

# Labor Pattern in South Indian Population

Chitra Bhat<sup>1</sup>, Seetha Panicker<sup>2</sup>

## ABSTRACT

**Aim:** Labor dystocia is one of the commonest indications of lower segment cesarean section (LSCS). Recent studies have shown a dramatic change in the rate of cervical dilatation and labor progress. There are no large studies to assess labor in this ethnic group and hence this study has been done to find out labor behavior in women with spontaneous labor in South India.

**Materials and methods:** A retrospective study was done in our teaching hospital. Labor was managed as per protocol and a partogram was maintained. Data were extracted from case-records and analyzed.

**Results:** Labor progress was much slower than what was thought of. There was wide variability in the duration of labor.

**Conclusion:** Many women took time up to the 95th percentile and some even crossed three times the median time to deliver.

**Clinical significance:** Though many women will deliver in the expected time, it is important to know the maximum time or the 95th percentile for each dilatation so that sufficient time can be allowed before labeling a case as prolonged labor.

**Keywords:** Labor curve, Labor duration, Rate of cervical dilatation, Slowest rate of dilatation.

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## INTRODUCTION

Cervical dilatation is one of the key determinants of the progress of labor and may be dependent on many factors. There have been many attempts to define the norms for the progress of labor that have yielded variable results.

This is not an easy task as there are many challenges to accurately measure the duration of labor. The labor norms are also dependent on a woman's ethnicity, age, parity, BMI, use of epidural analgesia, and may vary among population groups. Despite all these difficulties, it is important to arrive at a proper understanding of labor norms and identify the slowest acceptable rates of cervical dilatation.

The rates of cervical dilatation in the active phase of labor largely stem from the data published by Friedman in 1950.<sup>1</sup> The Friedman's labor curve and the active management of labor pioneered by O'Driscoll et al.<sup>2</sup> where the lowest acceptable rate of dilatation is 1 cm/hr has influenced obstetric practice worldwide. WHO partogram<sup>3</sup> is practiced all over the world and the expected rate of dilatation is 1 cm/hr in the active phase. Any shift to the right and if the curve crosses the action line, labor is labeled as prolonged labor or non-progression of labor, and lower segment cesarean section (LSCS) is performed.

Dystocia characterized by a delay in progression of cervical dilatation is one of the most common indications for primary cesarean sections, ACOG Bulletin states it is the leading cause contributing to around 50% of all primary LSCS being performed.<sup>4</sup>

Zhang et al. reassessed Friedman's curves.<sup>5</sup> They studied the electronic records of 62,416 parturients and found the rates of cervical dilatation to be much slower. Data from this study formed the basis of the new guidelines for the active phase of labor. Labor may take even 6 hours to progress from 4–5 cm and more than 3 hours to progress from 5–6 cm. Only after 6 cm was the progress faster.

Due to ethnic differences, it is important to have insight regarding labor in our population that is critical in diagnosing labor dystocia and making a decision regarding the mode of delivery

<sup>1,2</sup>Department of Obstetrics and Gynaecology, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India

**Corresponding Author:** Chitra Bhat, Department of Obstetrics and Gynaecology, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India, Phone: +91 9443353191, e-mail: chitrabhat63@gmail.com

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## AIMS AND OBJECTIVES

- To determine the duration of labor and the rates of cervical dilatation in low-risk primigravida and multigravida women with spontaneous onset of labor.
- To determine the slowest acceptable rates of cervical dilatation.
- To create a labor curve for this population.

## MATERIALS AND METHODS

This was a prospective observational study done in a teaching hospital in South India between 2017 and 2018.

The study population included both primigravida and multigravida who were admitted with spontaneous labor.

The inclusion criteria were term gestation, singleton pregnancy, and vertex presentation with spontaneous onset of labor who delivered either normally or by assisted vaginal delivery. The exclusion criteria were induced labor, pre-term labor, mal-presentations, and patients who were delivered by cesarean section.

The institutional protocols for monitoring of labor were followed. Maternal and fetal monitoring was done in the usual way. The progress of labor was assessed by monitoring uterine contractions per 10 minutes for every half an hour, cervical

dilatation, and descent of the head was assessed by vaginal examination every 3–4 hours in the first stage of labor.

The rate of cervical dilatation was plotted on a partogram with time in hours on the x-axis and cervical dilatation on the y-axis.

Ethical clearance was obtained from our institutional human ethical committee.

### STATISTICAL ANALYSIS

The data was entered on an Excel spreadsheet and analysis was done using SPSS STATA13.1 software.

The data were analyzed concerning maternal demographic characteristics. The cumulative labor duration from cervical dilatation on admission (i.e., at 1, 2, 3, 4, 6, 7) to reach 10 cm was assessed. Data were extracted according to two parity groups nulliparous and parous women.

With each starting dilatation, the mean rate of dilatation was calculated for primigravida and multigravida. Taking the value of 2SD, the slowest rate of dilatation was also calculated.

A non-regression model was used to plot the labor curve with cervical dilatation against time in hours.

### RESULTS

The total number of deliveries during the study period was 4150.

A total of 2558 women were delivered by cesarean section. The number of women with spontaneous onset of labor who delivered vaginally was 1196. A total of 152 patients who had incomplete data and 21 patients who were admitted at more than 8 cm were excluded. So, only 1023 deliveries were analyzed.

Primigravida were 556 in number and multigravida were 467 in number. The age, cervical findings on admission, and mode of delivery are shown in Table 1.

The cumulative time taken for each dilatation starting from 1 to reach 10 cm was analyzed in both primigravida and multigravida.

In our study, the median duration of labor was chosen, as the mean duration may be skewed by a few laborers of very short or long duration. If the labor duration is positively skewed, the mean duration will be longer than the median duration as shown in this study thus at 2 cm the mean duration was 7.7 hours and the median duration was 7 hours.

Table 2 shows the cumulative mean time taken for each dilatation to reach 10 cm in primigravida and multigravida, respectively. It shows that multigravidae took a shorter time to progress to 10 cm when compared to primigravida. Primigravida took a median time of 9 hours to reach 10 cm from 1 cm, whereas it was 8 hours in multiparous women. At 2 cm it was 7 and 6 hours. At 3, 4, 5, 6–10 cm it was 5, 3, 3, and 2 hours in primigravida and 4, 3, 2, and 2 hours in multigravida.

Table 2 also shows the 5th and the 95th percentile, the number of women who crossed the 95th percentile, and the maximum time allowed for labor to continue that resulted in normal vaginal delivery.

At 2 cm though the meantime was 7.7 hour in primigravida, 16 women crossed the 95th percentile and 10 patients had a vaginal delivery after almost three times this mean-ranging from 18–26 hours. In six multiparous women at the same dilatation, labor was prolonged to 16–27 hours and 15 women crossed the 95th percentile.

At 3 cm dilatation, although the mean duration of labor was 5.5 hours, four primigravida women had a vaginal delivery after 19, 17, 16, and 13 hours, respectively. Correspondingly three multigravidas had taken 21, 15, and 13 hours to deliver from 3 cm dilatation for a mean of 4.7 hours.

At 4 cm against a mean of 3.8 hours, five primigravidas had taken between 8 and 11 hours to deliver, and in multigravida for a mean of 2.9 hours four had taken between 6 and 9 hours. At 7 cm a multiparous woman took 6 hours to reach full dilatation.

With each starting dilatation, the mean rate of dilatation was calculated for primis and multis. Taking the value of 2SD, the slowest rate of dilatation was also calculated as shown in Table 3.

The labor curve obtained was hyperbolic and not a sigmoid curve. There was no definite point of acceleration seen (Figs 1 and 2).

**Table 1:** Demographics

Details	Primigravida	Multigravida
Number of cases	556	467
Age	24.2 years	27.4 years
% of normal delivery	74.3%	87.9%
Instrumental	25.7%	12.1%
Mean dilatation on admission	2.85 cm	3.2 cm

**Table 2:** Cumulative duration of labor (dilatation on admission to 10 cm)

Dilatation on admission (cm)	Obs score	Numbers	Mean	Median	SD	P 5	P 95	No > 95	Max time taken
1–2	Primi	121	9.36	9	5.05	2.5	19	17	30
	Multi	84	9.39	8	5	2.5	19	16	27
2–3	Primi	201	7.7	7	4.5	2	16	10	26
	Multi	158	6.8	6	4.2	2	15	6	27
3–4	Primi	112	5.5	5	3.2	2	10	5	19
	Multi	122	4.7	4	3.1	1	10	5	21
4–5	Primi	69	3.8	3	2.2	1	8	3	11
	Multi	74	2.9	3	1.6	1	6	2	9
5–6	Primi	29	3	3	1.8	1	6	1	10
	Multi	30	2.2	2.2	1.7	1	6	1	8
6–7	Primi	12	1.8	2	0.68	1	3	–	–
	Multi	6	1.8	2	0.68	1	3	–	–
7–8	Primi	12	1.4	1	0.64	–	3	–	–
	Multi	21	1.4	1	1.13	–	3	1	6

**Table 3:** Rate of cervical dilatation

Dilatation (cm)	Obs score	Mean rate of dilatation (cm)	Slowest rate of dilatation (cm)
2–3	Primi	1.03	0.65
	Multi	1.17	0.72
3–4	Primi	1.27	0.8
	Multi	1.48	0.89
4–5	Primi	1.57	1
	Multi	2.06	1.33
5–6	Primi	1.66	1.04
	Multi	2.27	1.28
6–7	Primi	2.2	1.61
	Multi	2.2	1.61

**DISCUSSION**

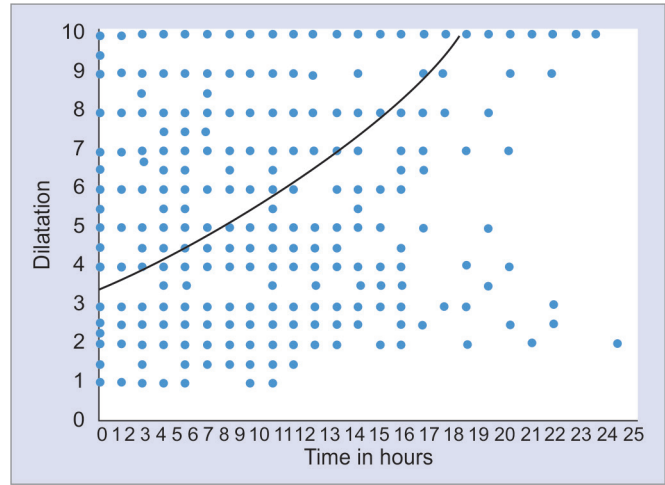
A total of 1023 patients were analyzed, out of which 556 were primigravida and 467 were multigravida. We found the following in our study:

- In the active phase, the average time taken was more than that described by Friedmann.<sup>6,7</sup> In his study, he has stated that from 2.5 cm to reach 10 cm the average time is 4.6–4.9 hours, and once they reach 4 cm half of them deliver in 2.6 hours. Our corresponding figures were 7.7 hours to reach 10 cm from 2.5 cm and the mean duration at 4 cm was 3.8 hours against 2.6 hours. Peisner and Rosen<sup>8</sup> found that 75% of women at 3 cm, 50% at 4 cm, and 25% at 5 cm do not dilate at the indicated rates associated with active labor.

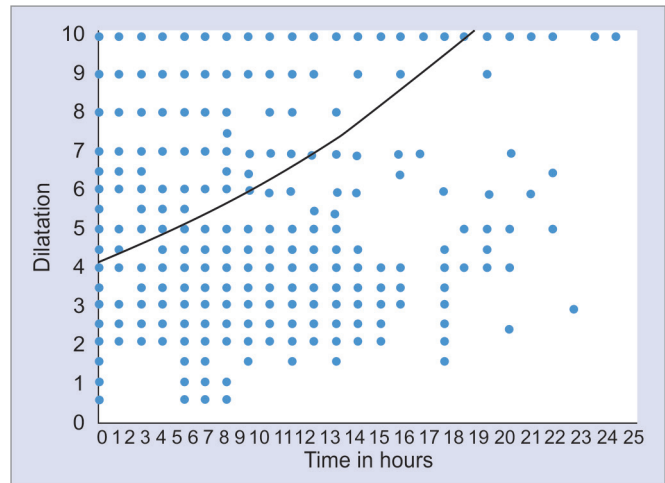
However, recent studies have shown a longer first stage of labor with slower acceptable rates of dilatation. Zhang et al. derived the average labor curves from 27,170 nulliparous women in the US population with spontaneous onset of labor. The curve had a slower progression of 1.1 cm/hr with no definite inflection point. The slowest acceptable rate was 0.6 cm/hr.

Albers et al.,<sup>9</sup> Albers,<sup>10</sup> and Jones and Larson<sup>11</sup> found that labor progression takes a longer time than the thought of earlier. These investigators have reported that in the active phase of labor from 4 cm to reach 10 cm the time ranges from 6.2–7.7 hours on average. In Albers’s study, the time taken was 7.7 hours since there was no use of oxytocin and labor was spontaneous.

- The second derivative was that there was a wide difference in time taken between individuals. When women were admitted at 2 cm, the median time taken to reach 10 cm was 7 hours in primigravida and 6 hours in multigravida. However, 2SD at this dilatation was 4.5 hours extending labor to 11.5 hours. Many women crossed the 95th percentile and also, ten primigravidas delivered normally after a duration that was almost three times the median ranging from 18–26 hours indicating wide variability in the duration of labor are still associated with normal outcomes. The same was seen at all dilatations. Our findings were similar to that quoted by Oladapo et al.<sup>12</sup> as part of WHO BOLD PROJECT (better outcome in labor difficulty) where he says median cumulative duration of labor indicates that nulliparous women admitted at 4, 5, and 6 cm reached 10 cm within an expected time, but their corresponding 95th percentile shows that labor could last up to 14, 11, and 10 hours.



**Fig. 1:** Labor curve—primigravida



**Fig. 2:** Labor curve—multigravida

- It was found that the rates of cervical dilatation accelerate as labor progresses and for each dilatation, an acceptable slow rate of progress exists. This is comparable to the study by Zhang et al. who found that the slopes of cervical dilatation progressively steepen with each passing centimeter. In his study, he also found that the median rates of dilatation between 3–4, 4–5, 5–6, 6–7, 7–8, 8–9, and 9–10 cm were 0.4, 0.6, 1.2, 1.7, 2.2, 2.4, and 2.4 cm, respectively. At the 5th percentile that is used to define the slowest normal dilatation rates the rates were 0.1, 0.2, 0.3, 0.5, 0.7, 0.8, and 0.7 cm/hour, respectively.
- Finally, the labor curve that was obtained showed a smooth hyperbolic pattern, there was no point of acceleration. A similar labor curve pattern is seen in other studies. Suzuki et al.<sup>13</sup> studied the labor patterns in 2369 low-risk nulliparous Japanese women with spontaneous onset of labor and derived the labor curve for that population. It showed that the curve had a smooth shape with an active phase duration of 5.1 hours with slower progression than that of Friedman’s curve. The deceleration phase was not observed and the rate of dilatation started to double from 5–6 cm onwards. A study done in South India by Pitchaimuthu and Bhaskaran<sup>14</sup> showed the same pattern



of slower dilatation, a smooth labor curve, and no point of inflection.

The limitations of this study include interpersonal variations in the assessment of cervical dilatation. The effect of ARM and oxytocin were not analyzed since many patients were subjected to either both or one of them.

## CONCLUSION

In low-risk women, both primigravida and multigravida with spontaneous onset of labor, there is wide variability in the duration of labor with normal maternal and fetal outcomes. Our study showed that in low-risk women admitted in early spontaneous labor, half of them took more than the meantime and a significant number of women took even three times the mean. The rate gradually increased with dilatation and in nulliparous women at 6 cm of dilatation the rate was much higher. It is worthwhile to note that many women despite crossing the 95th percentile delivered normally, hence, revision of the expectations of the rate of cervical dilatation would reduce both unnecessary interventions in labor and cesarean sections for slow or abnormal progress of labor. Labor should be more patient-centered and the same pattern will not fit all.

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