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Is There an Association Between Body Mass Index and Cervical Length?

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Abstract

Objective: The purpose of this study is to assess the relationship between maternal body mass index and second trimester cervical length.

Methodology: This is a prospective study conducted on 100 single ton gestation women aged between 18 to 34 years with mean age of 24.03 ± 4.34 from 2017 to 2019, all these women have their BMI measured in 1st trimester according to WHO criteria and cervical length measured in 2nd trimester (16-24 weeks).

Results: Hundred women participated in the study. Their mean age + SD was 24.03 + 4.34 years, ranging from 18 to 34 years. the rate of premature delivery among women aged ≥ 25 years was 52.3% compared with 35.7% among those aged less than 35 years (p = 0.097). The rate of premature delivery among women living in rural areas was 52.9%, compared with 41% among women living in urban areas (p = 0.363). The more the body mass index (BMI), the less the rate of premature delivery (p = 0.002) where it was 50% among thin women and 0% among obese women. premature delivery was 89.5% among women with short cervical length and 32.1% among women with normal cervical length (p < 0.001). 19% of the women of the whole sample had short cervix but none of the women with normal weight or obese had short cervix. It is evident in the table that 66.7% of thin women had short cervix (p < 0.001).

Conclusion: This study demonstrates a relationship between BMI and cervical length suggesting that obesity may be associated with longer cervical length. These results will need to be replicated in larger cohorts undergoing universal cervical length assessment

Keywords: Premature delivery; Body mass index; Cervical length; Pregnancy; Morbidity; Fetal acrosomia; Prenatal mortality; Oxytocin; Obese patients; Vaginal ultrasonography; Gestation

Introduction

Obesity and cervical insufficiency are leading causes of morbidity in pregnancy [1]. Over the past two decades in the United States, the rate of obesity has more than doubled from 15 to 33% [2]. It is estimated that more than one in five women of reproductive age are obese (body mass index, BMI > 30 kg/m2), and the rate of obesity continues to rise [3]. Obesity is defined by the National Institutes of health as a body mass index (BMI) of R30 kg/m2 [1]. The prevalence of obesity among adults in the United States has increased from 12% in 1991 to 20.9% in 2001 [4]. Obese women appear to have a lower rate of spontaneous preterm birth than normal weight women [5]. Prior data suggest that maternal obesity in pregnancy is associated with an increased need for labor induction, longer duration of labor, higher oxytocin and misoprostol requirements, and importantly, more frequent cesarean sections [6]. Obesity before pregnancy is associated with an increased risk of fetal acrosomia and prenatal mortality. The mother's being leaner than average (underweight), on the other hand, is associated with an increased risk of delivering an infant who is small for gestational age and perhaps also the risk of preterm delivery [7]. Pregnancies among underweight or over-weight women are therefore often regarded as high risk pregnancies, and thin women are frequently advised to gain weight before becoming pregnant [8]. Nonetheless, the optimal weight or body-mass index for women who wish to become pregnant is not known [7].

However, evidence regarding the association of maternal obesity and spontaneous preterm birth (SPB) is conflicting [4]. Although some studies suggest that obesity does not influence the rate of preterm birth at !37 weeks of gestation, other studies have found reduced rates of preterm birth in obese and morbidly obese patients [4]. The prevalence of overweight and obesity is increasing among women of childbearing age [9]. An estimated 22% of non-pregnant women 18–49 years of age in the United States are considered overweight (body mass index _BMI_ 25–29.9 kg/m2) and an additional 22% are classified as obese (BMI _ 29.9 kg/m2) [10]. Throughout pregnancy the cervix plays an

important role in maintaining the fetus in utero and preventing premature delivery [11]. Currently there are 250,000 preterm deliveries in the United States. The majority of these deliveries are caused by preterm labor and cervical incompetence [11]. Documentation of cervical shortening and dilatation is crucial in the diagnosis and management of cervical incompetence and premature labor.' Unfortunately, evaluation of the cervix by vaginal examination is subjective and inaccurate because anatomically one half of the cervix is not palpable [12].

The length of the cervix may be useful in predicting the risk of premature delivery, with a shorter cervix predicting a higher risk. Traditional methods to evaluate the cervix in pregnancy are limited and unsatisfactory [13]. Digital examination, the standard method, suffers from large variation among examiners. In contrast, transvaginal ultrasonography is a reproducible method of examination during pregnancy [13]. In a multicenter, population-based study, we used vaginal ultrasonography to measure the length of the cervix and examined the relation of this measurement to the risk of prematurity [14]. Neonates born preterm are at increased risk of both short term complications, attributed to immaturity of multiple organ systems, and long-term adverse health outcomes, such as neuro developmental disabilities, behavioral problems, childhood asthma, cardiovascular disease, diabetes and depression, in adult life [15]. In addition, preterm birth is associated with a substantial economic cost and adverse psychosocial and emotional effects on families [15]. A short cervix, traditionally defined as a transvaginal sonographic cervical length (CL) ≤25mm in the mid-trimester of pregnancy, is an important risk factor for preterm birth and has emerged as one of the strongest and most consistent predictors of preterm birth in asymptomatic women with a singleton or twin gestation [16]. The current study assessed the relationship between first trimester BMI and cervical length measured between 16 and 24 weeks of gestation [17].

Objective of study

To assess the relationship between maternal body mass index and second trimester cervical length.

Data analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 22). Chi square test of association was used to compare proportions. Fisher's exact test was used when the expected count of more than 20% of the cells of the table was less than 5. Pearson's correlation coefficient was calculated to assess the strength of correlation between two numerical variables. A p value of ≤ 0.05 was considered statistically significant

Method

This is a prospective study of 100 women with singleton gestation conducted in Erbil maternal hospital between October 2017 to January 2019. Informed consent were obtained from all of them and the study was approved by KBMS. All of them follow up and delivered in the same hospital. The women who included in this study, their ages were between 18 to 34 years of age with mean age of 24.03±4.34. Gestational age was calculated based on first day LMP and or early first trimester ultrasound. First trimester pregnancy BMI was calculated for women (BMI equal to weight in Kg/height in meter).

Women were classified into two groups according to WHO criteria.

a) Underweight BMI less 18.5. kg/M2.

b) Normal weight BMI 18.5 to 24 .9Kg/m

c) Overweight BMI 25 to 29.9 Kg

d) Class one obesity BMI 30 to 34,9

e) Class two or morbid obesity BMI > 35

Cervical length measured in centimeter by ultrasound scan between 16 and 24 weeks of gestation. Gestational age was based on last menstrual period compared with first trimester ultra-Sonography.

We examined whether there is a relation between cervical length and BMI and their impact on pregnancy outcome.

Inclusion criteria

All primigravida and those with miss carriage only aged between 18-35 years.

5.2. Exclusion criteria

a) Multiple gestations

b) Previous cervical surgeries

c) History of IVF

d) Age less than 18 or more than 35 year

e) No history of any medical diseases.

Results

Hundred women participated in the study. Their mean age + SD was 24.03 + 4.34 years, ranging from 18 to 34 years. The median was 23 years. Table 1 shows that the rate of premature delivery among women aged ≥ 25 years was 52.3% compared with 35.7% among those aged less than 25 years (p = 0.097). The rate of premature delivery among women living in rural areas was 52.9%, compared with 41% among women living in urban areas (p = 0.363). No significant association was detected between the rate of premature delivery and the other factors like educational level (p = 0.268), and progesterone intake (p = 0.522) as presented in Table 1. Table 2 shows that the more the body mass index (BMI), the less the rate of premature delivery (p = 0.002) where it was 50% among thin women and 0% among

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obese women. The same table shows that the rate of premature delivery was 89.5% among women with short cervical length and 32.1% among women with normal cervical length ($p < 0.001$). Table 3 shows that 19% of the women of the whole sample had short cervix but none of the women with normal weight or obese had short cervix. It is evident in the table that 66.7% of thin women had short cervix ($p < 0.001$). Figure 1 shows that there was a strong positive correlation between cervical length and the weeks of delivery. The more the cervical length, the more the weeks at delivery ($r = 0.708$, $p < 0.001$). The same pattern is observed in Figure 2 where it is evident that the more the body mass index, the more the weeks at delivery ($r = 0.555$, $p < 0.001$). Figure 3 shows a positive significant correlation between the BMI and the cervical length ($r = 0.710$, $p < 0.001$).

Table 1: Incidence of Premature Delivery by Age, Residency, Education, and Progesterone Intake.

	Delivery						
	Premature		Normal		Total		
	No.	(%)	No.	(%)	No.	(%)	p
Age (years)							
< 25	20	-35.7	36	-64.3	56	-100	
≥ 25	23	-52.3	21	-47.7	44	100.0)	0.097
Residency							
Urban	34	-41	49	-59	83	-100	
Rural	9	-52.9	8	-47.1	17	-100	0.363
Educational							
Educated	19	-50	19	-50	38	-100	
illiterate	24	-38.7	38	-61.3	62	-100	0.268
Progesterone							
No	26	-40.6	38	-59.4	64	-100	
Yes	17	-47.2	19	-52.8	36	-100	0.522
Total	43	-43	57	-57	100	-100	

Table 2: Incidence of Premature Delivery by Body Mass Index (BMI) and Cervical Length.

	Delivery						
	Premature		Normal		Total		
	No.	(%)	No.	(%)	No.	(%)	
BMI							
< 18.5	6	-50	6	-50	12	-100	
18.5-24.9	33	-55	27	-45	60	-100	
25-29.9	4	-17.4	19	-82.6	23	-100	
≥ 30	0	0	5	-100	5	-100	0.002*
Cervical length							
Short	17	-89.5	2	-10.5	19	-100	
Normal	26	-32.1	55	-67.9	81	-100	< 0.001
Total	43	-43	57	-57	100	-100	

By Fisher's Exact Test.

Table 3: Association Between Length of the Cervix and the Body Mass Index (BMI).

	Length of Cervix						
	Short < 2.5 cm		Normal		Total		
BMI (Kg/m^2)	No.	(%)	No.	(%)	No.	(%)	
< 18.5	8	-66.7	4	-33.3	12	-100	
18.5-24.9	11	-18.3	49	-81.7	60	-100	
25-29.9	0	0	23	-100	23	-100	
≥ 30	0	0	5	-100	5	-100	< 0.001
Total	19	-19	81	-81	100	-100	

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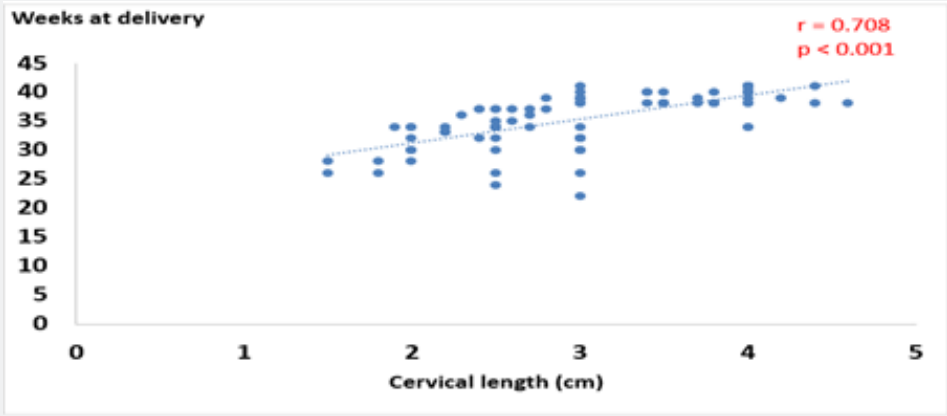

Figure 1: Correlation Between Cervical Length and Weeks at Delivery.

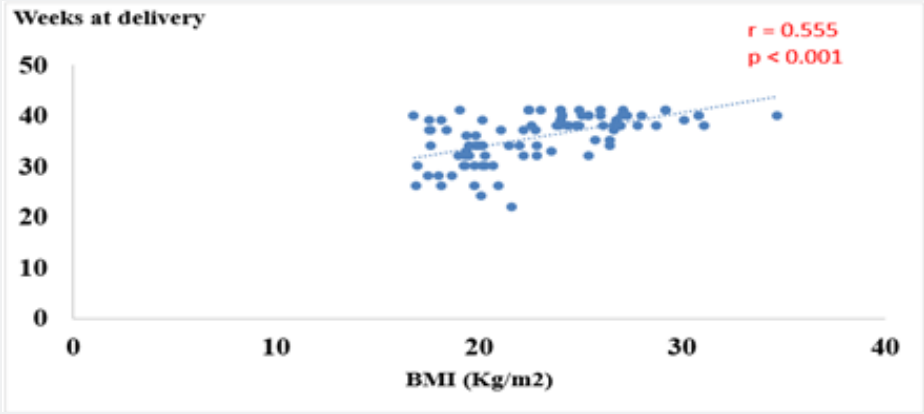

Figure 2: Correlation Between Body Mass Index and Weeks at Delivery.

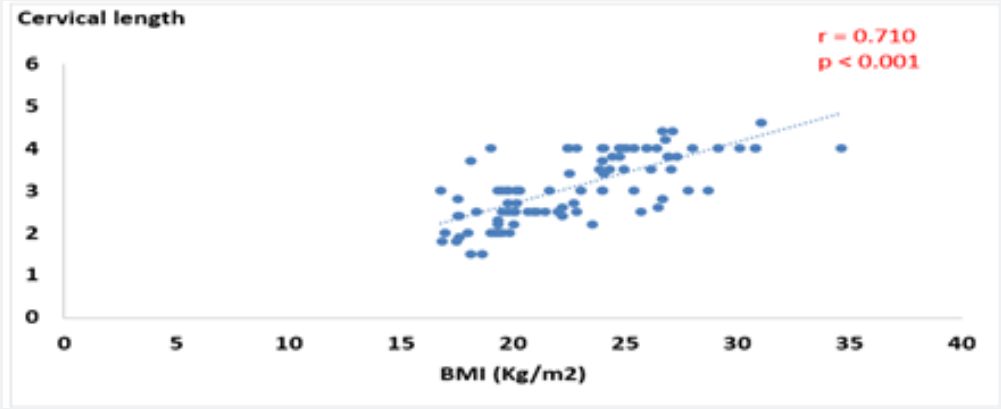

Figure 3: Correlation Between Body Mass Index and Cervical Length.

Discussion

BMI, which is derived from weight and height measurements, is one of the best markers of nutritional status and is used to classify populations from thin to obese [4]. In our study we found that relation between BMI and cervical length is proportional, those patient who have normal or high BMI, they do have normal cervical length, for example those patients who have BMI > 25 and more all of them have normal cervical length, while those patients who have BMI < 18.5 ,66.7 % of them they do have short cervix. These findings suggest that maternal obesity early in pregnancy may be associated with longer cervical length, and a possible explanation for the decreased rate of spontaneous preterm birth and increased rates of induction of labor and cesarean section among obese women. Importantly, these results will need to be replicated in larger cohorts of pregnant women undergoing universal second-trimester transvaginal

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ultrasound screening of cervical length before further inferences can be made.

Furthermore in our study we find out that 17 cases (89.5%) who have short cervix, they had premature delivery, and this is in concordance to the other study by Mission JF [18], An explanation for why pregnant women with a higher BMI may have a longer cervical length remains to be elucidated. Obese women may have a different physiology, endocrine environment, and profile of comorbid conditions compared with their normal weight counterparts, which could influence cervical length [19,20]. However in the other study conducted by YS Han [8], they f found that the average length of neonates delivered by obese mothers was significantly shorter than the average length of neonates delivered by mothers of normal weight, because of the high rates of preterm and LBW delivery in the obese group.

Conclusion

This study demonstrates a relationship between BMI and cervical length suggesting that obesity may be associated with longer cervical length. These results will need to be replicated in larger cohorts undergoing universal cervical length assessment.

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