The association between second trimester of pregnancy ultrasound measurements of cervical length and the gestational age, weight and APGAR score at delivery.

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Abstract

Introduction: Infant mortality is highest in preterm births. Cervical length may indicate early preterm delivery, according to studies. We assessed cervical length, gestational age, birth weight, and delivery Apgar scores.

Methods: This research included 100 women bearing 100 live foetuses (mean maternal age: 29.42 ± 6.26 years, mean gestational range 18-20 weeks). Transvaginal ultrasound measured cervical length in all women. Birth weight, gestational age and Apgar scores were recorded.

Results: 0% had cervical length less than 15 mm, 9% 15 mm-25 mm, 75% 25 mm-35 mm, and 16% >35 mm. ANOVA showed a significant relationship between cervical length classification and gestational age (p=0.031) and birth weight (p=0.001), but not Apgar scores (p=0.35) or gestational age at birth (p=0.29). Birth weight correlated significantly (p=0.04).

Conclusion: Cervical length screening during the second trimester should be regular in selected nations or areas to decrease premature labour.

Keywords: Anomaly scan, Birth weight, Cervical length, Pregnancy, Preterm birth

Introduction

In developed countries, preterm birth (infants born before 37 weeks of gestation) is the leading cause of perinatal morbidity and mortality [1,2]. Although knowledge has advanced about the factors and mechanisms underlying preterm birth and many health and medical interventions have been introduced to reduce such births, these numbers continue to rise in developing countries like Iran and South Africa, where preterm birth rates are even higher [3,4]. In the past two decades, the rate of preterm birth has increased by 20%, most of which occurred between 34 and 36 weeks of gestation [5]. Preterm infants have a six fold greater risk of dying in the first week of life and a three fold greater risk of dying in the first year of life. In terms of morbidity, preterm birth is associated with neurological impairment and disability. In addition to impacting the health of preterm infants and families, preterm birth increases the cost of providing care.

While the cause of preterm birth is still unclear, gestational age has been identified as one of the risk factors for preterm birth and is inversely related to infant mortality [6,7]. In this regard, infant mortality is significantly higher in infants born before 32 weeks of gestation [8]. Preterm birth could result in incomplete development of the immune system and organs, thus minimizing the resistance and immunity of the baby against possible diseases and infections [9].

A short cervical length can also contribute to preterm birth and has been observed in preterm births in about 30% of asymptomatic pregnant [10]. Although, not all pregnant women have the opportunity to assess their cervical length [11]. Obstetricians and gynecologists rarely measure cervical length unless there are symptoms or risk factors for preterm labor, such as abdominal pain or increased vaginal discharge. There is research on short cervical length in preterm birth, but there is little research on gestational age at delivery and birth weight with regard to cervical length [12,13]. Further, few studies have

been conducted on the various stages of pregnancy and some common or predominant ultrasonographic findings regarding cervical length. This research may demonstrate the need to conduct cervical length measurement at a certain stage in pregnancy to reduce preterm labor.

Materials and Methods

This multicenter cross sectional study included women who presented at the obstetric clinics of Taleghani and Mahdieh hospitals in Teheran, Iran, in 2020 for an anomalous ultrasound scan or routine check-up in the middle of their second trimester. The study excluded pregnant women who had to terminate their pregnancy before 38 weeks of gestation. Formal informed consent was obtained from study participants and ethical approval was obtained from the Institutional Review Board of Shahid Beheshti University of Medical Sciences, Tehran, Iran (IR.SBMU.MSP.REC.1397.839), besides the declaration of Helsinki was followed in all procedures.

After receiving written informed consent and taking a medical history, participating mothers underwent ultrasound sonography. Between 18-20 weeks of gestation, the cervical length was measured using transvaginal ultrasound. Transvaginal ultrasound was utilized since it is considered the 'gold standard' modality to measure cervical length as it is highly reproducible with measurements not limited by maternal obesity, cervical position or obstructive shadowing from foetal parts as with transabdominal ultrasound [14]. After the bladder was emptied, the transducer was inserted into the anterior fornix of the vagina and positioned to observe the endo-cervical canal. The image was enlarged to fill at least half of the screen and calipers were placed at the internal and external os to obtain the cervical length measurement. When the cervical os was curved, the sum of two separate straight lines was utilized to determine the cervical length. The gestational age, birth weight and Apgar scores were recorded at delivery.

The IBM Statistical Software for the Social Sciences (SPSS) for Windows (IBM Corporation, Armonk, NY) version 25.0 was used to analyze the data. The Kolmogorov-Smirnov test was used to determine the type of distribution. Based on the normality of the sample, the Pearson and Spearman rank correlation coefficients were applied to establish the relationship between cervical length, gestational age at birth, birth weight and Apgar scores. Analysis of Variance (ANOVA) was used to compare the means of variables. A p-value of $\geq$ 0.05 was utilized to determine the level of significance.

Results

In our study, 73% of neonates were born *via* cesarean section and 27% *via* Normal Vaginal Delivery (NVD). Of the new-borns, 53% were female and 47% were male. The mean cervical length of the women in this study was 30.94 mm ± 3.74 millimeters (mm), with 75% of women falling in the 25 mm-35 mm classification. Mean gestational age was 38.11 ± 1.34 weeks and birth weight was 3162.76 grams ± 404.73 grams (g). In the first minute, 34% of neonates had Apgar scores less than 9 and 41% had scored less than 10 in the fifth minute. Table 1 illustrates the significant ($p<0.05$) relationship using ANOVA between cervical length classification and mean gestational age ($p=0.031$) and mean birth weight ($p=0.001$).

Table 1. *Analysis of variance of cervical length classification and mean gestational age and mean birth weight.*

Cervical length classification (mm)	Gestational age (weeks)	Significance (p-value)	Delivery birth weight (g)	Significance (p-value)
<15	36.6 ± 1.10	0.031	-	0.001
15-25	37.73 ± 1.20		2773.30 ± 196.50	
25-35	37.76 ± 1.30		3160.80 ± 395.80	
>35	38.60 ± 1.50		3408.20 ± 413.40	
Note: Data are presented as mean ± SD; mm: millimeters; g: grams.				

Table 2 shows the Pearson and Spearman correlation coefficients between gender, gestational age, birth weight and Apgar scores for the new-born using cervical length classifications. In spite of the lack of significant correlation between cervical length classification, gestational age and neonatal Apgar scores, a significant correlation was found between cervical length and birth weight, suggesting that as cervical length increased, so too did average infant birth weight.

Table 2. *Correlation between cervical length classification and mean gestational age, mean birth weight and mean Apgar scores.*

		Gestational age	Birth weight	Neonate Apgar scores
Cervical length at 18-20 weeks of gestation	Correlation co-efficiency	0.15	0.32	0.17
	p-value	0.35	0.04*	0.29
Note: *Indicates statistical significance at $p \leq 0.05$.				

Discussion

Recent literature has questioned both the cost efficiency and the usefulness of cervical length measurement as an indicator of preterm delivery especially in developing nations like Iran [15-17]. In this regard, studies have found that a cervical length below 25 mm at 24 to 28 weeks of gestation can predict preterm birth [18]. This study evaluated the relationship between cervical length in the second trimester of pregnancy and gestational age, birth weight and Apgar scores at delivery.

While ANOVA demonstrated a significant relationship between cervical length classification and gestational age ($p=0.031$) and birth weight ($p=0.001$), no significant ($p \leq 0.05$) correlation was found between cervical length classification gestational age at birth ($p=0.35$) and Apgar scores ($p=0.29$). However, a significant correlation was found with birth weight ($p=0.04$).

The results of this study showed that the mean cervical length at 18-20 weeks of gestation was 30.94 mm ± 3.74 mm. While this finding is more than the 31 mm of Melamed, et al., it is lower than that of Jafari, et al. which demonstrated a mean cervical length of 38.30 mm ± 7.28 mm at 20 weeks gestation [19,20]. In addition to maternal characteristics, increased stress, psychosocial problems, obesity, aging, smoking, alcohol abuse, underlying diseases, race, nationality, socioeconomic status, number of fetuses and lack of prenatal care may be contributing factors to this variation [21].

Despite not finding a definitive association between cervical length and Apgar scores, this study demonstrated that cervical sonography has limited potential in predicting gestational age, which is in line with previous research that has indicated that shorter cervical length is associated with preterm birth [22]. As Jafari-Dehkordi, et al. found a shorter cervical length from 8-38 weeks of gestation led to an increased likelihood of preterm birth.

This study also found that cervical length had a significant impact on infant birth weight, showing that as cervical length increased, so did infant birth weight. These findings are consistent with previous studies [23]. This finding is important since low birth weight can result from preterm birth or Intrauterine Growth Restriction (IUGR). This low birth weight, whatever the cause, is strongly associated with fetal and neonatal mortality and morbidity, inhibited growth and cognitive development, mortality risk in the first year and is also associated with an increased risk of developing diseases in adulthood.

Conclusion

Despite inconsistent recommendations regarding the routine assessment of cervical length during pregnancy this study does recommend the targeted use of cervical length sonography. However, based on the findings of this study, there may not be a need for global cervical length evaluation but rather a regional and country specific approach to allowing early interventions to reduce preterm birth rates.

Conflicting Interests

The authors declared no potential conflicts of interests with respect to the research, authorship and/or publication of this article.

Ethical Approval

This study was approved by institutional review boards of the Shahid Beheshti university of medical sciences, Tehran, Iran (IR.SBMU.MSP.REC.1397.839)

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Author's contributions

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