



## 2. Materials and Methods

This study was undertaken at K. J.Somaiya Medical College, Hospital and Research Centre, Mumbai between February 2010 to JUNE 2012. The study was an observational study, including 250 nulliparous women who had been selected on the basis of the below mentioned inclusion and exclusion criteria:

### Inclusion Criteria

- Nullipara.
- 37 to 41 weeks of gestation.
- Singleton pregnancy.
- Cephalic presentation.
- Low risk pregnancy.
- Spontaneous labour.

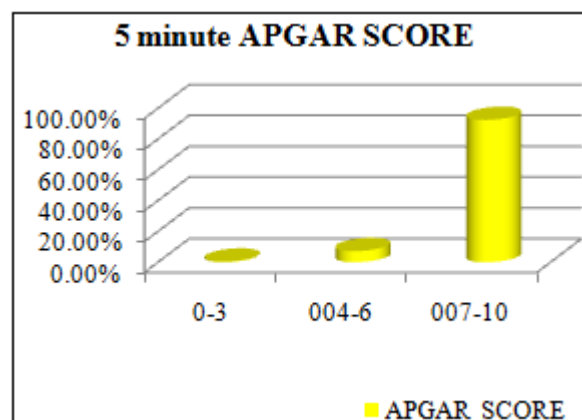
### Exclusion Criteria

- Non cephalic presentation
- Major fetal structural anomaly
- Previous uterine surgery
- Any acute obstetric complications such as antepartum hemorrhage, antepartum eclampsia.
- High risk medical conditions such as Moderate to Severe Anemia, Diabetes, Epilepsy, Hypertension, Asthma.
- Induced labour
- The progress of labour was plotted on simplified partogram.
- The following protocols were followed :
- Plotting was started at cervical dilatation > 4cm
- Fourth hourly per vaginum examination was recommended, but could be done more frequently if required.
- Maternal pulse, B.P., temperature and fetal heart rate was monitored and filled in partogram as per the columns.

## 3. Results

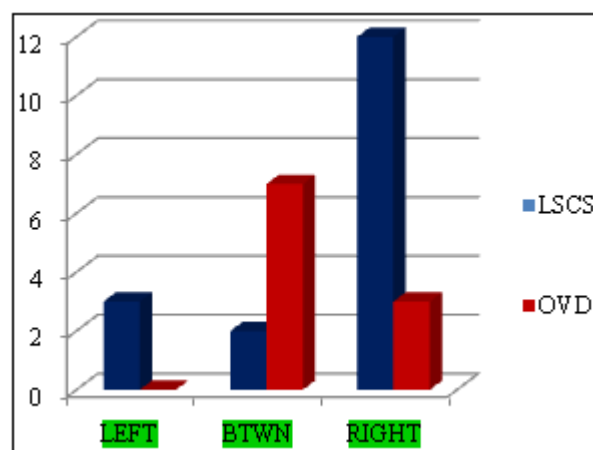
- The mean Age was 23.4years and the mean Gestational age was 38.4 weeks.
- The mean duration of first stage labour was 3.13 hours and the mean duration of second stage of labour was 37.04 minutes.
- The mean dilatation rate of the cervix was 1.54 cm/hr and the 10<sup>th</sup> centile was 1.09cm/hr.
- In this series, 38.4% women received augmentation of labour. In the entire study group we had 89.2% normal vaginal deliveries, 6.8% caesarean sections and 4% operative vaginal deliveries.
- The operative delivery rate was 83.33% in the group of women who crossed the action line, 45 % in the group of women who were between alert and action line and only 1.4 % of the women who were to the left of alert line. The average birth weight was 2.64 kg.
- The 5 minute APGAR score less than 7 was found in 19 babies out of which only 11 required NICU admissions.
- The babies born to women who were to the left of alert line required less (21.2%) NICU admissions compared to the babies born to the women who were between the alert and action line and who had crossed the action line (78.8%).

- There were only 2 perinatal deaths hence the prenatal mortality rate was 0.8%, the major reason for death being respiratory problems.
- The mean age found in our study was 23.4 years which is a favorable age (21-25yrs) for conception with the least pregnancy related complications. The mean age in our study was more than the mean age found in Philpott and Castle's study<sup>11</sup>:- 18 years and was less than the mean age found in the WHO partograph in management of labour study:- 27.23 years.<sup>17</sup> The probable reason for the younger population group could be due to early age of marriages in our country.
- The mean gestational age was 38.4 weeks which is comparable to the gestational age found in WHO partograph in management of labour study<sup>17</sup>:- 39 weeks.



Graph 2: 5 minute APGAR score showing admission in NICU.

- All our patients delivered in the duration of 1 to 8 hrs after admission but the mean of the first stage of labour found in our study group was 3.13 hours. The duration of the first stage of labour as studied by various authors is as follows :



Graph 1: Comparison of alert line and action line with mode of delivery

The maximum no. of women (84%) delivered vaginally without crossing the alert line. Among the women who were between the alert and the action line 33.3% required an operative delivery. In the women who crossed the action line, 55.6 % required operative vaginal delivery (OVD).

The babies who had 5 minute APGAR score < 7 (7.6%). this group of low apgar babies (19) were responsible for 57.9% of NICU admission.

#### 4. Discussion

This study was a prospective study in which 250 women with spontaneous onset of labour were studied with the help of partograph .The mean age found in our study was 23.4 years which is a favorable age (21-25yrs) for conception with the least pregnancy related complications. The mean age in our study was more than the mean age found in Philpott and Castle’s study<sup>5</sup>:- 18 years and was less than the mean age found in the WHO partograph in management of labour study:- 27.23 years<sup>1,6</sup> The probable reason for the younger population group could be due to early age of marriages in our country.

The mean gestational age was 38.4 weeks which is comparable to the gestational age found in WHO partograph in management of labour study <sup>16</sup>:- 39 weeks. All our patients delivered in the duration of 1 to 8 hrs after admission but the mean of the first stage of labour found in our study group was 3.13 hours. The duration of the first stage of labour as studied by various authors is as follows:

**Table 1:** Showing duration of first stage of labour in various author series.

Author	Duration of first stage of labour
Friedman (1955) <sup>7</sup>	4.9 hrs
Hendricks (1970) <sup>8</sup>	4.8 hrs
Studd ( 1973 ) <sup>9</sup>	5.7 hrs
Pierre Drouin (1979) <sup>10</sup>	6.1 hrs
Damania et al (1992) <sup>11</sup>	7.50 hrs
Zhang & colleague(2002) <sup>12</sup>	5.5 hrs
Present study (2012)	3.13 hrs

The reason for varying duration is probably due to the difference in the cervical dilatation point at which the cervicograph was started to be plotted by various authors and also because of different rates of cervical dilatation in a given population. The duration of the first stage of labour in our study was shorter compared to other studies probably because almost two fifth of our patients were augmented during labour. In our study, the mean duration of the first stage of labour in the women who were to the left of alert line was 2.8 hours and was 5.1 hours in the women who had crossed the action line.

In our study group , the highest number of women (47.2%) had a dilatation rate in the range of 1 – 1.5 cm/hr and the mean dilatation rate was 1.54 cm/hr. A number of observational studies have reported wide variations in the mean, median, and centile values for the rate of cervical dilatation.<sup>38</sup> This may explain the lack of uniformity in the size and shape of the partogram and the timing of the alert and the action line on a number of partograms that deviate from Philpott’s original version<sup>11</sup>. The rate of cervical dilatation was 1.6cm/hr in study by Philpott and Castle (1972)<sup>5</sup>. However Friedman reported the rates of cervical dilatation in nulliparous women range from 1.2 cm/hr to 6.8 cm/hr.<sup>7</sup>

**Table 2:** The table below shows a few Indian studies which reported the cervical dilatation rate in their patients <sup>14</sup>

Khara et al(1984)	1.55 cm/hr.
Baracho et al (1984)	1.35 cm/hr.
Mittal et al (1981)	1.89 cm/hr.
Daftaryand Mhatre (1973)	1.61 cm/hr
Present study	1.54 cm/hr

The dilatation rate in our study was comparable to the results found in Khara et al, Daftary et al studies but was less than the result reported by Mittal et al and was more than the result found in the study by Baracho et al. In our study population rate of cervical dilatation in the lowest 10<sup>th</sup> centile is around 1cm/hr (1.09 cm/hr) compared to the study done by L.-J. van Bogaert<sup>33</sup> in South Africa where he found it as 0.86cm/hr. In our study augmentation was done in 38.4% women. Out of these patients 30.2% had oxytocin drip and 27.1% had both ARM + Oxytocin drip while remaining 42.7% progressed only with ARM.

**Table 3:** Following are the incidences of augmentation quoted by different authors in primigravidas

Study	LSCS percentage
O’ Driscoll , 1973 <sup>17</sup>	3%
Composite WHO partograph <sup>19</sup>	4.5%
Javed et al , 2007 <sup>20</sup>	6.4%
Mathews et al 2006 <sup>21</sup>	13.2%
Present study	6.8 %

The percentage of women who received augmentation of labour in our study was more compared to other studies. In the present study 89.2% of patients delivered normally, 6.8% had Caesarean sections; Forceps was applied in 1.6% and Vaccum delivery carried out in 2.4%. The studies mentioned below in table no.16 shows comparison between different rates of Caesarean section performed in different studies:

**Table 4:** Caesarean section rates in various studies

	11%
Ledge & Whitting (1972) <sup>16</sup>	14%
O’ Driscoll ( 1969 ) <sup>17</sup>	20%
O’Driscoll and Stronge (1975) <sup>18</sup>	55%
Present study	38.4%

The Caesarean section rate was comparable to the study done by Javed et al and was slightly more than the other studies mentioned above. In our study, 17 Caesarean sections were performed for the following indications as shown in table below:

**Table 5:** Indications for Caesarean sections in our study

Indications	First Stage	Second Stage
Arrest of dilatation	6	
Foetal distress	5	
CPD		3
Deep transverse arrest		3

In our study this incidence was 3.5% which is slightly lower than the study of Friedman et al<sup>9</sup>. In our study, six sections were performed in the second stage of labour. In all these patients, labour dystocia in the form of fetopelvic disproportion was present either in the form of malposition (deep transverse arrest) or inadequacy of maternal pelvis

(Cephalopelvic Disproportion, CPD) which became more apparent in the second stage of labour. In our study the incidence of CPD was 50% in women who required LSCS in the second stage of labour. This is comparable to the study by Friedman and Sachtleban<sup>[9]</sup> who found more than 50% incidence of CPD among the women who had secondary arrest of descent and protracted descent.

We had four (1.6%) forceps delivery, three for the indication of fetal bradycardia and one for the poor maternal bearing down efforts. We also had six (2.4%) vacuum delivery, three for the indication of fetal bradycardia and three for poor maternal bearing down. The mean duration of second stage in vacuum delivered patients was 56.66 mins and the mean birth weight was 3 kgs.

In our study mean birth weight was 2.64 kg. The average birth weight found in the LSCS group was 2.6 kg and in the operative vaginal delivery group it was 3 kg. According to the study by Chan and Studd (1979)<sup>[22]</sup>, women whose labour progress was to the right of the action line delivered heavier babies and these babies required resuscitated more often. In our study we did find that the birth weight affected the course of labour. Women whose progress in labour was to the left side of the alert line had smaller babies compared to the ones who were between the alert and the action line or who crossed the action line.

In our study the maximum number of women (i.e. 84.8%) delivered without even crossing the alert line, 7.2% women had crossed the action line and 8% women remained in between the alert and the action line. These results are comparable to the results found in the WHO partogram in management of labour study<sup>[17]</sup> which had 72.8% women who remained to the left of alert line, 17.3% were between the alert and the action line and 9.9% crossed the action line.

In our study, in the women who were to the left of alert line, 1.4% had operative delivery (all three were LSCS done for fetal distress). In the women who were between the alert and the action line 45% had operative delivery and the women who were to the right of action line 83.33% required operative deliveries. In the study of Pierre Drouin et al (1979)<sup>[41]</sup>, 0.57% lying to the left of alert line had operative delivery, 30.76% between the alert and the action line had operative delivery while 51.42% to the right of the action line had operative delivery. Thus from the above, the trend for increased operative delivery for the patients lying to the right of alert line is obvious.

In our study we had 13.2% patients with meconium stained liquor. Out of these, 24.24% babies required NICU admissions. The probable reason for the low incidence of meconium stained liquor may be because many of the women delivery quickly spontaneously without crossing the alert line.

In our study we found low APGAR score in the babies born to women who crossed the alert and the action line. We had nineteen babies with low Apgar score, out of which eleven babies (57.9%) required NICU admission. Out of the eleven NICU admission, only one baby had Apgar score less than four and this baby died. This result was similar to the study

by Studd et al<sup>[9]</sup> which found low APGAR score in the babies of the women who crossed the action line. However the studies of Sizer et al<sup>[23]</sup> and Lavender et al<sup>[1]</sup> showed no difference in the APGAR scores in the babies whose mothers were to the left or right of the alert line or the action line.

Among the women who remained to the left of the alert line had less NICU admissions (21.2%) compared to the women who were between the alert and the action line and the ones who crossed the action line (78.8%). Two main causes for low APGAR score related to partograph were Meconium aspiration syndrome and Respiratory distress syndrome. The other common reason found for NICU admission was hyperbilirubinemia 79.4% which was not related to the partograph directly. Hyperbilirubinemia was previously considered to be related to augmentation with oxytocin (Buchan P.C., 1979)<sup>[24]</sup> but recent data by Oral et al (2003)<sup>[8]</sup> does not support the above assumption. In our study we did not find any relation between oxytocin augmentation and hyperbilirubinemia. There were two perinatal deaths (0.8%) in our study. In Philpot's series the perinatal mortality was 3.8% and in the study conducted on WHO composite partogram<sup>[19]</sup>, it was found to be 0.3%.

In our study, perinatal mortality was associated with labour dystocia. Babies were shifted to the NICU for low APGAR score. One neonatal death was associated with secondary arrest of the cervical dilatation which did not improve with augmentation and due to appearance of meconium, Cesarean section had to be done. The baby was severely asphyxiated, died after four hours in NICU (cause of death was meconium aspiration with severe birth asphyxia). The other perinatal death was in a patient who had deep transverse arrest and died due to birth asphyxia on day two of life despite LSCS.

Though we did not have any still birth in our study, the WHO partogram in the management of labour study<sup>[6]</sup> showed significant reduction in the intrapartum still birth and neonatal deaths after introduction of the partogram.

From our results we found that the women who remained to the left of the alert line required lesser duration of labour, less augmentation of labour and lesser operative deliveries babies born to these mothers had better Apgar action line and those who crossed the score and required less NICU admissions and less perinatal morbidity and mortality compared to the women who were between the alert and the action line.

From all the above mentioned maternal and fetal benefits in our study, we strongly recommend the use of partogram which is an aid to referral decisions and is a labour management tool which should be used as a routine tool for monitoring labour in a developing country like India.

## 5. Summary

Partogram is a graphical record of labour which is an inexpensive, easily available, managerial tool which has been endorsed by WHO for monitoring of labour. Various types and designs of partograms are being used at various centers. Recently, WHO introduced simplified version of partogram, for the use by skilled birth attendants. In our

study we evaluated nulliparous women in labour using this simplified partogram. This study was conducted at K. J. SOMAIYA HOSPITAL, MUMBAI, included 250 nulliparas with uncomplicated pregnancies at term. Using WHO simplified partogram, characteristics of nulliparous women in labour and their neonatal outcome were evaluated.

The mean Age of our patients was 23.4 years and the mean Gestational age was 38.4 weeks.

The mean duration of first stage labour was 3.13 hours and the mean duration of second stage of labour was 37.04 minutes. The duration of labour found in the women who crossed the action line was greater than the one who remained on the left side of alert line. The mean dilatation rate of the cervix was 1.54 cm/hr and the 10<sup>th</sup> centile was 1cm/hr.

In this series, 38.4% women received augmentation of labour. In the entire study group we had 89.2% normal vaginal deliveries, 6.8% caesarean sections and 4% operative vaginal deliveries. The operative delivery rate was 83.33% in the group of women who crossed the action line, 45 % in the group of women who were between alert and action line and only 1.4 % of the women who were to the left of alert line.

We had a good perinatal outcome and the average birth weight was 2.64 kg. The 5 minute APGAR score less than 7 was found in nineteen babies out of which only eleven required NICU admissions. The babies born to women who were to the left of alert line required less (21.2%) NICU admissions compared to the babies born to the women who were between the alert and action line and who had crossed the action line (78.8%). There were only 2 perinatal deaths hence the prenatal mortality rate was 0.8%, the major reason for death being respiratory problems. Though we had no still birth in our study, literature has reported that the partograph does improve the still birth rate and neonatal deaths but due to small sample size this aspect could not be evaluated in our study.

From the above it is clear that the partogram is an invaluable aid in the management of parturient women across the globe.

## 6. Conclusion

The partogram is an inexpensive and accessible tool that can effectively monitor the progress of labour. Other benefits of partogram include:

- 6.1 Unlike other interventions in maternal health, use of the partogram does not require expensive technology which may malfunction.
- 6.2 A partogram review (if well recorded) provides rapid, comprehensive information about progress in labor when compared with a review of detailed hand written case notes.
- 6.3 Midwives find the partogram to have practical benefits in terms of ease of use, time resourcefulness, continuity of care and educational assistance, and these positive aspects may contribute to improving maternal and fetal outcomes.
- 6.4 Partogram is more user friendly and can be easily taught to skilled birth attendant. From our study, we also

realised the importance of the alert line and the action line.

- 6.5 An alert line on the partogram should be based on the lower 10<sup>th</sup> centile rate of the cervical dilatation of the local population. We found this rate as 1.09 cm/hr, which approximately corresponds to the slope of the alert line on a standard partogram.
- 6.6 The action line should be placed 4 hours from the alert line with the rate of the cervical dilatation 1cm/hr. Placing this line early can have a biased opinion regarding the progress of labour and can lead to more operative delivery. Because of the frequent observations of the patients with the help of partogram we managed to:
- 6.7 Treat dysfunctional labour early and effectively.
- 6.8 Reduce the incidence of Caesarean sections.
- 6.9 Obtain a better outcome in neonates.

Based on this we conclude, simplified partogram is a very good method for monitoring labour progress of women in our local population. It a very helpful tool to monitor labouring women by both trained and untrained workers and thus must be implemented in all the hospital both rural and urban to avoid mishaps.

## References

- [1] World Health Organization. The World Health Report 2005: Make Every Mother and Child Count. Geneva: World Health Organization; 2005.
- [2] World Health Organization. Managing Complications in Pregnancy and Childbirth. Geneva: World Health Organization; 2000.
- [3] Matthews Mathai, MD, MObstet, PhD, The Partograph for the Prevention of Obstructed Labour Clinical obstetrics and gynecology. Volume 52, Number 2, 256–269
- [4] Lavender T, Alfirevic Z, Walkinshaw S. “Effect of different partogram action lines on birth outcomes: a randomized controlled trial,”. *Obstet Gynecol.*108: 295–302 2006.
- [5] Philpott RH, Castle WM. “Cervicographs in the management of labour in primigravidae. II. The action line and treatment of abnormal labour,”. *J Obstet Gynaecol Br Commonw.*(79),599–602, 1972.
- [6] .World Health Organization partograph in management of labour. World Health Organization Maternal Health and Safe Motherhood Programme,”. *Lancet.*;(343):1399–1404, 1994
- [7] Friedman E. “The graphic analysis of labor,”. *Am J Obstet Gynecol.*(68), 1568–1575, 1954.
- [8] Hendricks CH, Brenner WE, Kraus G. “Normal cervical dilatation pattern in late pregnancy and labor,”. *Am J Obstet Gynecol.* (106)1065–1082,1970
- [9] Duignan NM, Studd JW, Hughes AO. “Characteristics of normal labour in different racial groups,”. *Br J Obstet Gynecol*,(82):593–601, 1975
- [10] Pierre Drouin, Nasah, Kounawa N. “Study of partogram in primigravidae,”. *Obstet Gynaecol* 740, 1979.
- [11] Damania KR, Mhatre PN, Manju Mataliya, Daftary SN. “Partographic monitoring of labour using nomogram. *Journal of Obstet and Gynaecol of India* 611-615, 1992.

- [12] Oral E , Gezer A, Cagdas A, Pakkal N. "Oxytocin infusion in labour: The effect , different indication and the use of different diluents on neonatal bilirubin levels,". Arch Gynecol Obstet 267(3): 117 – 120, 2003.
- [13] Pattinson RC, Howarth GR, Mdluli W, et al. "Aggressive or expectant management of labour: a randomised clinical trial,". BJOG.110:457–461, 2003.
- [14] Pahalad Kushtagi, Dhall GI, Dhall K. "Pattern of Cervical dilation in normal labour,". Journal of Obstet Gynaecol India, 601-605,1989.
- [15] L.-J. van Bogaert. Revising the primigravid partogram: does it make any difference? Arch Gynecol Obstet 279,643–647, 2009
- [16] Ledger WI, Witting WC. Obstet Gynaecol ,1972; 174.
- [17] O'Driscoll K, Stronge, Minogue M. Active Management of Labour. British Medical Journal 1973; 133.
- [18] William Obstetrics, 23<sup>rd</sup> edition, 2009.
- [19] Matthews Mathai, MD, MObstet, PhD, The Partograph for the Prevention of Obstructed Labour Clinical obstetrics and gynecology. Volume 52, Number 2, 256–269
- [20] Bosse G, Massawe S, Jahn A. The partograph in daily practice: it's quality that matters. Int J Gynaecol Obstet. 2002;77:243–244.
- [21] Mathews JE, Rajaratnam A, George A, et al. "Comparison of two World Health Organization partographs". Int J Gynaecol Obstet.96:147–150 ,2007.
- [22] Thom MH, Chan KK, Studd JW. "Outcome of normal and dysfunctional labour in different racial groups,". Am J Obstet Gynecol.,35:495–498, 1979.
- [23] Sizer AR, Evans J, Bailey SM, et al. " A second-stage partogram,". Obstet Gynecol.;96:678–683,2000.
- [24] Buchan P.C. "Pathogenesis of neonatal hyperbilirubinemia after induction of labour with oxytocin,". Br. Med. J, 2(6200), 1255- 1257, 1979.

**Dr Amit Kolekar** MBBS MS MCH URO presently passed from Nair Hospital Mumbai. working as Assistant Professor in Department of Surgery AVBRH Sawangi Wardha Maharashtra India.

**Dr Kaveri Pai** MBBS MD ANAESTHESIA passed from BJMC Pune. Presently working as Assistant Professor in Department of Anesthesia AVBRH Sawangi Wardha Maharashtra India.

## Author Profile

**Dr. Rutuja Kolekar** .M B B S. DNB (OBYG) has Total Experience of One Year Post DNB Qualification . Medical Officer in MCGM MATERNITY HOME, MUMBAI FOR 1 YEAR. M.B.B.S. 58% Passed from Dr. D.Y.Patil Medical College and Hospital , Navi Mumbai , Maharashtra. DNB OBYG - Passed in 2013 September from K. J. Somaiya Medical College, Hospital and Research Centre, Mumbai, Maharashtra. Laproscopic Tubal Ligation Training done in June 2014. Presently Working as Senior Resident in Department of Obstetrics and Gynecology in SNMC Medical College and HSK Hospital Bagalkot , Karnataka Since 2 Months .

**Dr. Shivanand Gundalli**.M B B S. MD (PATH) Passed MBBS from KIMS Hubli and M D Pathology from Drvmgmc Solapur India. Total Experience of 2 and Half Year Post M D Qualification Registrar in Pathology in MGM Medical College Parel Mumbai for 2 Months. Medical Officer in YCM Hospital Pimpri, Pune for Three and Half Months. Work Experience as Assistant Professor in Department Of Pathology Govt Med College Solapur for 9 Months. Worked as Consultant Pathologist in SRL Ranbaxy Laboratories Mumbai for 11 Months. Worked as Part Time Consultant Pathologist in Lifecare Laboratory, CAP Accredited Laboratory Mumbai and Shruti Clinical Laboratory Mumbai, an ISO Certified Laboratory. Presently Working as Assistant Professor in Department of Pathology SNMC Medical College and HSK Hospital Bagalkot Since 2 Months working as Part Time Consultant Pathologist in Shruti Clinical Laboratory Mumbai, an ISO Certified Laboratory.