the total duration of labor after the introduction of partograph. In our study, out of 100 women, 85 had normal LABOR pattern and 15 women had abnormal LABOR patterns.

Labor patterns and Duration: Normal LABOR pattern was seen in 97.4% of deliveries in zone A, 58 34% in zone B and 11.1 % in zone C, whereas in patients with abnormal LABOR pattern only 2.6% delivered in Zone A, 41. 66% delivered in Zone B and the rest in Zone C. The difference was statistically significant.

Table 4: Chi-Square test for labor pattern with Chi-square value= 88.534, p-value, 0.001 (significant difference)

Zone on partograph			
Labor pattern	**Zone A**	**Zone B**	**Zone C**
Normal	76 (97.4%)	8 (61.5%)	1 (11.1%)
Arrest of descent	0 (0.0%)	1 (7.7%)	6 (66.7%)
Arrest of dilatation	1 (1.3%)	0 (0.0%)	0 (0.0%)
Failed descent	0 (0.0%)	1 (7.7%)	2 (22.2%)
Protracted descent	1 (1.3%)	3 (23.1%)	0 (0.0%)
Total	78 (100%)	13 (100%)	9 (100%)

Friedman identified cervical dilatation as the best indicator to monitor the progress of LABOR.[8] Later, the descent of the presenting part was also added to this monitoring. Employing partograph, the departure from normal LABOR progress was identified in time, and active inference undertaken. Of the 100 women in our study 85 progressed normally and 15 showed abnormal progress. Of the 78 women in Zone A,

97.4% had normal progress. However, only 58.34% of the 12 women in Zone B and 11.1% of the 10 in Zone C had normal progress. The difference was statistically significant. Amongst the abnormal progressions, protracted descent was significantly more in Zone B while arrest of descent was significantly more in Zone C. Timely intervention was done in all cases, and of the 15 women with abnormal progress, 10 were delivered with LSCS, 4 had instrumental delivery and 1 delivered normally. The use of partograph thus helped in early detection of abnormal LABOR patterns guiding timely intervention as a result of which prolonged LABOR and its sequelae were prevented. A study by Drouin P et al in 1979,[11] and a trial by WHO in 1994,[6] showed similar advantages of the partograph.

Mode of delivery: Out of total of 100 women, 85 followed a normal pattern of LABOR and delivered vaginally. 78 out of 100 delivered before crossing the alert line i.e. Zone A, 13 delivered between the alert and action line i.e. zone B, and 9 delivered after crossing the action line i.e. Zone C.

In Zone A, 96.2% women delivered vaginally, 2.6% delivered by caesarean section, and 1.3% had instrumental delivery. In Zone B 53.8% women delivered vaginally, 15.4 % delivered by caesarean section and 30.8 % had instrumental delivery. In Zone C only 11.8% women delivered vaginally, 66.7% delivered by caesarean section and 22.2 % had instrumental delivery. Normal Vaginal Delivery was significantly more in Zone A as compared to Zone B & C. The need for operative intervention increased after the alert line was crossed. The results of the present study matched with the results of many other studies. The interventions done reduced the incidence of prolonged LABOR and its sequelae (4,6,10–12).

Table 5: Chi-Square test for mode of delivery, Chi-square value= 55.348, p-value <0.01 (significant difference)

Zone on partograph			
Mode of delivery	**Zone A**	**Zone B**	**Zone C**
Caesarean	2 (2.6%)	2 (15.4%)	6 (66.7%)
Instrumental	1(1.3%)	4 (30.8%)	2 (22.2%)
Vaginal	75 (96.2%)	7 (53.8%)	1 (11.1%)
Total	78 (100%)	13 (100%)	9 (100%)

Maternal outcome: The maternal morbidity, evaluated in terms of sepsis, fever and need for blood transfusion, was 3.6% and 80.1%, in women with normal and abnormal labor respectively. This was quite a significant difference. The mean hospital stay was 3.35 and 7.88 days, in women with normal and abnormal labor respectively. This also was a significant difference. These results are similar to those of the WHO trial of 1991 and 1994(6,10)

Table 6: Chi-square test for maternal outcome, *Significant difference

Maternal morbidity	Normal labor pattern	Abnormal labor pattern	Chi-square value	p-value
Need for blood transfusion	1 (1.2%)	1 (6.7%)	2.161	0.046*
Fever	2 (2.4%)	5 (33.3%)	18.798	<0.001*
Wound sepsis	0 (0.0%)	3 (20%)	17.526	<0.001*

CONCLUSION

We conclude that the use of a partograph provided a cost-effective objective reproducible tool for the monitoring of labor which can help in the early detection of potential abnormal labor and guide regarding timely interventions, leading to decreased maternal morbidity.

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