**THE IMPACT OF USE OF MODIFIED WHO PARTOGRAPH ON MATERNAL AND PERINATAL OUTCOME**

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**Abstract**

**Background:** Early detection of abnormal progress and prevention of prolonged labour can significantly improve the outcome of labour. Partograph is an inexpensive tool which can provide a continuous pictorial overview of labour and is essential to monitor and manage labour.

**Objective:** The study was aimed to determine if among low risk labouring women, the use of modified WHO partograph resulted in reduced maternal and perinatal morbidity.

**Methodology:** The course of labour of 100 women with uncomplicated full term pregnancies with cephalic presentation in active labour was studied using modified WHO partograph. 100 historical matched controls comprising of low risk women who delivered without the use of partograph were identified from the labour register and their course of labour studied. The hospital records were studied to obtain the demographic variables. Maternal and perinatal outcome was analyzed for both cases and controls.

**Results:** The emergency caesarean section rate was reduced from 44% in controls to 21% in cases (p value <0.05). None of the cases had labour beyond 12 hours, thus indicating significant reduction in prolonged labour. Neonatal intensive care admissions decreased from 17% in controls to 6% in cases indicating an improved maternal & neonatal outcome.

**Conclusion:** The use of Modified WHO Partograph significantly improves the maternal and neonatal outcome of labour thus recommending use of WHO partograph in all maternity units.

**Keywords:** Modified WHO Partograph, Labor and Delivery

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**1. Introduction**

Half a million women lose their lives every year because of pregnancy related complications. Obstructed labour and ruptured uterus contributes up to 70% of maternal mortality. Early detection of abnormal progress and prevention of prolonged labour can significantly reduce it. Tools and techniques to monitor labour thus play an important role in saving women’s lives. The partogram or partograph is an inexpensive tool to provide a continuous pictorial overview of labour and is essential to monitor and manage labour. It is a single sheet of paper where all information related to labour is obtained. It is a practical device in a busy labor room with many cases but limited personnel to screen the abnormal labour. With its use, there is no need to record labour-events repeatedly. It predicts deviation from normal progress of labor and proper intervention can be done in time. It facilitates handover and responsibility and accountability of the person conducting labor. Partography is designed for all maternal settings, but has different level of functions at different levels of health care. It serves as an "early warning system" and assists in early decision on transfer, augmentation and termination of labour. It also increases the quality and regularity of all observations on the fetus and the mother in labour, and aids early recognition of problems with either. The first WHO partograph or ‘Composite partograph’, covers a latent phase of labour of up to 8 hours and an active phase beginning when the cervical dilatation reaches 3 cm. The active phase is provided with an alert line and an action line, drawn 4 hours apart on the partograph as aids to monitoring labor. This partograph is based on the principle that during active labor, the rate of cervical dilation should not be slower than 1 cm/hour. A lag time of 4 hours between slowing of labour and the need for intervention is unlikely to compromise the foetus or the mother and avoids unnecessary intervention. Since a prolonged latent phase is relatively infrequent and not usually associated with poor perinatal outcome, the usefulness of recording the latent phase of labour in the partograph has been questioned. Moreover,
differentiating the latent phase from false labour being difficult, diagnosis is often made in retrospect. To alleviate these disadvantages, a WHO ‘Modified Partograph’ was introduced by removing the latent phase and considering the beginning of active phase at 4 cm dilatation of cervix instead of 3 cm. There were some other minor changes which include considering two squares in 1 hour instead of one square in 1 hour in cervical dilatation curve.

In this study we aim to determine, if among low risk labouring women with cephalic presentation, the use of a modified WHO Partograph (as compared to retrospective women where partograph was not used) had resulted in reduced maternal and perinatal morbidity and improved maternal and neonatal outcome.

2. Material and Methods:
This study was carried out in a rural medical college of central India where annually 5000 deliveries take place, of which 70% are low risk population. Typically each delivery is conducted by a resident doctor under the supervision of a consultant. Since last 2 years Modified WHO partograph is being used to monitor all labouring women. The base population of the study is all women who seek services at the hospital for labour and delivery. Consecutive women admitted in labour room were screened and 100 women with uncomplicated full term pregnancies with cephalic presentation in active labour were identified and enrolled as cases in the study after informed consent. Women with medical complications like severe anaemia, hypertension, uncontrolled diabetes, immune compromised status were excluded from the study. Women with obstetrical complications like preterm labour, postdias, antepartum haemorrhage, intrauterine growth restriction and premature rupture of membranes were also excluded. 100 historical matched controls (comprising of low risk women who delivered without the use of partograph) were identified from the labour register during the period when partograph was not being (Before 2 years). The course of labour of the women selected as cases was studied from the Modified WHO partograph plotted for her during labour. Data was collected in a predesigned proforma. Duration of first and second stage of labour and any abnormalities of labour were noted down. Labour parameters like meconium staining of liquor, fetal heart rate abnormalities, need for augmentation of labour, duration of total labour, criteria for intervention if any and need for instrumental delivery or caesarean section were studied. Maternal outcome was analyzed by studying various parameters like mode of delivery, puerperal sepsis, postpartum hemorrhage, need for blood transfusion, duration of stay in the hospital and maternal mortality.

The perinatal outcome was analyzed by studying various parameters like condition of baby at birth (live birth/still birth), Apgar score, respiratory distress, neonatal sepsis, need and duration of stay in neonatal intensive care unit. Similar data was collected for the matched controls. Demographic data and labour delivery data was studied. The number (proportion) of each dichotomous variable and mean (SD) for continuous variables for both cases and controls were determined. The data was analysed using Students t test (for continuous variable) and Chi square test (for dichotomous variable). Epi info software was used.

3. Results:
The mean age of women labelled as cases was 24.10 years (SD 3.81) and that of controls was 24.27 (SD 3.86). It was found that maximum women were educated up to secondary school in both cases (49%) and controls (56%). However 4% of cases and 12% of controls were illiterate. Most women had been booked in the antenatal outpatient department with minimum three visits in both cases (40%) and controls (51%). However 37% of cases and 24% of controls were unbooked with no antenatal visit. The impact of implementing partograph in labour management is shown in Table 1. Among the singleton pregnancies, vaginal deliveries increased from 53% among controls to 78% amongst cases. Instrumental deliveries were less common in cases (1%) than in controls (3%). The emergency caesarean section rate was reduced significantly by 23% that is 44% in controls as compared to 21% in cases. This was statistically significant with p value < 0.05.

When indications for emergency caesarean section were examined there was overall reduction in caesarean section for foetal distress that is from 24% in controls to 16% in whom partograph was used. The most significant difference was found in women requiring caesarean section for prolonged first stage
which reduced from 10% in controls to 1% in whom partograph was used. In addition, there was reduction in caesarean section rate from 5% to 1% for prolonged 2nd stage and from 5% to 1% for cephalopelvic disproportion when partograph use and no partograph use were compared. This reduction was found to be statistically significant.

Table 3 shows the analysis of women according to duration of labour. Significantly in all women (100%) in whom partograph was used the labour was completed before 12 hours out of which 66% delivered within 8 hours. In control group only 40% of women delivered within 8 hours and 31% had labour upto 12 hours. A significant 11% of these women in whom partograph was not used had labour upto 16 hours and 6% of women had intrapartum period of more than 16 hours. However in 12% women in control group reliable data for duration of labour was not available. These findings are statistically highly significant with p value <0.01.

There was significant reduction in neonatal intensive care admissions from 17% in control group to 6% in babies where partograph was used. When indications for NICU admissions were seen there was marked difference in admissions for meconium staining of liquor. Women in whom partograph was used had 5% babies with 1 min Apgar score below 7, only 1 baby had 5 min Apgar score below 7 and none of the babies had 10 min Apgar score below 7. However in control group 10% of babies had 1 min Apgar score below 7, 6% of babies had 5 min Apgar score below 7 and 1% of babies had 10 min Apgar score below 7. This baby later succumbed to respiratory distress. In control group 5 min Apgar score below 7, 4 babies had extended stay in NICU.

In control group 13% of women required blood transfusion as compared to 7% in women where partograph was used. Significant reduction in puerperal sepsis was observed in cases where partograph was used 1% as compared to 6% where partograph was not used. There was failing lactation in 5% women of control group compared to 1% of cases. One woman each in control group had post partum haemorrhage and post partum psychosis.

4. Discussion
E.A. Friedman in 1954 following a study on a large number of women in the USA, described a normal cervical dilatation pattern. In 1969 Hendricks et al demonstrated that in the active phase of normal labour the rate of dilatation of the cervix in primigravidae and multiparae varies little and that there is no deceleration phase at the end of the first stage of labour. Philpott in extensive studies of primigravidae in Central and Southern Africa constructed a partogram for cervical dilation in his population and was able to identify deviations from the normal and provide a sound scientific basis for early intervention leading to the prevention of prolonged labour.

Since then various authors have developed similar partograms and brought about various modifications. The WHO model of the partograph has been devised by an Informal Working Group which examined most of the available published work on partographs and their design. It represents a synthesized and simplified format including the best features of several partographs. Since then many obstetric providers started using this concept as an aid to intrapartum management and various studies have been conducted by a number of researchers. The earliest was in 1972 by Philpott and Castle who concluded that the use of partogram reduced the Caesarean section rate, the incidence of prolonged labour and the perinatal mortality rate. In 1973 John Studd said that retrospective evaluation of the partogram showed that it can separate normal labour from labour destined to result in an abnormal outcome, such as longer first and second stages, a greater incidence of instrumental delivery, and babies with low Apgar scores. He suggested that the use of partogram would be of considerable use, both in specialist and in general-practitioner units.

In 1979, Drouin P conducted a retrospective study of 686 patients and a prospective study of 1045 patients at the University Center for Health Science in Yaounde, Cameroon, Africa. With the institution of partogram they found that the perinatal mortality decreased by 10 deaths/1000 births. Hence they recommended the use of partograph.

The results in our study provide evidence that the use of WHO Modified Partograph with a simple management protocol improves outcome of labour both in maternal and neonatal perspective. The initial basic sociodemographic, medical and obstetric data in both control and case group was similar thus providing a sound basis for comparison in between intrapartum and outcome attributes. A
significant reduction in the caesarean section rate (more than 50%; 44% in control and 21% in cases) was achieved with the introduction of partogram with a corresponding rise in spontaneous vaginal deliveries. Minimal reduction in operative deliveries was also achieved. This reduction in caesarean section was also recorded by other authors\textsuperscript{11}. A caesarean section rate of 0.05% was achieved by Bird\textsuperscript{8} in Papua New Guinea (0.7% if symphysiotomies are included). Similar reduction in caesarean section rates was achieved in a study carried out in Pakistan\textsuperscript{12}. Javed reported normal vaginal delivery in 88%, operative vaginal delivery in 5.6% and caesarean section in 6.4% with use of partograph. Sizer and Evans\textsuperscript{13} 2000 found that second stage partogram is associated with increasing chance of spontaneous vaginal delivery (odds ratio 1.68 [OR] for nulliparas, 1.59 for multiparas), decreasing chance of instrumental vaginal delivery (OR 0.67 for nulliparas, 0.64 for multiparas), and emergency caesarean delivery (OR 0.39 for nulliparas)\textsuperscript{12}. However Lavender found no evidence of any difference between partogram and no partogram in caesarean section (risk ratio (RR) 0.64, 95% confidence interval (CI) 0.24 to 1.70) or instrumental vaginal delivery (RR 1.00, 95% CI 0.85 to 1.17)\textsuperscript{14}. Similarly, Windrim\textsuperscript{15} reports an increase in caesarean section rates with the use of partograph.

When we consider the incidence of prolonged labour with the use of partogram it is significantly reduced in our study with none of the women having labour beyond 12 hours. Javed\textsuperscript{12} reported that introduction of partogram showed significant impact on duration of labour (p<0.001) as well as on mode of delivery (p<0.01). In multigravidae 94.4% delivered within 12 hours and rest 5.6% delivered within 24 hours when partogram was used while 88.4% delivered within 12 hours and the rest 11.6% within 24 hours before the use of partogram. Thus with the use of WHO Modified Partograph the labour management becomes more efficient, reducing the duration of labour without an increase in caesarean sections. Similar findings have been reported by a number of authors\textsuperscript{11,12,15}. The partograph graphically represents key events in labour and provides an early warning system. The World Health Organization partographs are the best known in low resource settings. Experiences with World Health Organization and other types of partographs in low resource settings suggest that when used with defined management protocols, this inexpensive tool can effectively monitor labor and prevent obstructed labor\textsuperscript{4,16}. This impact on the duration of labour is significant as it will further bring a reduction in maternal and neonatal morbidity. Intrapartum still births fall with the use of partogram. First week neonatal mortality also falls drastically\textsuperscript{11}. In the present study the neonatal intensive care admissions were few in partogram group as compared to no partogram group, thus indicating an improved neonatal outcome. In control group where 5 and 10 min Apgar score was found to be higher we could not estimate the true neonatal death rate as systematic follow up of the infants was not undertaken nor found feasible in this study. The improvements described in this study are remarkable as it was in low risk women without any obstetric or medical complications. Rocha\textsuperscript{17} found that Apgar scores of less than 7 at 1 min were reduced significantly. Dangal\textsuperscript{18} found that the partograph can be highly effective in reducing complications from prolonged labor for the mother (postpartum hemorrhage, sepsis, uterine rupture, etc) and for the newborn (death, anoxia, infections). Use of WHO partograph in 8 hospitals in Indonesia, Thailand, and Malaysia reduced postpartum infections (by 59%), the number of stillbirths, the amount of oxytocin augmentation, and unnecessary caesarean sections\textsuperscript{2}.

The visual presentation of clinical information has great implications in the management of labour. This is very true of a graphical aid such as partograph. Another point to be stressed is that all information about the labouring women and her intrapartum progress could be obtained from a single sheet of paper thus fulfilling the need for proper documentation in patient management. During collection of data for control group difficulty was encountered in gathering information. In fact in 12% of women adequate data regarding duration of labour could not be obtained due to poor documentation. Similar kind of advantage of partographic documentation has been expressed by a number of authors like Cartmill et al\textsuperscript{19}. Thus training of health care providers who supervise labour parturient women in the use of partograph has been recommended by many\textsuperscript{20}. In this study obstetric staff had a favourable impression of partograph as observation of
labour was found to be clearly improving the interpretation of findings and communication between members of maternity unit. The reduction in caesarean section rate have many implications such as financial as well as reducing the number of working hours, requirement of expert intraoperative supervision etc. More support can thus be given to the labouring women by the existing staff. Simplified WHO partograph was more user-friendly and was associated with better labor outcomes. The WHO Modified Partograph had an advantage of removing the latent phase of labour and thus making it more acceptable. This WHO Modified Partograph was found to be simple and efficient in labour management preventing prolonged labour and its complications in third world countries with scarcity of resources.

Post partum complications such as sepsis, failing lactation and need for blood transfusion can also be reduced bringing a reduction in maternal mortality. Khan and Rizvi found that partograph prevented rupture uterus in planned labour after caesarean delivery. Javed found that by using partogram, frequency of prolonged and augmented labour, postpartum haemorrhage, ruptured uterus, periperal sepsis and perinatal morbidity and mortality was reduced. Ernest found that there was one uterine rupture and 2 maternal deaths before introduction of partograph but none after partograph introduction. The authors concluded that introduction of partograph in peripheral health units in a developing country reduced labour complications. Its use significantly influences decision-making and associated with positive labour outcome among low/high-risk parturient. It is recommended as the sine qua non tool for intra-partum monitoring in all health facilities in Nigeria to reduce maternal complications. However only 9 – 10 % of all the personnel routinely employed the partograph for labour management and almost half of these individuals had a poor level of knowledge. Thus primary training of health care providers in partograph use is essential.

As the sample size in this study was small and the time period over which it was conducted was less we recommend planning of a larger study so that favourable results of this study can be reproduced. WHO calls for health personnel to use its partograph and its management protocols, both in labour wards with the capabilities to manage labour complications and in health centers without these capabilities which can refer women with labor complications to a specialist facility. The appropriate time of referral needs more emphasis in continuing education and the WHO partograph should be promoted for use by midwives who care for labouring women in a maternity home. As partograph is utilized mainly in tertiary health facilities and knowledge about partograph among peripheral workers is poor hence further research in this field and training of personnel is mandatory.

**Conclusion**

Based on the findings of this study it can be concluded that the use of Modified WHO partograph significantly improves the outcome of labour in both maternal & neonatal perspective. Thus recommending that, the WHO partograph be used in all maternity units with incorporated management guidelines so that the labouring women, their babies & also health care providers can be benefited. Its proper use will reduce neonatal & maternal morbidity as well as reduce caesarean sections.

**References**

18. Dangal G. Preventing prolonged labor by using partogram. *Int J Gynecol Obstet* 2007; 7(1)

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Cases</th>
<th>Controls</th>
<th>Pearson Chi square test</th>
<th>Likelihood ratio</th>
<th>Linear by linear association</th>
</tr>
</thead>
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<td>NVD</td>
<td>78</td>
<td>53</td>
<td>value-12.239</td>
<td>value-12.440</td>
<td>value-12.134</td>
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<tr>
<td>LSCS</td>
<td>21</td>
<td>44</td>
<td>df – 2</td>
<td>df – 2</td>
<td>df – 1</td>
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<td>Instrumental delivery</td>
<td>1</td>
<td>3</td>
<td>p value – 0.002</td>
<td>p value -0.002</td>
<td>p value- 0.001</td>
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Table 2- Distribution according to indication of LSCS

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<tr>
<th>Indication</th>
<th>Cases</th>
<th>Controls</th>
<th>Pearson's Chi square test</th>
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<th>Linear by linear association</th>
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<tbody>
<tr>
<td>Foetal distress</td>
<td>16</td>
<td>24</td>
<td>value- 15.821</td>
<td>df-5</td>
<td>value- 11.848</td>
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<tr>
<td>Prolonged first stage of labour</td>
<td>1</td>
<td>10</td>
<td>df-5</td>
<td>18.335</td>
<td>df-1</td>
</tr>
<tr>
<td>Prolonged second stage of labour</td>
<td>1</td>
<td>5</td>
<td>P value – 0.007</td>
<td>df-5</td>
<td>P value – 0.002</td>
</tr>
<tr>
<td>Cephalo-pelvic disproportion</td>
<td>1</td>
<td>5</td>
<td>P value – 0.002</td>
<td>df-1</td>
<td>P value – 0.001</td>
</tr>
<tr>
<td>Failure to descent</td>
<td>2</td>
<td>0</td>
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Table – 3 Distribution according to duration of labour

<table>
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<th>Duration of labour</th>
<th>Cases</th>
<th>Controls</th>
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<tr>
<td>Upto 8 hours</td>
<td>66</td>
<td>40</td>
<td>Less than 0.01</td>
</tr>
<tr>
<td>8 – 12 hours</td>
<td>34</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>12 – 16 hours</td>
<td>0</td>
<td>11</td>
<td>Less than 0.01</td>
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<tr>
<td>&gt; 16 hours</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Not known</td>
<td>0</td>
<td>12</td>
<td></td>
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Table – 4 showing indication for NICU admissions

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<th>Indications</th>
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<th>Controls</th>
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<tbody>
<tr>
<td>Meconium Staining of liquor</td>
<td>3</td>
<td>9</td>
<td></td>
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<tr>
<td>Respiratory distress</td>
<td>2</td>
<td>4</td>
<td>Less than 0.05</td>
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<tr>
<td>Delayed cry</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Low birth weight</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>Altered sensorium of mother</td>
<td>0</td>
<td>1</td>
<td></td>
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