

STUDY OF SECOND TRIMESTER CERVICAL LENGTH AS A PREDICTOR OF PRETERM LABOUR-A PROSPECTIVE STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction:- Cervical dysfunction either due to disruption of intact cervical epithelial barrier or mechanical incompetence of the cervix has been associated as one of the risk factors for preterm premature rupture of membranes and preterm birth. Our aim was to study second trimester cervical length as a predictor of preterm labour in our population. **Methodology:-** This hospital based prospective study was conducted in a tertiary care hospital over a period of one and a half year (2019-2021). The relationship of cervical length between the 16th and 24th week of pregnancy and preterm delivery was evaluated for the 82 women after inclusion and exclusion criteria. Data was analyzed using SPSS version 11.0. **Results:-** The mean age of study patients was 29.3 ± 2.52 years, with 52.4% (most common) being in the age group of 28-31 years. 26.8% patients had a cervical length of ≤ 2.5 cm while 73.2% had cervical length of > 2.5 cm at the time of examination. 45.1% women delivered at < 37 weeks of gestation while 54.9% delivered at term. Most of the patients i.e., 64.6% delivered by normal vaginal delivery and 35.4% delivering by Cesarean section. 72.7% patients with short cervical length delivered at < 37 weeks while only 35% of those with normal cervical lengths delivered at < 37 weeks. This difference was statistically significant ($p < 0.0002$). **Conclusion:-** We concluded that a short cervical length of < 2.5 is a risk factor for development of spontaneous preterm labour and that ≤ 2.5 mm is an optimum threshold for it.

KEYWORDS

Preterm labour, cervical length, Cesarean section

INTRODUCTION:-

Preterm birth is the leading cause of neonatal morbidity (1/2) and mortality (75%) not attributable to congenital anomalies or aneuploidy [1]. Mortality rises from about 2% for a infant born at or after 32 weeks to more than 90% for those born at 23 weeks [1]. Because active brain development normally occurs throughout the 2nd and 3rd trimesters, those born at < 25 weeks of gestation are believed to be especially vulnerable to brain injury (hypoxic-ischemic injury and periventricular leukomalacia) [2].

Due to the substantial and far reaching impact of preterm birth, it is important to recognize patients at increased risk of preterm birth. Cervical dysfunction either due to disruption of intact cervical epithelial barrier (leading to ascending bacterial infections) or mechanical incompetence of the cervix has been associated as one of the risk factors for PPROM (preterm premature rupture of membranes) and preterm birth. [3]

The ability to identify women who will deliver prematurely is important, as it allows targeted administration of effective treatments such as cerclage, vaginal progesterone, steroids and magnesium sulphate for neuroprotection. [4,5]

There are 4 major groups of tests that have been developed to identify women at high-risk of preterm birth. Home uterine activity monitoring, risk factor scoring, cervical length measurements and biochemical/endocrine markers.

Cervical assessment by ultrasound has been correlated with the prediction of spontaneous preterm birth (Berghella 2003) [6] The most predictive and reproducible variable that can be measured is cervical length [7,8]. The shorter the cervical length, the higher the risk of preterm birth becomes (Grimes-Dennis 2007). [9]

For ease of clinical use, 25 mm has been chosen as the 'cut off' at above which a cervix can be regarded as normal, and below which can be called short. [10] A cervical length < 25 mm before 28 weeks gestation is abnormal and associated with a higher incidence of preterm birth. [11] Women with a cervical length < 25 mm and contractions have twice the incidence of preterm birth than women with a cervical length < 25 mm but no contractions. [10] Durnwald et al and Decalvalho et al [12] suggested an additive effect of past obstetric history with short cervix as a criterion for screening of preterm LABOUR.

Our aim was to study second trimester cervical length as a predictor of preterm labour in our population. Our hospital being the only tertiary care hospital in the valley caters to whole of Kashmir and some areas of Jammu as well. We get a huge number of patients with preterm LABOUR. As of date no such study has been conducted in the valley and it became imperative to carry out such a study which will help in early identification of at-risk women for developing spontaneous preterm LABOUR and with timely interventions would help in decreasing neonatal mortality and morbidity.

Methodology:-

The study was conducted in the postgraduate department of obstetrics and gynecology, Government Lalla Ded Hospital, tertiary care hospital of the valley. This was a hospital based prospective study for a period of one and a half year (2019-2021). Ethical clearance was obtained from the institutional ethical committee of the medical college. After explaining the procedure and techniques of the study, written informed consent was taken from participants for participation in the study. Pregnant women with age 22-35 years, in second trimester with low obstetric patients were included. While as pregnant women with PPROM at time of examination, had cervical funneling and underwent emergency cerclage, previous preterm labour and high risk pregnancy (Multiple, congenital malformation, genital infection) were excluded.

From the 140 women, 22 women were lost to follow-up in the study, 36 women got excluded due to rescue/emergency cerclage. The relationship of cervical length between the 16th and 24th week of pregnancy and preterm delivery was evaluated for the 82 remaining women. Data was analyzed using SPSS version 11.0.

RESULTS:-

The mean age of study patients was 29.3 ± 2.52 years, with 52.4% (most common) being in the age group of 28-31 years as shown in Table 1. The distribution of patients as per gravidity was 41.5% of patients being second gravid, 37.8% being primigravida and 20.7% being multigravida. The mean gestational age measurement of cervical length was 20.1 ± 2.23 weeks. 26.8% patients had a cervical length of ≤ 2.5 cm while 73.2% had cervical length of > 2.5 cm at the time of examination. The mean gestational age at delivery was 36.2 ± 4.73 weeks. 45.1% women delivered at < 37 weeks of gestation while 54.9% delivered at term. Most of the patients i.e., 64.6% delivered by normal vaginal delivery and 35.4% delivering by Cesarean section.

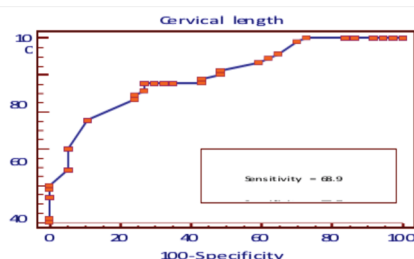
Table 2 and graph 1 is a ROC curve analysis depicting diagnostic accuracy of cervical length in predicting preterm labour and 2.5 cm cervical length as a optimal cut-off and sensitivity, specificity, positive predictive and negative predictive values and accuracy being 68.7%, 75.7%, 66.7%. Area under ROC is 0.793 and $p < 0.001$ (statistically significant). 72.7% patients with short cervical length delivered at < 37 weeks while only 35% of those with normal cervical lengths delivered at < 37 weeks. This difference was statistically significant ($p < 0.0002$) as shown in Table 3. Table 4 depict comparison of cervical length as per gestational age with those delivering at < 37 weeks having a lesser mean cervical length (2.75 cm) than those delivering at term (3.92 cm). This difference is statistically significant ($p < 0.001$). The admission of 34.1% (28) newborns of study population in NICU was as a result of prematurity and its complications. Table 5 represent mortality among newborns of patients in the study population with 10.97% neonates expiring within first 2-3 weeks of life.

Table 1: Age distribution of study patients

Age (Years)	Number	Percentage
24-27	20	24.4
28-31	43	52.4
32-35	19	23.2
Total	82	100
Mean $\pm$ SD (Range)=29.3 $\pm$ 2.52 (24-35 Years)		

Table 2: ROC analysis depicting diagnostic accuracy of cervical length in predicting preterm labour

Parameter	Value	95% CI
Optimal cutoff	≤ 2.5	-
Sensitivity	68.7	54.3-80.5
Specificity	75.7	59.5-86.6
PPV	77.5	62.5-87.7
NPV	66.7	51.6-78.9
Accuracy	71.9	61.4-80.5
Area under ROC Curve	0.793	0.689-0.875
P-value	< 0.001	-



Graph 1: Diagnostic accuracy of cervical length in predicting preterm labour

Table 3: Correlation of cervical length with gestational age at delivery in study patients

Gestational age	Cervical length ≤ 2.5 cm		Cervical length > 2.5 cm	
	No.	%age	No.	%age
< 37 Weeks	16	72.7	21	35.0
≥ 37 Weeks	6	27.3	39	65.0
Total	22	100	60	100

Chi-square=9.254; P-value=0.0002 (Statistically significant)

Table 4: Comparison of cervical length (cm) as per gestational age

Gestational age (Weeks)	N	Mean	SD	t-value	P-value
< 37 Weeks	45	2.75	0.992	4.734	$< 0.001^*$
≥ 37 Weeks	37	3.92	1.256		

*Statistically Significant Difference (P-value < 0.05); P-value by Student's independent t-test

Table 5: Neonatal mortality among study neonates

Neonatal mortality	Number	Percentage
Yes	9	10.97
No	73	89.03
Total	82	100

DISCUSSION:-

The increasing trend of preterm birth is alarming as over one million children die each year due to complications of preterm birth. [13] Prematurity is the leading cause of neonatal death and second leading

cause of death after pneumonia in children under 5 years of age. [1] The etiology of preterm labor is still of research interest worldwide. All of the clinical risk factors for preterm birth which have been identified so far, have low isolated or combined predictive value and the cause remains unidentified in upto half of the patients. [14] A shortened cervical length has been identified as one of the major risk factors for development of a spontaneous preterm labor.

In our study, we observed that out of 82 patients, majority of patients accounting for 52% belonged to the age group of 28-31 years, and patients were having their age in the range of 32-35 years with mean age of the participants was 29.3 ± 2.52 years. This was similar to Judith et al [15] who conducted a study on cervical length at 16-22 weeks and risk of preterm delivery and reported mean age of participants as 26.4 ± 6.4 years. While assessing the gravidity of patients, we observed that 37.8% patients were primigravida, 41.5% were second gravida and 20.7% were multigravida. In concordance with our study, Judith et al¹⁵ reported 50.6% primigravida, 28.1% second gravida and 21.3% multigravida in their study. While a study conducted by Nooshin Eshraghi et al [16] on similar topic included only primigravida.

Most clinical guidelines related to preterm delivery and cervical length recommend cervical length screening between 16-24 weeks of gestation. [17] Measurements of cervical length before 16 weeks of gestation is not recommended by most of the studies as they report a low predictive accuracy of first and early second trimester cervical length assessment for preterm birth, especially in asymptomatic women without any history of preterm birth. [10] Moreover, routine cervical length screening is not recommended after 24 weeks of gestation in asymptomatic women as most studies explaining various methods for prevention of preterm birth have most frequently used 24 weeks of gestation as the maximum bound period for initiation of therapies or interventions. [4,5] In accordance with these studies and their conclusions, in our study, mean gestational age at measurement of cervical length was 20.1 ± 2.23 years. Majority (40.2%) of patients were subjected to cervical length measurements by transvaginal sonography at 19-21 weeks, 30.5% patients underwent measurements at 16-18 weeks, and only 29.3% were screened for cervical lengths at 22-24 weeks.

We observed that 45.1% patients delivered at < 37 weeks of gestation and 54.9% patients delivered at > 37 weeks of gestation, the mean pregnancy duration at the time of delivery was 36.2 ± 4.73 weeks. This was in congruence with Cook et al [18] and Cristopher et al [19] who in similar studies reported mean age at delivery being 36.4 ± 3.7 weeks and 36 weeks respectively.

We observed that in our study, out of 82 patients, 22 patients (26.8%) had cervical lengths ≤ 2.5 cm and 60 patients (73.2%) had cervical length of > 2.5 cm. This resembled the study of Vinistine et al [20] who had 23% patients with cervical length of < 25 mm and 77% patients with cervical lengths of > 25 mm. While Cook et al [18] reported short cervical length in 40.03% while normal cervical length in 59.16% patients in their prospective cohort study.

In our study, we analyzed that amongst patients who had a short cervical length (< 2.5 cm), a total of 73.2% (16/22) delivered at < 37 weeks of gestation and only 27.3% (6/22) delivered at > 37 weeks of gestation. Among patients with cervical length of > 2.5 cm only 35% (21/60) delivered at < 37 weeks of gestation while majority, that is 65% (39/60) patients delivered at > 37 weeks of gestation. This difference was statistically significant (t value = 4.734, $p < 0.01$) implying that the incidence of preterm delivery was much higher in those with short cervical lengths of ≤ 2.5 cm than in those with cervical lengths of > 2.5 cm. This was in accordance with the prospective study conducted by Wang Ying et al [21] in a Chinese population who reported a preterm delivery rate of 75% in short cervical group as compared to only 7% in normal cervical length group patients. Likewise, CM Cook et al [18] and William et al [22] reported preterm delivery rates of 49% and 50% respectively in women with short cervical length in comparison to only 25% and 17% preterm birth rates in those with > 25 mm cervical lengths in their studies.

In our study, receiver operating characteristic (ROC) curve was constructed to determine the optimal cut-off value of cervical length measurement in predicting preterm labor and a cut-off of ≤ 2.5 cm was determined. This was in consonance with multiple studies conducted on this issue who have reported an optimum cut-off at cervical length

of $\leq 25\text{mm}$ for prediction of preterm labor. [11] ER Guzman et al [23] reported that a cervical length of $\leq 2.5\text{cm}$ was equal to other cervical parameters in its ability to predict spontaneous preterm birth and was better for the prediction of prematurity. We assessed that the cut-off was established with a sensitivity of 68.7%, specificity of 75.7%, Positive predictive value (PPV) of 77.5%, Negative predictive value (NPV) of 66.7%, accuracy of 71.9%. This suggests that cervical length can diagnose at-risk patients as well as identify low risk patients for development of preterm birth. Likewise to our results, Davies et al [24] found a sensitivity of 57% and a specificity of 82% for preterm birth, using a cut-off of 30mm at 24-28 weeks of gestation. Similarly, CM Cook and D.A Ellwood [18] reported a sensitivity, specificity, positive predictive value and negative predictive value of 67%, 66%, 33% and 89%. Christopher et al [19] reported that for spontaneous delivery before 32 and 35 weeks of gestation the sensitivity of cervical length $\leq 2.5\text{cm}$ was 100% and 54% respectively and the specificity was 84 and 87% respectively. We analyzed that 53 patients (64.6%) were delivered by vaginal delivery while 29 patients (35.4%) underwent cesarean sections (12 due to history of previous cesarean section with refusal of vaginal birth after cesarean section, 4 due to acute fetal distress, 8 because of cephalopelvic disproportion and 5 because of malpresentations). 28 neonates (34.1%) were admitted in NICU as a result of prematurity among which 9 (10.97%) expired within 28 days of admission. None of the studies has mentioned this data. Thus we can also infer that estimating short second trimester cervical length is also a good predictor of NICU admissions due to prematurity.

The limitations of our study was one that the Sample size was limited due to restricted OPD visits of patients due to COVID-19 pandemic another that the Patients who underwent an emergency cerclage had to be excluded from the study and the last there was a Limited time period.

CONCLUSION:-

We concluded that a short cervical length of < 2.5 is a risk factor for development of spontaneous preterm labour and that $\leq 2.5\text{mm}$ is an optimum threshold for it. Identifying women with short cervical lengths at an earlier gestational age may help in identifying a separate group requiring closer follow-up or interventions (eg; cerclage or progesterone use) for the rest of pregnancy, and, therefore, can reduce neonatal morbidity and mortality especially in low resource settings like ours where NICU facilities are not readily available.

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