The Role of Late First Trimester Cervico-Isthmic Length Screening in Prediction of Preterm Labour

Anjlina Bhati[1], Rini Upadhyaya[2], Mayank Jain[3]

[1]Assistant Professor, Department of Obstetrics and Gynaecology, Jhalawar Medical College, Jhalawar, Rajasthan
[2] Senior Resident, Department of Obstetrics and Gynaecology, LHMC, New Delhi
[3]Professor, Department of Community Medicine, Jhalawar Medical College, Jhalawar, Rajasthan

Abstract

Background: Across 184 countries, the rate of preterm birth ranges from 5% to 12% of babies born and this accounts for 50- 75% of the perinatal mortality. Every year, an estimated 15 million babies are born preterm and this number is rising. By predicting high risk women for preterm labour, we can take appropriate measures to prevent preterm labour thus prevent maternal and child mortality and morbidity.

Objective: To assess role of late first trimester cervico- isthmic length in prediction of preterm labour.

Methods: A Longitudinal follow-up analytic study was carried out on 200 pregnant women attended OPD of Obstetrics & Gynaecology department in 1st trimester and delivered at Index Medical College Hospital and Research Centre, Indore during March 2020 to August 2021. Selected women were assessed clinically and cervical length was measured using transvaginal ultrasonography. A follow up was planned at 20 to 26 weeks and at delivery to assess pregnancy outcome.

Results: Out of 200 study participants, 28 (14%) were delivered before completing 37 weeks of gestation. At first trimester, the mean cervical length among preterm and term delivered women was 3.24±0.8 and 3.83±1.1cm respectively. Using ROC curve, best cut off of cervical length at 11-14 weeks for prediction of preterm delivery is 3.4 cm. Out of 43 who had short cervical length (<3.4 cm) at 11-14 weeks, 55.81% delivered at preterm and 44.19% delivered at term.

Conclusion: Association of short cervical length at 11-14 weeks was found statistically significant with preterm delivery (p=0.001). Cervical length at 11-14 weeks has significantly high accuracy (88.50%) for prediction of preterm labour.

Keywords: First Trimester, Cervical Length, Transvaginal Ultrasonography.

Introduction

Preterm labour is one of the most challenging problems confronting the obstetricians and perinatologists, as this unfortunate episode in the course of woman's pregnancy takes a heavy toll of perinatal mortality which accounts for 50- 75% of the perinatal mortality. [1] The financial impact of preterm birth in health care systems is also a cause of global concern. Preterm labour is defined as onset of labour before 37 weeks of gestation. There are sub-categories of preterm birth, based on gestational age: extremely preterm (less than 28 weeks), very preterm (28 to 32 weeks), moderate to late preterm (32 to 37 weeks). [2]

Across 184 countries, the rate of preterm birth ranges from 5% to 12% of babies born. Every year, an estimated 15 million babies are born preterm and this number is rising. It is estimated that up to 90% of all mortality among preterm infants without

lethal malformations is due to immaturity. Approximately 1 million children die each year due to complications of preterm birth. [3] Although the overall rate of preterm birth has not decreased over the last 30 years, the survival rate of preterm infant has improved because of NICU facilities and expert health care workers. [4]

Premature birth may be iatrogenic or spontaneous. Iatrogenic premature birth is the result of a medical intervention due to a fetal and/or maternal condition (e.g., fetal growth restriction, preeclampsia) necessitating early delivery. By contrast, spontaneous premature birth often occurs despite best efforts to prolong the pregnancy. [5] Spontaneous preterm labour and delivery are a heterogeneous condition with many triggers or precipitating factors including maternal genital tract haemorrhage, cervical dysfunction, idiopathic

uterine contractions, infection, malnutrition, multifetal pregnancy, and spontaneous rupture of the fetal membranes. Although, most of preterm deliveries had no triggering factors. Preterm labour is, worldwide, the most challenging problem in obstetrics, but the prevention of preterm labour has been difficult and ineffective because of its multi-factorial and partly still unknown etiology [6]

Current screening tests for the prediction of spontaneous preterm labour can be divided into three general categories: (i) Risk factor assessment, (ii) Cervical measurement, and (iii) Biochemical markers. [7] Ultrasound assessment of the cervix, with development of transvaginal probes and the increasing acceptance by patients of transvaginal sonography during pregnancy, cervical length can be measured with accuracy by sonologist. Several studies have reported that transvaginal cervical length assessment may be of particular value in predicting and managing of placenta previa, preterm labor and cervical incompetence. [8] The risk of spontaneous preterm labour is inversely proportional to the length of the cervix; those with the shortest cervical length have the highest risk of prematurity. [9] Evaluation of the cervix has been used as a tool to predict preterm birth based on the concept that the cervix acts as an anatomic marker of the underlying pathologic process leading to preterm delivery. So, cervical measurements obtained from the beginning of 11-14 weeks and 20-26 weeks with proper obstetrical history and physical examination throughout pregnancy will help in prediction of female at risk of preterm labour. [10]

By predicting high risk women for preterm labour, we can take appropriate measures to prevent preterm labour thus prevent maternal and child mortality and morbidity. Strategies for reducing the incidence of preterm labour and delivery have focused on educating both physicians and patients about the risks for preterm labour and methods of predicting and predicting preterm labour. Taking these factors into consideration this study was planned to assess role of late first trimester cervico-isthmic length in prediction of preterm labour at Department of Obstetrics & Gynaecology Index Medical College Hospital and Research Centre, Indore (M.P.)

Material and Methods:

Study Design: Longitudinal follow-up analytic study.

Study Period: The study was carried out over a period of one and half year from March 01, 2020 to August 31, 2021.

Study Population: Pregnant women had attend OPD of Obstetrics & Gynaecology department in 1st trimester and delivered at Index Medical College

Hospital and Research Centre, Indore (M.P.) was included.

Inclusion Criteria: 1.Singleton pregnancy, 2. Primigravida, 3. Women in first trimester, 4. Consenting women.

Exclusion Criteria: 1. Multiparous, 2. Multiple pregnancy, 3. Women with uterine anomalies, previous history of surgery like conisation etc 4. Women with medical complications \ obstetric complication like DM, HTN, renal disorders, PIH, Pre-eclampsia. 5. Congenital fetal anomalies. 6. Non-consenting women

Sample Size: Considering 12% prevalence, 95% confidence interval, 5% precision and 10% lost to follow up, sample size of 186 was calculated by using $4pq/l^2$ formula for sample size estimation. Making it convenient for analysis and rounding off a sample, 200 pregnant women was taken in study.

Sampling Technique: All pregnant women suitable for study (based on inclusion and exclusion criteria) were included, till desire sample size was achieved. Women with lost to follow up or with incomplete data were excluded.

Method of data collection: Based on inclusion and exclusion criteria, 200 pregnant women at first trimester, attending OPD or IPD of Department of Obstetrics & Gynaecology, Index Medical College Hospital and Research Centre, Indore a tertiary care center in M.P during study period were chosen for study. Individual patient information was collected in pre-designed proforma at first visit. After obtaining written consent, participants were interviewed. Selected patients were undergone through detail history (socio-demographic profile, menstrual history, medical history, family history, addictions and dietary history etc) and thorough clinical examination (general and systemic examination, anthropometry, vitals, PV examination etc.) under the supervision of experience faculties. They were undergoing for routine ANC investigations such as Hb, blood group, urine complete etc. Cervical length was measured using transvaginal ultrasonography with the standard longitudinal view of cervix while patient's bladder is empty. Siemens Acuson X 300 PRO TVS probe EV 9-4 H instrument with 9-4 mHz was used to measure cervical length. It was measured by keeping the probe 3cm away from the posterior fornix. The cervical length is defined as the length between the internal os and external os. All the information was recorded in individual case proforma.

Follow -up: A follow up was planned at 20 to 26 weeks and at delivery if pregnancy was uneventful. At 20 to 26 weeks of gestation, ANC routine investigation and transvaginal USG was performed. At the time of delivery, required information such

as gestational age at delivery, mode of delivery, maternal outcome, neonatal outcome etc were recorded in individual case proforma.

Statistical Analysis: All collected data were coded and enter in MS Excel. All data were tabulated and analysed by using SPSS 23.0. Quantitative data were analysed by using mean and slandered deviation. Qualitative data were present as number and percentage. Student t-test and Chi-square test was used for significance.

Ethical Consideration: The study was started after obtaining ethical approval from the Institutional Ethics Committee, Index Medical College Hospital and Research Centre, Indore, M.P. Written consent was obtained in consent form from all participants.

Results

Out of 200 study participants, 28 (14%) were delivered before completing 37 weeks of gestation and 172 (86%) were delivered at term. In present study, the prevalence rate of preterm labour was 14%. Among 28 preterm deliveries, 09 (4.5%) were delivered at or before 34 weeks of gestation (early preterm deliveries) and 19 (9.5%) were delivered after 34 weeks of gestation (late preterm deliveries).

Table 1: Distribution of study participants according to cervical length at 11-14 Weeks.

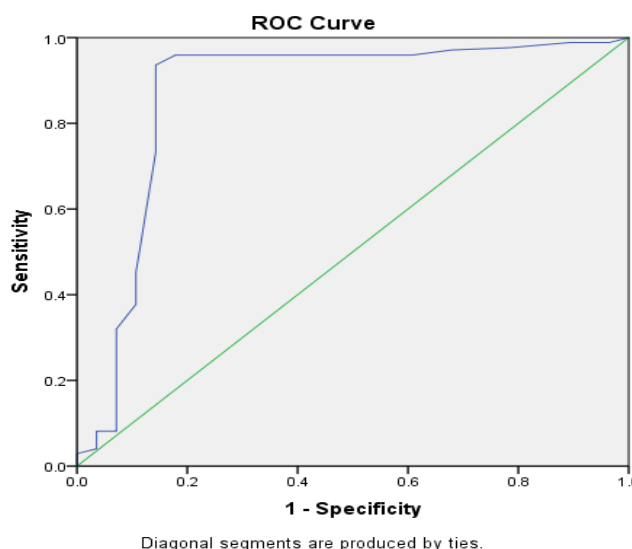| Cervical length at 11-14 Weeks	Numbers	Mean±SD
≤2.5	05 (2.5%)	3.66±0.9
2.6 – 3.0	14 (07%)	
3.1 – 3.5	28 (14%)	
3.6 – 4.0	108 (54%)	
4.1 – 4.5	33 (16.5%)	
≥4.6	12 (06%)	

At 11 – 14 weeks, cervical length ≤2.5 cm was found in 2.5%, 2.6 to 3 cm in 7%, 3.1 to 3.5 cm in 14%, 3.6 to 4 cm in 54%, 4.1 to 4.5 cm in 16.5% and ≥4.6 cm in 06%. Mean cervical length of participants was 3.66±0.9 mm. (Table 1)

Table 2: Association of mean cervical length and pregnancy outcome.

Cervical length	Pre-term (n=28) Mean±SD	Term (n=172) Mean±SD	Total (n=200) Mean±SD	P value
Mean Cervical length at 11-14 Weeks	3.24±0.8	3.83±1.1	3.66±0.9	0.007*

*Student t-test was used as test of significance and p value <0.05 was considered as statistically significant.

The mean cervical length at first trimester of those who delivered preterm and term were 3.24±0.8 and 3.83±1.1cm respectively and this difference was found statistically significant (p=0.007). (Table 2)

Figure 1: ROC curve at 11-14 Weeks.

Area under ROC curve = 0.867 (0.768 – 0.967)

Using ROC curve, best cut off of cervical length at 11-14 weeks for prediction of preterm delivery is 3.4 cm. (Figure 1)

Table 3: Association of short cervical length with pregnancy outcome.

Cervical length at 11-14 Weeks	Pre-term (n=28)	Term (n=172)	Total (n=200)	P value
≤3.4 Cm	24 (55.81%)	19 (44.19%)	43	**0.001***
>3.4 Cm	04 (2.55%)	153 (97.45%)	157	

* Chi-square test was used as test of significance and p value <0.05 was considered as significant.

Out of 43 who had short cervical length (<3.4 cm) at 11-14 weeks, 55.81% delivered at preterm and 44.19% delivered at term. Association of short cervical length at 11-14 weeks was found statistically significant with preterm delivery (p=0.001). In prediction of preterm delivery, first trimester cervical length has 85.71% sensitivity, 88.95% specificity, 55.81% positive predictive value, 97.45% negative predictive value and 88.50% accuracy.

Discussion

In present study, the prevalence rate of preterm labour was 14%. The mean cervical length at first trimester in preterm and term deliveries were 3.24±0.8 and 3.83±1.1cm respectively and this difference was found statistically significant (p=0.007). Bases on cutoff of 3.4 cm for cervical length at first trimester, prediction of preterm labour has 85.71% sensitivity, 88.95% specificity, 55.81% positive predictive value and 97.45% negative predictive value.

Elena Greco et al [11] found 1.04% prevalence of spontaneous preterm delivery before 34 weeks and delivery between 34 and 36 completed weeks in 213 (2.1%) cases in singleton pregnancies. M.H. B. Carvalho et al [12] found 4.3% women had a spontaneous preterm delivery which is lower than prevalence (14%) in present study. The mean cervical length was high in comparison to present study at 11-14 weeks (42.4 mm vs 3.66±0.9 cm). In contrast to present study, Carvalho found no statistically difference in mean cervical length at 11 to 14 weeks between the group of women who delivered at term (42.7 mm) and the preterm group (40.6 mm, P = 0.2459).

Karabulut A et al [13] observed 21.21% (14/66) of preterm delivery and 78.79% (52/66) term delivery among singleton pregnancy. Opposite to finding of present study, he detected no difference between term and preterm delivered groups for cervical length and shape. However cervical volume at 11-12 weeks was detected smaller in the preterm delivery group (22584±13847 mm3 vs. 28497±10764 mm3) (p=0.02).

Urvi Tanna Wadhawan et al [14] observed preterm delivery in 12% and term delivery in 88%. Mean cervical length at 11-14 weeks was 3.94 cm± 0.41 cm. Cut off value was higher (3.85 cm vs 3.4cm) than present study for cervical length at 11-14 weeks for prediction of preterm labour. Reduction in cervical length>0.6 cm between 11-14 weeks and 20-22 weeks have sensitivity 66.67%, specificity 87.5%, PPV 42.11%, NPV 95.06% and p value <0.00001for prediction of preterm delivery.

Conclusion

The prevalence rate of preterm labour was 14%. The mean cervical length at first trimester was significantly shorter among preterm deliveries. Association of short cervical length at 11-14 weeks was found statistically significant with preterm delivery (p=0.001). For prediction of preterm delivery, cervical length at 11-14 weeks has significantly high accuracy (88.50%).

Bibliography:

1. Dasgupta S. Preterm labour. In: Immunological basis of pathophysiology. Mukherjee OG, Buckshee K edts., 1st edn., 1998:4-7.
2. Bulletin of the World Health Organization; 2010; 88:31-38.
3. http://www.who.int/news-room/fact-sheets/detail/preterm-birth assessed on 28/ 09/2023.
4. Preterm Birth: Causes, Consequences, and Prevention http://www.nap.edu/catalog/11622.html.
5. Harry M. Georgiou, Megan K. W. Di Quinzio, Michael Permezel, and Shaun P. Brennecke, Predicting Preterm Labour: Current Status and Future Prospects, Disease Markers, 2015; Article ID 435014, 9 pages, 2015.
6. J. N. Robinson, J. A. Regan, and E. R. Norwitz, The epidemiology of preterm labor, Seminars in Perinatology, 2001; 25(4): 204–214.
7. Harry M. Georgiou, Megan K. W. Di Quinzio et al. Predicting Preterm Labour: Current Status and Future Prospects. Hindawi Publishing Corporation Disease Markers Volume 2015; Article ID 435014, 9.
8. Carvalho MH, Bittar RE, Brizot ML, Maganha PP, Borges da Fonsec ES, Zugaib M. Cervical length at 11-14 weeks' and 22–24 weeks' gestation evaluated by transvaginal sonography, and gestational age at delivery. Ultrasound Obstet Gynecol. 2003; 21:135-9.

9. Esmat jafari-Dehkordi, Atoosa Adibi, Mehri Sirus; published 2015 in advanced biomedical research. DOI: 10.4103/2277-9175.157839.
10. .Lim K, Butt K, Crane JM. SOGC Clinical Practice Guideline. Ultrasonographic cervical length assessment in predicting preterm birth in singleton pregnancies. J Obstet Gynaecol Can 2011; 33 (5): 486–99.
11. E. Greco, R. Gupta, A. Syngelaki, L. C. Y. Poon, and K. H. Nicolaides, First-trimester screening for spontaneous preterm delivery with maternal characteristics and cervical length, Fetal Diagnosis and Therapy, 2012; 31(3): 154–161.
12. Carvalho MH, Bittar RE, Brizot ML, Maganha PP, Borges da Fonsec ES, Zugaib M. Cervical length at 11-14 weeks' and 22–24 weeks' gestation evaluated by transvaginal sonography, and gestational age at delivery. Ultrasound Obstet Gynecol. 2003; 21:135-9.
13. Karabulut A.; Oztekin O et al, Prediction of preterm birth with progressive cervical measurements and first trimester PAPP-A levels, Journal of the Turkish German Gynecology Association; May 2016; vol. 17
14. Wadhawan UT, Shah NP, Patil AN. Prediction of preterm labour by cervical length. Int J Reprod Contracept Obstet Gynecol 2017;6: 2978-82.