

ORIGINAL RESEARCH ARTICLE

Prediction of preterm birth by measuring the width of cervical internal os and length of cervical canal using ultrasonography

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Abstract

This study mainly explored the application of predicting preterm birth by measuring the width of cervical internal os and length of cervical canal using ultrasonography. One hundred pregnant women admitted to our hospital from January 2022 to January 2023 were selected and separated into non-preterm group and preterm group. Compared with non-preterm group, preterm group had wider width of cervical internal os, shorter length of the cervical canal and higher Bishop score. The incidence of preterm birth in pregnant women with the width of cervical internal os ≥ 5 mm was significantly higher than that in < 5 mm group. The incidence of preterm delivery in pregnant women with the length of cervical canal < 10 mm was significantly higher than that in 10-20 mm group, the incidence of preterm delivery in pregnant women with the length of cervical canal between 10-20 mm was significantly higher than that between 21-30 mm group, and the incidence of preterm delivery in pregnant women with the length of cervical canal between 21-30 mm was significantly higher than that > 30 mm group. Collectively, perineal ultrasound measurement of the length of the cervical canal in the second trimester of pregnancy has good application value in predicting premature birth. (*Afr J Reprod Health* 2026; 30 [6]: 48-54).

Keywords: preterm birth, perineal ultrasound, length of the cervical canal, width of cervical internal os

Résumé

Cette étude a principalement exploré l'application de la mesure de la largeur de l'orifice interne du col utérin et de la longueur du canal cervical par échographie pour prédire la prématurité. Cent femmes enceintes admises dans notre hôpital entre janvier 2022 et janvier 2023 ont été sélectionnées et réparties en deux groupes : un groupe témoin et un groupe prématuré. Comparé au groupe témoin, le groupe prématuré présentait une largeur de l'orifice interne du col utérin plus importante, une longueur du canal cervical plus courte et un score de Bishop plus élevé. L'incidence des naissances prématurées chez les femmes enceintes dont la largeur de l'orifice interne du col utérin était ≥ 5 mm était significativement plus élevée que dans le groupe < 5 mm. L'incidence des accouchements prématurés chez les femmes enceintes dont la longueur du canal cervical était < 10 mm était significativement plus élevée que dans le groupe 10-20 mm ; l'incidence des accouchements prématurés chez les femmes enceintes dont la longueur du canal cervical était comprise entre 10 et 20 mm était significativement plus élevée que dans le groupe 21-30 mm ; et l'incidence des accouchements prématurés chez les femmes enceintes dont la longueur du canal cervical était comprise entre 21 et 30 mm était significativement plus élevée que dans le groupe > 30 mm. La mesure échographique périnéale de la longueur du canal cervical au cours du deuxième trimestre de grossesse présente un intérêt certain pour la prédiction des accouchements prématurés. (*Afr J Reprod Health* 2026; 30 [6]: 48-54).

Mots-clés: accouchement prématuré, échographie périnéale, longueur du canal cervical, largeur de l'orifice interne du col utérin.

Introduction

Preterm birth has always been the focus of obstetrics and gynecology and pediatrics, with the change of social pressure and environment, the incidence of preterm birth has been increasing for

the past few years, and pregnant women who give birth at 28 to 37 weeks of pregnancy are considered to be preterm birth¹. More than 75% of neonatal deaths are related to preterm birth, and about 80% of surviving preterm infants may suffer from varying degrees of intellectual disability and

neurological sequelae, which brings serious burden to society and families of preterm infants². Therefore, accurate prediction of preterm birth and effective intervention are of great significance for improving pregnancy outcome and reducing preterm birth rate in clinical practice.

For traditional medicine, obstetricians usually use vaginal examination to make corresponding judgments on cervical conditions³. Although this method can obtain certain detection effects, it has obvious limitations and relatively low accuracy, which will be affected by subjective factors⁴. Some studies have suggested that the length of the cervix is most closely related to the occurrence of preterm labor, and morphological changes such as cervical length affect the whole process of labor, so strengthening the examination of indicators such as cervical length and shape of the maternal cervical will help to predict premature birth, so as to better prevent premature birth⁵.

Ultrasound examination is one of the routine examination items during pregnancy, which can visually and clearly show the length and morphological changes of the cervix during pregnancy, not only can early detection and diagnosis of cervical insufficiency, but also can dynamically monitor high-risk pregnant women with a history of abortion and preterm birth⁶. Therefore, cervical changes can be detected in time through ultrasound monitoring during pregnancy, and pregnant women with cervical insufficiency can be detected and diagnosed early, and timely targeted treatment can be taken to avoid adverse pregnancy outcomes such as abortion and premature delivery⁷. At the same time, ultrasound examination can reduce the probability of unnecessary surgical intervention for pregnant women with cervical changes that do not cause abortion and preterm labor although there are signs⁸. In our study, we explored the application of the prediction of preterm birth by measuring the width of cervical internal os and length of cervical canal using ultrasonography.

Methods

Materials

A prospective study was conducted on 100 first-born single pregnant women at 16⁺⁰~24⁺⁶ weeks of

gestation who were examined in our hospital from January 2022 to January 2023. General data of pregnant women were collected and sorted out and their pregnancy outcomes were tracked. According to whether preterm birth occurred, they were divided into preterm birth group (60 cases) and non-preterm birth group (40 cases). There was no significant difference in the age and body mass index (BMI) between 2 groups ($P>0.05$), as shown in Table 1.

The inclusion criteria were as follows: Pregnancy 16⁺⁰~24⁺⁶ weeks; Single and first pregnancy; According to the ultrasound of the pregnant woman in the first trimester, the size of the fetus was consistent with the gestational age; All pregnant women gave informed consent and voluntarily joined the study with good compliance; All pregnant women underwent perineal ultrasound measurements at 16⁺⁰~24⁺⁶ weeks of gestation of gestation.

Exclusion criteria: Pregnant women with benign and malignant uterine tumors; Pregnant women with cervical malignant tumor disease; Those who are unaware of this study or have poor compliance.

Methods

All pregnant women underwent perineal ultrasound measurements at 16⁺⁰~24⁺⁶ weeks of gestation of gestation. The pregnant women were placed in lithotomy position or supine position and examined with Philips EIPQ5 color Doppler diagnostic instrument and ultrasonic probe with frequency of 2 ~ 9 MHz (the probe was wrapped with a condom and coated with coupling reagent). First, the probe was placed between the vaginal opening and the urethral opening for sagittal scan to clearly show the cervical canal, the inner cervical opening, and the outer cervical opening. Then, the width of the inner cervical opening (the maximum width of the wedge-shaped area of the inner cervical opening) and the length of the cervical canal (the distance from the inner cervical opening to the outer cervical opening) were measured, and the average value was taken for 3 consecutive measurements. The pregnant women were divided into <5 mm group (62 cases) and ≥5 mm group (38 cases) according to the width of cervical internal os, and the cervical canal length was divided into <10 mm group (26

cases), 10 ~ 30 mm group (23 cases), and >30 mm group (51 cases).

Observation indicators

The width of cervical internal os and length of cervical canal were compared between the non-preterm group and the preterm group.

Bishop cervical maturity score was used to evaluate the effect of artificial membrane rupture on shortening labor. The full score was 13 points, in which score ≤ 3 points indicated failure of artificial membrane rupture, and score 4-6 points indicated 50% success rate of artificial membrane rupture. A score of 7-9 indicated that the success rate of artificial film breaking was 80%, and a score of ≥ 9 indicated that the success rate of artificial film breaking was 100%. The incidence of preterm labor was compared with different width of cervical internal os and length of cervical canal.

Statistical analysis

SPSS 20.0 statistical software was used for statistical analysis of the data. Measurement data were expressed as ($\bar{x} \pm s$) and t test was adopted for comparison. Statistical data were exhibited as [n (%)], and were measured by χ^2 test. $P < 0.05$ was considered statistically significant.

Results

The width of cervical internal os and length of cervical canal between preterm and non-preterm group

The width of cervical internal os in the preterm group presented wider than that in the non-preterm group, and the length of the cervical canal in the preterm group presented shorter than that in the non-preterm group ($P < 0.01$, Figure 1).

Bishop score between preterm and non-preterm group

The Bishop score in the preterm group presented higher than that in the non-preterm group ($P < 0.01$, Figure 2).

Table 1: General data of both groups

Groups	Cases	Age (years)	BMI (kg/m ²)
Preterm group	40	29.25±2.23	21.00±1.21
Non-preterm group	60	29.03±2.26	21.03±1.25
T		0.48	0.11
P		0.63	0.90

Incidence of preterm birth with different width of cervical internal os

The incidence of preterm birth in pregnant women with the width of cervical internal os ≥ 5 mm presented higher than that in < 5 mm group ($P < 0.05$).

Incidence of preterm birth with different length of cervical canal

The incidence of preterm delivery in pregnant women with the length of cervical canal < 10 mm was significantly higher than that in 10-20 mm group, the incidence of preterm delivery in pregnant women with the length of cervical canal between 10-20 mm was significantly higher than that between 21-30 mm group, and the incidence of preterm delivery in pregnant women with the length of cervical canal between 21-30 mm presented higher than that > 30 mm group ($P < 0.05$).

Discussion

After the second trimester of pregnant women, with the continuous increase of amniotic fluid and the gradual growth of the fetus, the intrauterine pressure is significantly increased, and the fetal sac is easy to protrusion from the mouth of the cervix, thus shortening and expanding the cervical tube, until the cervical dilation to a certain extent, may cause contractions, and even preterm delivery after the membranes are broken⁹. According to the relevant data, preterm birth accounts for about 5% to 15% of the total number of births in China¹⁰. Preterm birth has become one of the major diseases that threaten the safety of mother and child during pregnancy¹¹.

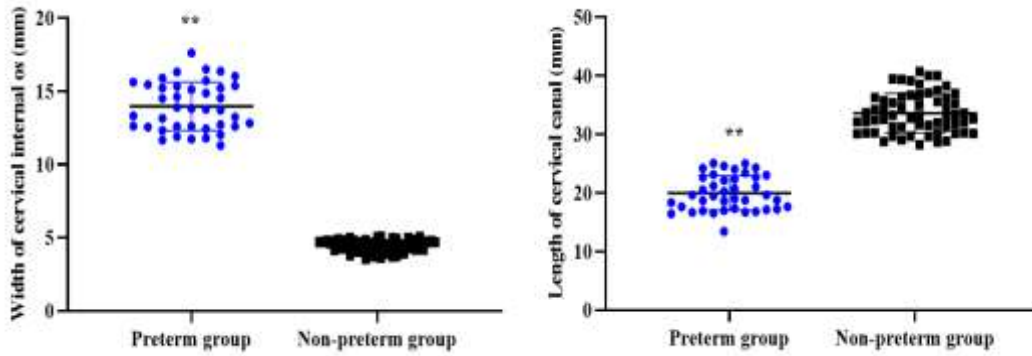


Figure 1: The width of cervical internal os and length of cervical canal between preterm and non-preterm group. **P<0.01.

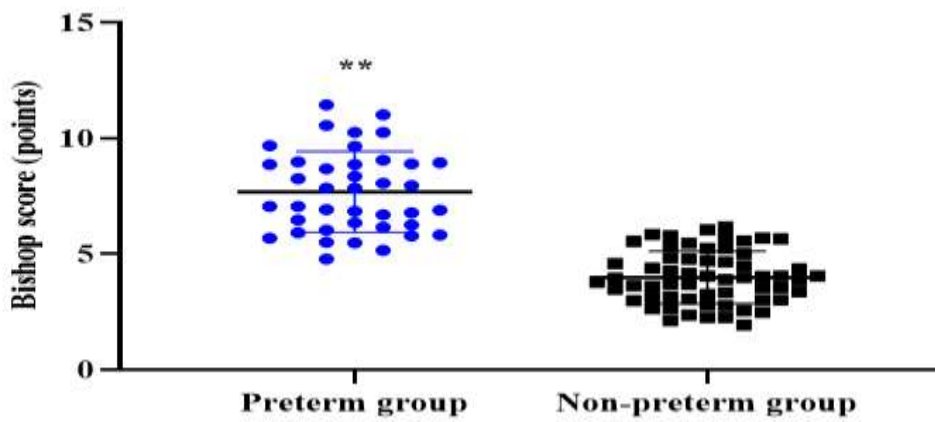


Figure 2: Bishop score between preterm and non-preterm group. **P<0.01.

Table 2: Incidence of preterm birth with different width of cervical internal os

Groups	Cases	Incidence rate of preterm birth
<5 mm group	62	18 (29.03%)
≥5 mm group	38	20 (52.63%)
χ^2		5.57
P		0.02

Table 3: Incidence of preterm birth with different length of cervical canal

Groups	Cases	Incidence rate of preterm birth
<10 mm group	15	10 (66.67%)
10-20 mm group	10	5 (50.00%) ^a
21-30 mm group	30	9 (30.00%) ^{ab}
>30 mm group	45	6 (13.33%) ^{abc}

Note: Compared with <10 mm group, ^aP<0.05; Compared with 10-20 mm group, ^bP<0.05; Compared with 21-30 mm group, ^cP<0.05.

If it is not detected in time and effective intervention is taken, it may bring serious consequences to pregnant women and fetuses¹². Therefore, choosing effective prediction method becomes the key.

In the past, clinical prediction of preterm birth was mainly based on clinical symptoms of pregnant women combined with subjective indicators such as Bishop score of vaginal tract examination¹³. However, Bishop score can only evaluate the cervical and vaginal segments, and the prediction process is also susceptible to clinical experience, examination methods, examiner subjectivity and other factors, which will greatly reduce the accuracy of the test results¹⁴. In addition, vaginal examination is also easy to stimulate uterine contractions and increase the chance of premature rupture of membranes in pregnant women, so this test method has great limitations¹⁵. With the deepening of clinical research on preterm birth, many studies have confirmed that preterm birth is closely related to cervical structure and cervical duct shortening¹⁶. Generally speaking, the normal length of the cervical canal is 30-70 mm, but some scholars have measured the length of the cervical canal and the width of cervical internal os of pregnant women at different gestational weeks by ultrasound, and found that from the second trimester to the third trimester, affected by uterine pressure, fetal growth, amniotic fluid increase and other factors, most pregnant women have a slight reduction in the length of the cervical canal¹⁷. To the second and third trimester of pregnancy, the normal length of the cervical canal is mostly maintained at 25 ~ 30 mm, and with the continuous shortening of the cervical canal length and the decline of the lower uterine segment, when the cervical canal length is shortened to 30 mm, it is easy to cause premature labor¹⁸.

At present, ultrasound is one of the most commonly used clinical imaging techniques in China, which has unique advantages in measuring cervical tube length and predicting preterm birth¹⁹. It has many advantages, such as low price, safe and non-invasive, high resolution and repeatability, and can objectively and truly reflect cervical tube length, thus helping to improve the accuracy of preterm birth prediction²⁰. Ultrasound examination mainly includes three ways: transabdominal,

transvaginal and transperineal²¹. Among them, abdominal ultrasound examination has the lowest impact on the vagina and cervix of pregnant women, and is simple, safe, and easy to operate. However, before the examination, the patient needs to fill the bladder, which is susceptible to the influence of insufficient or excessive bladder filling, fetal position and other factors, resulting in large measurement errors and thus affecting the accuracy of cervical canal length measurement²². The success rate of transvaginal ultrasound imaging can reach 100.0% and the bladder does not need to be filled before the examination, but the probe should be inserted into the patient's vagina during the examination, and the detection personnel should be gentle, otherwise it is easy to induce vaginal bleeding, infection, abdominal pain and other symptoms of the patient²³. Moreover, it is contraindicated for pregnant women with vaginal bleeding, premature rupture of membranes and placenta previa²⁴. Perineal ultrasound not only does not need to fill the bladder, but also does not need to enter the pregnant women's body, simple operation, safe, clear imaging, vaginal bleeding, premature rupture of membranes and placenta previa pregnant women can be examined²⁵. In addition, it can also carry out repeated examination and dynamic observation of cervical changes in patients, so it is recommended to use this detection method to measure cervical tube length in pregnant women²⁶.

In our study, the outcomes displayed that compared with the non-preterm group, the preterm group had wider width of cervical internal os, shorter length of the cervical canal and higher Bishop score. The incidence of preterm birth in pregnant women with the width of cervical internal os ≥ 5 mm was significantly higher than that in < 5 mm group. The incidence of preterm delivery in pregnant women with the length of cervical canal < 10 mm was significantly higher than that in 10-20 mm group, the incidence of preterm delivery in pregnant women with the length of cervical canal between 10-20 mm was significantly higher than that between 21-30 mm group, and the incidence of preterm delivery in pregnant women with the length of cervical canal between 21-30 mm was significantly higher than that > 30 mm group. These results indicate that the length of the cervical canal

measured by perineal ultrasound during the second trimester can be used as an important basis for predicting preterm labor in pregnant women. When the length of the cervical canal becomes shorter and the width of cervical internal os becomes wider, preterm labor may occur in pregnant women.

In summary, perineal ultrasound measurement of cervical tube length during the second trimester has good application value in predicting preterm birth, with advantages of simple operation, safety, clear imaging, and accurate prediction. Therefore, for pregnant women with symptoms of threatened preterm birth, it is necessary to use transperineal ultrasound as soon as possible to measure the length of their cervical canal. Once the cervical canal length of patients is less than 30 mm, timely and effective treatment measures should be taken to intervene the patients, so as to reduce the incidence of preterm birth and thus effectively reduce the incidence of adverse pregnancy outcomes of mothers and infants.

Authors' contributions

Yi Cao and Jiqing Xuan: conceived and designed the study and prepared the manuscript. Wei Tan, Jiqing Xuan, and Tingting Ni collected and analysed the data. All authors mentioned in the article approved the manuscript.

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