

## Transvaginal sonographic measurement of cervical length and the risk of spontaneous preterm birth

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**Abstract:** Transvaginal sonographic measurement of cervical length, at 20 weeks of gestation, is very useful to predict spontaneous preterm birth. A large number of studies have been performed in the attempt to detect the spontaneous preterm birth on the basis of biological, biochemical and ultrasound parameters. Transvaginal Sonography is a good tool to evaluate the cervix. This study aims to evaluate the relationship between cervical length measured by transvaginal ultrasonography and the risk of spontaneous preterm birth. This is a prospective observational analytical study. The study population consisted of 150 pregnant women who had at least one risk factor for preterm labor. The patients underwent transvaginal sonography at 14-28 weeks of gestation. Samples were collected from Imam Ali Hospital of Zahedan, Iran, from 2011 to 2012. The data were analyzed using the SPSS program and student T paired test. A cervical length of 18 mm was the best cut-off value to predict the preterm delivery at <35 and at <37 weeks' gestation. Using logistic regression test showed that the cervical length less than 18 mm has a strong statistical correlation with SPDT at <35 and at <37 weeks of gestation. (P value= 0.001 and P value=0.005, respectively). Cervical length measured by transvaginal ultrasonography in pregnant women with the risk of preterm labor, at <35 and at <37 weeks, predicts spontaneous preterm birth and helps reduce neonatal morbidity and mortality.

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### 1. Introduction

Preterm labor is one of the most important factors determining morbidity and mortality in neonates, and accounts for  $\frac{2}{3}$  of deaths in the first year of life.<sup>1</sup> Spontaneous preterm birth before 37 weeks' gestation occurs in 7-11 percent of pregnancies and birth before 34 weeks of gestation (very early) occurs in 3-4 percent of pregnancies.<sup>2</sup>

The highest mortality rate due to preterm delivery is seen in babies who are born before 34 weeks<sup>3, 4</sup>. Preterm birth continues to remain a major obstetrical concern. Once the process has started, any attempts to stop the preterm labor are quite unsuccessful; therefore most of researches have focused on preventing the preterm labor. The first step towards preventing preterm birth is to predict it and in this matter

the early detection and treatment of at-risk women during the prenatal care is one of the main goals. Many biological, biochemical and sonographic factors have been investigated for the diagnosis and prediction of spontaneous preterm delivery (SPDT). Despite the positive results of several studies, using biochemical tests is expensive and time-consuming so using them is not cost-effective. One of the diagnostic tools in this settings, is transvaginal ultrasonography which is highly reliable for assessing morphological details of the cervix.<sup>5-11</sup>

For more than a decade, measuring the cervical length by ultrasonography has been the most important marker to predict the preterm delivery.<sup>5-13</sup> Numerous studies measuring the cervical length by transvaginal ultrasonography do not report similar results and different values

(15 -30 cm) have been reported.<sup>7-9</sup> The absence of a unique a cut-off point is considered to be a weakness of this method. On the other hand, the sensitivity and the positive predictive value of cervical length for predicting preterm delivery are high in high-risk women, but are not in general population.<sup>10-13</sup>

Some studies have found a significant relationship between cervical length and morphological features of cervix with preterm delivery but others have not reported such a relationship. Considering these difficulties and limitations, finding a morphological characteristic of the ripe cervix can be a useful factor for predicting preterm delivery. This method has to have high sensitivity in both general and high-risk population. This study was performed with the aim of evaluating the relationship between SPTD and the cervical length of pregnant women.

## 2. Methods

This is a prospective observational analytical study. The study population consisted of 150 pregnant women who had at least one risk factor for preterm delivery. These risk factors include a history of previous preterm labor, second trimester abortion, cervical insufficiency, uterine abnormalities, lower abdominal pain, and low back pain. Pregnant women having any of the following conditions were excluded from the study: gestational age more than 28 weeks and less than 14 weeks, multiple gestation, membrane rupture, vaginal discharge and active bleeding at the time of sampling, placenta previa, placental abruption, polyhydramnios, oligohydramnios, intrauterine growth restriction, fetal anomalies, fetal distress, systemic diseases in the mother and not being an Iranian.

The samples were collected in hospital from Imam Ali Hospital of Zahedan, Iran, from 2011 to 2012; the patients were followed to the end of the pregnancy. The informed consent was taken before performing the sonography examination and transvaginal sonography was done at 14-28 weeks of gestation. Gestational age was calculated comparing the last menstrual period date and the ultrasound examination.

All ultrasound examinations were done by one operator. The patients emptied their bladder before ultrasound and all patients had dorsal lithotomy position during the sonography. Vaginal probe moved through the vagina so that a sagittal image of the cervix was obtained. Once the adequate image was obtained the probe was slowly withdrawn. The adequate image is defined as the cervix internal os, external os and the endocervical canal image. The cervical length is the distance between internal and external os in the endocervical canal.

The data were stored in SPSS ver. 18 software and were analyzed using Fisher exact test and T-test. To investigate the relationship between the gestational age at termination of pregnancy and ultrasound markers with SPTD logistic regression analysis was used.

## 3. Results

In this study, 150 women underwent transvaginal ultrasound. During the study, 11 patients were excluded and instead of them, 11 patients who had the inclusion criteria entered the study. The patients mean age was  $28.8 \pm 11.6$  years. Number of previous pregnancies varied from one to eight: 37% first pregnancy, 25.7% second pregnancy, 16% third pregnancy, 10.3% fourth pregnancy and 11% the fifth to the eighth. 47.2% had cesarean delivery and 52.8% had NVD. Mean cervical length was  $29.7 \pm 8.4$  mm. The cervical length of 18 mm was considered to be the best cut-off value for the prediction of preterm delivery in gestational ages below 35 weeks and below 37 weeks using Receiver Operating Characteristic (ROC) curve. The sensitivity, the specificity and the positive and the negative predictive values for this cut-off value are shown in table 1. Three women had the cervical length shorter than 18 mm. One out of seven women who had a preterm delivery, had a cervical length less than 18 mm. One out of four pregnant women who delivered before 35 weeks, had a cervical length less than the 18 mm. Biometrical parameter showed a significant relationship between spontaneous preterm birth before 37 and 35 weeks and the cervical length less than 18 mm. Logistic regression testing, showed a cervical length less than 18 mm, has a strong

statistical relationship with SPDT before 35 and 37 weeks so, this marker is an independent risk

factor for the SPDT less 35 and 37 weeks.

**Table 1.** SPDT cervical length between 35 and 37 weeks of pregnancy.

Cervical length (Week)	Number	Classification	Property	Sensitivity	Predictive Value +	Predictive Value -	P-value
35	1	18<	99	25	33.3	98.5	0.001<
	3	18>					
37	1	18<	99	14.3	13.3	97	0.005
	6	18>					

#### 4. Discussion

Accurate diagnosis of preterm labor by reducing the high false positive rate is an important goal. A large number of published researches acknowledge that the sonographic examination of the cervix is better than the manual examination.<sup>14,15</sup> Vaginal ultrasound has the potential to measure the cervical length precisely, objectively and repeatably.<sup>16</sup> The risk factors used to identify women at risk of preterm labor are neither specific nor sensitive and lack of clinical and paraclinical tools to distinguish low-risk women from high-risk women has lead to long term hospitalization and the use of tocolytics that can be potentially harmful. On the other hand, these processes can be stressful for pregnant women and their families. In this study, 7 women (4.7%) had spontaneous preterm delivery. In Pires et al study which included 338 pregnant low-risk women this index was 6.2%<sup>17</sup> and in Fukami et al study in 2003 was 3.2%.<sup>18</sup> Although our study was performed on high-risk women, preterm delivery rate was lower than the reference, and it seems to be because of low predictive value of low back pain and lower abdominal pain as predictive markers to select the high-risk women. Since one of the predictors of the risk of preterm delivery is considered to be the clinical symptoms reported by the mother, in our study, 77.5% of pregnant women were chosen only because they had

lower abdominal pain and low back pain. However, the published studies have shown that the symptoms reported by pregnant women, for example uterine contractions or lower abdominal pain, have little predictive value to choose the high-risk women. Krupa et al showed that the symptoms reported by the mother have little value to predict the preterm delivery.<sup>19</sup> Similar results reported by Mauldin et al.<sup>21</sup> Different cut-off values of cervical length with different sensitivity and specificity have been reported by different studies. In our study based on the ROC curve, the cut-off value of 18 mm had the highest sensitivity and specificity to predict preterm delivery below 35 and 37 weeks. Pires et al reported that the cut-off value of 20 mm has maximum sensitivity and specificity while William et al studied 69 pregnant women and reported the cut-off value of 22mm has maximum sensitivity and specificity.<sup>21</sup> The reason for these differences seems to be the fact that studied women were from different age groups and the proportion of participants based on the number of previous births were not similar because the cervical length primiparous and multiparous women has differences. Some studies had evaluated suspected preterm labor whereas others had studied asymptomatic pregnant women or women without any reported problems. In our study, 37.5 women were primiparous, and all of them were at risk for preterm delivery.

The results of this study showed that cervical length less than 18 mm has high sensitivity and specificity to predict preterm birth below 35 and 37 weeks. Pires et al suggest that a cervical length less than 20 mm has high sensitivity and specificity to predict preterm birth below 35 and 37 weeks. Our study showed that the cervical length less than 18 mm is an independent factor for predicting preterm delivery under 35 and 37 weeks. Anderson et al showed that the cervical length less than 20 mm is an independent factor for predicting preterm labor.<sup>22</sup> Cervical length measured by transvaginal ultrasonography in pregnant women at risk of spontaneous preterm birth, before 35 and 37 weeks, can predict preterm birth and thereby reduces neonatal morbidity and mortality rates. Also it can be used to rule out the diagnosis in other women and prevent the use of potentially dangerous drugs, hospitalization and waste of time and cost.

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