Impact of cervical length on Bacterial vaginosis at Mansoura University Hospital.

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Abstract

Background: Cervical length defines the measurement of the cervix uteri. In healthy pregnancies, the cervix typically measures between thirty and fifty millimeters (three and five centimeters) in length and remains solid until the end of pregnancy. A cervix measuring less than twenty-five millimeters in length is referred to as a short cervix.

Patients & Methods: This study was cross sectional research performed at Mansoura University Hospital. The present study was carried out through 2 years from October 2022 to 2024 to detect the impact of cervical length (CL) on bacterial vaginosis (BV) in pregnant women and determine prevalence rate.

Results: Regarding to validity of presence of bacterial vaginosis in prediction of preterm labor among studied cases, sensitivity was 62.9%, specificity was100%, PPV was 100%, NPV was 3.5%, accuracy was 69.05%. Regarding the validity of combination between bacterial vaginosis and short cervical length in prediction of preterm labor, Sensitivity was 75.7%, Specificity was 71.4%. Regarding predictors of preterm labor among studied cases, a statistically significant distinction has been observed among studied cases as regards cervical length with p value=0.008, bacterial vaginosis with p value=0.001.

Conclusion: Preterm birth is strongly linked to bacterial vaginosis, according to the study, which highlights the importance of routinely examining pregnant women, especially those with short cervical lengths.

Keywords: CL; BV; Preterm birth.

Introduction

Cervical length indicates the measurement of the cervix uteri. In healthy pregnancies, the cervix typically measures between thirty and fifty millimeters (three to five centimeters) in length and remains firm until the conclusion of pregnancy. A cervix measuring less than twenty-five millimeters in length is referred to as a short cervix [(1)].

The primary causes of a shortened cervix and cervical

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funneling involve trauma, heredity, cervical or uterine abnormalities, and cervical insufficiency (sometimes referred to as incompetent cervix). An inadequate cervix occurs when the cervix opens or dilates prematurely, frequently leading to preterm birth. The evaluation of cervical length via ultrasound will be associated with the prediction of spontaneous preterm birth [(2)].

Three types of ultrasound cervical examination exist: transabdominal, transvaginal, and transperineal (sometimes referred to as trans labial). Transvaginal ultrasonography is the most objective and successful ultrasound technique [(3)].

Bacterial vaginosis is a vaginal inflammation resulting from the proliferation of microorganisms normally present in the vagina, disrupting the natural equilibrium. [(4)].

Bacterial vaginosis denotes a complex alteration in vaginal flora, marked by a decrease in the prevalence of the typically dominant hydrogen-peroxide-producing lactobacilli and a concomitant increase in other microbial organisms. [(5)].

The diagnosis of bacterial vaginosis will be established utilizing the clinical Amsel criteria; nevertheless, vaginal pH testing serves as an effective and economical screening method. The Amsel criteria for diagnosing bacterial vaginosis include a vaginal pH of five or higher, a homogenous thin, milky vaginal discharge, a positive smell test, and the presence of clue cells observed microscopically [(6)].

The objective of this research was to detect the impact of cervical length (CL) on bacterial vaginosis (BV) in pregnant women and determine prevalence rate.

Patients and methods

This study was cross sectional research and was performed at Mansoura University Hospital. The present study was carried out over 2 years from October 2022 to 2024.

Inclusion criteria: Singleton pregnancy, pregnant women with short cervix <25mm, presence of bacterial vaginosis or not and gestational age between sixteen and twenty-four weeks.

Exclusion criteria: Multiple pregnancies, obstetrical or medical complications in the current pregnancy by medical history, laboratory investigation, and clinical diagnosis.

Sample size: Sampling technique: The study calculated the sample size using cervical lengths and vaginal pH in the second trimester of pregnancy as an indicator of preterm birth. There were 110 cases, but 10 cases were rejected, resulting in 100 cases using the G power program.

Methods

All studied cases (100 cases) had been exposed to: Complete history taking, physical examinations, general examination, routine laboratory tests, vaginal Examination and radiological examinations. Transvaginal ultrasound examination: a transvaginal ultrasound was used to determine the cervical length in 16-24 weeks of gestation. To prevent the cervix from lengthening during the examination, the patient had to be empty of the bladder. The lithotomy posture was used for the patient. Moreover, a transvaginal probe is inserted into the vagina far from the cervix. Once the cervical canal has been located, the probe is gently retracted to prevent the tip from pressing on the cervix. The cervical canal, the external cervical os, and the internal cervical os are all visible in a sagittal plane through the cervix. From the outside to the inner cervical os, the cervix's length is calculated as a straight line. It is crucial to only include the endocervical mucosa-bordered portion of the cervical canal.)7).

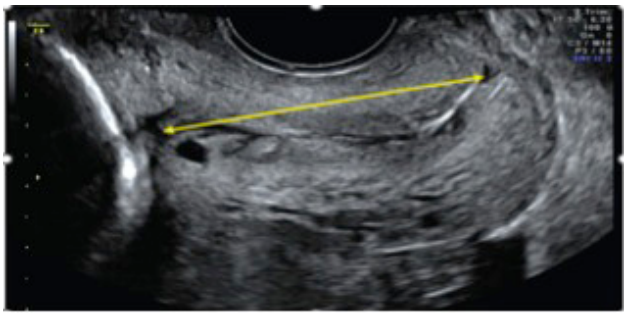

Figure 1: Transvaginal sonography for cervical length measurement

In all cases, the probe has been positioned in the distal vagina or in contact with the external cervical os. Altering the depth of the ultrasonic probe established a distinct focal point, thereby making various places viewable. Sagittal imaging was acquired through lateral motions of the probe from one adnexa to the other. Adjusting the probe to ninety degrees provided a transverse/semi-coronal orientation. The transverse image obtained via endovaginal imaging approximated a coronal plane, but the authentic transverse image has been acquired transabdominally. Subsequent imaging was conducted by repositioning the probe from anterior to posterior. A general survey has been conducted as a preliminary assessment by traversing the probe from the midline to the lateral margins at the bilateral adnexa. The probe was subsequently rotated ninety degrees and adjusted in the anterior-posterior direction. The cervix, endocervical canal, internal os, and rarely the external os have been visualized in both sagittal and transverse orientations. (8)

Diagnosis of bacterial vaginosis: A clinical diagnosis of bacterial vaginosis necessitates a vaginal pH exceeding 4.5, the presence of a milky discharge, clue cells, and the emission of an amine (fishy) odor. These criteria can be determined using pH sticks, pH paper, and potassium hydroxide.

Outcome Measurements and Follow-up: Patients were monitored at the outpatient clinic through monthly antenatal visits, reviewing maternal vital signs and abdominal ultrasounds. Those 28-36 weeks gestational were advised to visit every 2 weeks for PTL symptoms. All patients have been followed until delivery to detect the gestational age at delivery. Most patients delivered before 37 weeks, reviewing hospital records for obstetric information, neonatal outcomes and preterm labour.

Ethical Consideration

The research protocol has been submitted to the Institutional Review Board of the Faculty of Medicine, Mansoura University, for permission. Informed verbal agreement has been obtained from each patient participating in the research with the assurance of confidentiality and personal privacy. The data collected from cases has been utilized only for the current research goals.

Statistical Analysis

Statistical calculations were performed using Microsoft Excel and SPSS. Descriptive statistics included mean, standard deviation, and range. Analytical statistics included Student T Test, Student T-test, and Chi square tests. The following statistical tests and parameters were used: Mean, standard deviation and the chi square test.

Results

Regarding to obstetric history of the studied cases, this table shows that age mean was 27.28±6.74 years, the median of parity was 1 cases rang from (0-5), history of preterm labor was 25 in number that 17 cases was once, 6 cases was twice, 2 cases third times, body mass index of our patients range from 20 to 44.8 and mean of gestational age at delivery was 33.75±4.49 weeks, previous CS was 43 cases negative and 57 other positive and mean of gestational age at presentation was 20.79±2.21 week , the median number of previous CS was 1 case range from (1-5) , previous abortion was 58 cases negative and 42 other positive, the median number of previous abortion was 1case range from (1-8) (Table 1).

Table (1): Obstetric history of the studied cases.

	N=100	%
Parity **Median (min-max)**	1(0-5)	
Age/ years **Mean ±SD** **(Min-max)**	27.28±6.74 (18-43)	
Hx of preterm labor **once** **twice** **three times**	N=25 17 6 2	 68.0 24.0 8.0
BMI **Mean ±SD** **(Min-max)**	33.69±5.61 (20-44.8)	
Gestational age at delivery(weeks) **Mean ±SD** **(Min-max)**	33.75±4.49 (19-39)	
Gestational age at presentation (weeks) **Mean ±SD** **(Min-max)**	20.79±2.21 (16-26)	
Previous CS **-VE** **+VE**	 43 57	 43.0 57.0
Number of previous CS **Median (min-max)**	1(1-5)	
Previous abortion **-VE** **+VE**	 58 42	 58.0 42.0
Number of previous abortions **Median (min-max)**	1(1-8)	

The mean of cervical length was 22.23±2.58 mm, Bacterial vaginosis found in 56 cases and not present in 44 cases (Table 2).

Table (2): Cervical length and bacterial vaginosis prevalence among studied cases.

	Total number =100	
Cervical length **Mean ±SD** **(Min-max)**	 22.23±2.58 (16-25)	 mm mm
Bacterial vaginosis **No** **Yes**	 44 56	 44% 56%

Regarding to relation between (previous cesarean, abortion and history of preterm) prevalence of bacterial vaginosis among studied cases, this table exhibited a statistically insignificant variance has been observed among (previous CS, abortion), (number of previous CS, abortion) and bacterial vaginosis with p value>0.05, considering to relation between history of preterm and prevalence of bacterial vaginosis among studied cases there was statistical

significant variance among history of preterm labor and bacterial vaginosis with p value< 0.05 (Table 3).

Table (3): Relation between (previous cesarean &abortion and history of preterm) and prevalence of bacterial vaginosis among studied cases.

	Bacterial vaginosis		Test of significance
	-ve N=44	+ve N=56	
Previous CS -VE +VE	17(38.6) 27(61.4)	26(46.4) 30(53.6)	X^2=0.610 P=0.435
Number of previous CS Median (range)	1(1-3)	1(1-5)	Z=0.679 P=0.497
Previous abortion -VE +VE	26(59.1) 18(40.9)	32(57.1) 24(42.9)	X^2=0.038 P=0.845
Number of previous abortions Median (range)	1(1-3)	1(1-8)	Z=1.02 P=0.307
Hx of preterm labor	N=7	N=18	
Once	7(100)	10(55.6)	P=0.03*
Twice	0	6(33.3)	P=0.002*
Three times	0	2(11.1)	P=0.0003*

X^2=Chi-Square test, Z: Mann Whitney U test.

A statistically insignificant variance has been observed among studied cases as regard gestational age at presentation and bacterial vaginosis with p value=0.769 and regarding to relation among gestational age at delivery and bacterial vaginosis prevalence among studied cases, a statistically significant variance has been detected among gestational age at delivery and bacterial vaginosis with p value=0.001 (Table 4).

Table (4): Relation among gestational age at presentation &at delivery and prevalence of bacterial vaginosis among studied cases.

	Bacterial vaginosis		Test of significance
	-ve N=44	+ve N=56	
Gestational age at presentation (weeks)	20.86±2.13	20.73±2.28	t=0.294 p=0.769
Gestational age at delivery(weeks)	36.40±2.78	31.34±4.41	t=6.22 P=0.001*

t: Student t test.

Regarding to validity of presence of bacterial vaginosis in prediction of preterm labor among studied cases, this table found that sensitivity was 62.9%, specificity was100%, PPV was 100%, NPV was 3.5%, accuracy was 69.05% (Table 5).

Table (5): Validity of presence of bacterial vaginosis in prediction of preterm labor among studied cases.

	Sensitivity	Specificity	PPV%	NPV%	Accuracy%
Bacterial vaginosis	62.9%	100.0%	100.0%	35%	69.05%

PPV: Positive predictive value, NPV:Negative predictive value.

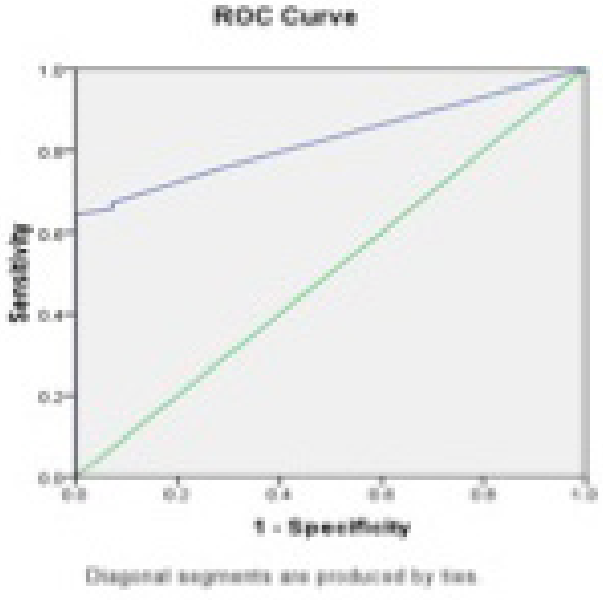

Figure (2): ROC curve for combination among bacterial vaginosis & short cervical length in prediction of preterm labour.

Regarding to validity of combination between bacterial vaginosis and short cervical length in prediction of preterm labor, this table revealed that sensitivity was 75.7%, specificity was 71.4% (Table 6).

Table (6): Validity of combination between bacterial vaginosis and short cervical length in prediction of preterm labour.

Area	Std. Errora	P value	Asymptotic 95% Confidence Interval		Sensitivity %	Specificity %
			Lower Bound	Upper Bound		
.827	.045	.001*	.739	.915	75.7	71.4

Regarding to predictors of preterm labor among studied cases, this table shows a statistically significant variation has been observed among examined cases as regard cervical length with p value=0.008, bacterial vaginosis with p value=0.001 (Table 7).

Table (7): predictors of preterm labour among studied cases.

	β	P value	Odds ratio (95%CI)
Cervical length	-0.527	0.008*	0.591 (0.401-0.871)
Bacterial vaginois	20.58	0.001*	Undefined

Discussion

The impact of cervical length on bacterial vaginosis is that shorter cervical length was correlated with an increased risk of preterm birth. When combined with BV, this risk can be further heightened. BV had been linked to preterm labor due to its role in inflammation and potential infection, which may contribute to cervical changes. Infants born preterm often had lower birth weights, which can be compounded by the presence of BV. Bacterial vaginosis may be related to negative pregnancy outcomes, such as low birth weight. A cervical length of under twenty-five millimeters is correlated with a heightened risk of premature labor. cervical insufficiency, leading to early dilation and effacement.

Our study showed that age mean was 27.28±6.74 years, mean of gestational age at presentation was 20.79±2.21 weeks, the median of parity was 1 case rang from (0-5), history of preterm labor was 25 in number that 17 cases was once, 6 cases was twice, 2 cases third times. Body mass index of our patients range from 20 to 44.8 and mean of gestational age at delivery was 33.75±4.49 weeks, previous CS was 43 cases negative and 57 other positive, the median number of previous CS was 1 case range from (1-5), previous abortion was 58 cases negative and 42 other positive, the median number of previous abortions was 1 case range from (1-8). Our study shows that mean of cervical length was 22.23±2.58mm, bacterial vaginosis found in 56 cases and not present in 44 cases.

Prajarto et al. aimed to examine the correlation among bacterial vaginosis, cervical length, premature rupture of membranes and urinary tract infections concerning the incidence of preterm labor on a similar no of cases (112 pregnant females), similar gestational age range (28-34 weeks) and similar mean age (28.71 ± 6,080 years) who had premature labor in the delivery room & hospital ward (9). They found bacterial vaginosis present in 27 cases and not in 29 cases in imminent preterm labor while it is positive only in 5 cases out of 56 cases of threatened (non-imminent PTL). He also found in cases of imminent PTL the probability to have short cervix alone is 44.35%, bacterial vaginosis alone 72.45% while probability to have both is 93.09% which demonstrates the synergistic effect to have BV with short cervix in the incidence of PTL [9].

Ng & Lim et al. (10) tested the maternal and fetal results of pregnant females with bacterial vaginosis. Their study performed on 237 females who presented with abnormal discharge, and they reported 24 cases with positive bacterial vaginosis and 213 cases without bacterial vaginosis (10.1%), however, these results were irrespective to the cervical length in contrast to our study. In line with current study, Ng & Lim et al. found significant higher preterm birth rate, below 34 weeks (22.7% vs. 6.2%, p=0.019) in women with BV [10].

Our research demonstrated that a statistically insignificant distinction has been observed among previous CS, number of previous CS and bacterial vaginosis with p value>0.05.

In supporting our results, Hsu I et al. showed that no differences were noted in the previous CS was performed with P value =0.091and no significant between previous CS and bacterial vaginosis with p value>0.05 [11].

Also, our study regarding the relation between previous abortion and prevalence of bacterial vaginosis among studied cases, our investigation shows a statistically insignificant variance has been observed among previous abortion, number of previous abortion and bacterial vaginosis with p value more than 0.05. These results contrast with Işik G et al. who studied 200 fertile women who had history of previous abortion either recent within 6 months or recurrent 3 times or more. He found significant association between BV and recent abortion but not with the history of previous recurrent abortion (12). Nguyen et al., who sought to discover a rate of bacterial vaginosis (BV) among 435 pregnant women, their findings in-

dicated that BV was significantly more prevalent in females with a history of abortion, with a p-value of 0.007 [13].

Our study shows that regarding the relation between the history of preterm and prevalence of bacterial vaginosis among studied cases, our results revealed a statistically significant variance has been observed in the history of preterm labor and bacterial vaginosis with p value< 0.05. In supporting our results, Goud et al found 18.8% of patients with bad obstetric history caused by various infections, BV reported in 22% of infection and in BV group PTL was positive in 48.6% [14].

In a recent meta-analysis published by Mohanty T et al. demonstrated a significant association between bacterial vaginosis and premature birth. 20 articles with a total of 290,397 observations were included in the analysis. They found the relative risk of preterm delivery is about two-fold in cases with BV [15].

Our findings indicated a statistically insignificant distinction among studied cases as regards gestational age at presentation and bacterial vaginosis with p value=0.769.

In supporting our results, Ng & Lim et al. revealed a statistically insignificant distinction among examined gestational age at presentation and bacterial vaginosis [10].

Also, our study regarding the relation among gestational age at delivery & prevalence of bacterial vaginosis among studied cases, our study demonstrates a statistically significant distinction among bacterial vaginosis and gestational age at delivery with p value=0.001.

In accord with our results, Goud et al. demonstrated 50% of bad obstetric history women with BV had preterm labor [14].

Our study showed that regarding to validity of presence of bacterial vaginosis in prediction of preterm labor among studied cases, our study found that sensitivity was 62.9%, specificity was100%, PPV was 100%, NPV was 3.5%, accuracy was 69.05%.

Another model for prediction of preterm labor was created by Park et al. by testing 10 bacteria in the cervicovaginal fluid of the test group, and found significant difference appear between preterm birth and term birth by using the mean value of total bacillus class with sensitivity 71%, specificity 59%, PPV 77%, NPV 67% [16].

Our study showed regarding to validity of combination between bacterial vaginosis & short cervical length in prediction of preterm labor, our study revealed that sensitivity was 75.7%, specificity was 71.4%. Wang et al. examined the prognostic significance of transvaginal ultrasonography measurements of cervical length in the 2nd trimester for spontaneous preterm birth. It was determined that only three out of four cases of cervical shortening led to spontaneous preterm birth, with a predictive sensitivity of 3.33 percent and a specificity of 99.9 percent (17). Although this study investigated similar concepts to ours, the results differ significantly in terms of the predictive power of cervical length, which may be due to differences in study design, population, combination of cervical length with BV or other factors (17).

Our study shows that regarding predictors of preterm labor among studied cases, a statistically significant variation among examined cases as regards cervical length with p value=0.008, bacterial vaginosis with p value=0.001.

Accordance with Mohanty et al. identified a statistically significant correlation among bacterial vaginosis and premature delivery. [15].

Conclusion

The study found a strong correlation among preterm birth and bacterial vaginosis, suggesting routine examination of pregnant females for bacterial vaginosis. Short cervical length and bacterial vaginosis were linked to preterm labor incidence, with significant differences observed in cervical length and bacterial vaginosis.

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