Prevalence of bacterial vaginosis: Assessment of sociodemographic characteristics among the reproductive age women

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Abstract

Bacterial vaginosis (BV) is caused by the shift in the vaginal flora from hydrogen peroxide-producing lactobacilli to other bacteria. Nugent's score and Amsel criteria are used as the standard methods to diagnose bacterial vaginosis. In present study prevalence of BV is calculated and also the association between various sociodemographic and clinical characteristics of the participants with the presence and absence of BV are studied using the Chi-square test.

The clinical characteristics were analyzed for 150 study participants, which revealed that there is no significant association of clue cells with BV With an odds ratio of 0.7563 (CI: 0.382,1.499) and the P value of 0.4228. while Whiff's test and pH significant results with an odds ratio of 0.229 (CI: 0.009,0.061) and 0.2971 (CI: 0.130,0.681) respectively with P values less than 0.05

Among the clinical characteristics to identify the BV, Whiff's

test and pH were found to be the most effective methods. Using these diagnosis methods for all the women of reproductive age attending the outpatient department of obstetrics and gynecology would help to identify the asymptomatic BV individuals in the early stage and would help to maintain the health of women and overcome the adverse health effects.

The vaginal microbiota plays an important role in maintaining the women's health. The dominating *Lactobacillus* will produce lactic acid which will help in protecting vaginal health by keeping the acidic pH of less than 4.5 [4,9]. Due to certain factors, the change in the vagina leads to the disruption of the *Lactobacillus* dominating microbiota to the overgrowth of other certain bacteria apart from *Lactobacillus* leading to vaginal infections. One such common infection among women of reproductive age is bacterial vaginosis[2,5]. Bacterial vaginosis (BV) is a condition that is associated with preterm birth, urinary tract infections, Endometritis, low-weight birth of infants, and spontaneous abortions[1,3,4,6]. The exact etiology of bacterial vaginosis is not known and it is a condition marked by milky creamy vaginal discharge, increase in pH, amine fishy odor, and vaginal itching, or some individuals may be asymptomatic[7,8].

To overcome the adverse effects of BV among reproductive-age women, early screening with proper diagnosis and a newer line of treatment will be helpful. Studying the prevalence of BV with sociodemographic and clinical characteristics provides a local demographic tool in reducing the effect of BV. In this paper, the study aims to estimate the prevalence of bacterial vaginosis among women of reproductive age and to study the influence of various risk factors associated with bacterial vaginosis.

Sample size : 150
Study design and period :

A cross-sectional study was conducted from June to December 2023 at Hyderabad Karnataka Education Society's Basaveshwar Teaching and General Hospital, Kalaburagi.

Data collection :

Data was collected from each patient after obtaining informed consent. The sociodemographic information and certain medical history were collected by using a structured questionnaire.

Sample collection :

Two vaginal swab samples were collected from 150 patients; one swab was used for the determination of the clinical criteria and another was used for the laboratory-based method of identifying the microbes of the vagina. Clinical criteria like pH, wet mount, grams staining, and whiff test were used for the determination of BV. In

laboratory-based methods, different culture media like Nutrient agar, Brain heart infusion, McConkey agar, Bile esculin azide agar, Lauria Bertini agar, Lactic acid bacteria agar, Blood agar, and Chocolate agar were used for culturing the organisms at 37°C for 24 hours. The biochemical test was performed to identify the specific strains.

Wet mount examination :

On a clean glass slide, a smear was prepared from the secretions of the swab followed by covering the smear with a cover slip. The slide was examined under the microscope at different magnifications to identify the clue cells.

Detection of pH *:*

The swab was rubbed on the pH paper and the pH was interpreted by using the colour scale provided by the manufacturer.

Amsel *test criteria :*

It is a clinical diagnosis that uses 3-4 criteria for determining the BV. The criteria include vaginal pH which is more than 4.5, vaginal discharge- it's colour and consistency, and the whiff test using 10% KOH for detecting the amine fishy odour.

Gram *stain and* Nugent *Scoring system :*

The vaginal swabs were used for preparing the smear on a clean grease-free slide and were air dried and heat fixed, then gram staining was performed according to protocol. The slides were examined under the light microscope at different magnifications. Depending on the number of gram-positive *Bacillus* with different bacterial morphotypes, the score is assigned called Nugent's score, which is considered as one of the gold standard tests for identifying the BV. The Nugent score ranges from 0-10 for each sample by making the total scores of the three morphotypes. A score ranging from 0-3 indicates normal vaginal flora, 4-6 indicates intermediate vaginal flora and 7-10 indicates BV table-1.

Data analysis :

SPSS version 21.0 was used to analyze the collected data, where the association between characteristics was evaluated with Chi-square with the P value <0.05 indicating that the results are significant.

Table-1. Nugent's scoring on Gram stain.

Score	*Lactobacillus* Morphotypes per field	*Gardnerella* Morphotypes per field	Curved bacteria (*Mobiluncus*) per field
0	> 30	0	0
1	5-30	< 1	1-5
2	1-4	1-4	> 5
3	< 1	5-30	-
4	0	> 30	-

Whiff's *test :*

Ten percent potassium hydroxide solution was added to the swab. The development of an amine fishy odour was considered a positive test and the rest other as negative.

Table-2. Prevalence of Bacterial Vaginosis.

Groups	Number of patients
Normal vaginal flora	6 (4%)
Intermediate BV	82 (54.66%)
Bacterial Vaginosis	62 (41.33%)
Total	150

Table-3. Socio-demographic details

Sl no	Characteristics		Frequency
1	Age	18-24	24 (16%)
		25-31	56 (37.3%)
		32-38	35 (23.33%)
		39-45	35 (23.33%)
2	Residence	Urban	100 (66.66%)
		Rural	50 (33.33%)
3	Educational level	Illiterate	7 (4.66%)
		Primary	6 (4%)
		Secondary	29 (19.33%)
		P U	69 (46%)
		Degree	39 (26%)
4	Occupation	Housewife	137 (91.33%)
		Employed	13 (8.66%)
5	Economic status	Low income	3 (2%)
		Medium income	147 (98%)
6	Pregnancy	Yes	108 (72%)
		No	42 (28%)
7	Symptoms	Yes	75 (50%)
		No	75 (50%)
8	Type of discharge	Thin white	22 (14.66%)
		White mucoid	119 (79.33%)
		Others	9 (6%)
9	Clue cells	Present	96 (64%)
		Absent	54 (36%)
10	Whiff's test	Amine fishy odour	56 (37.33%)
		No amine fishy odour	94 (62.66%)
11	pH >4.5	> 4.5	109 (72.66%)
		≤ 4.5	41 (27.33%)

Table-2 represents the information of the patients belonging to different groups based on Nugent's score and its frequency along with its proportion to the total sample collected. Among 150 participants included in the study, 58.66% of them belong to the no BV group which included normal vaginal flora and intermediate BV and 41.33% (62/150) of them were included in the BV group.

The frequency distribution of socio-demographic information collected from 150 participants in this study is represented in Table-3. The majority of the participants belonged to the age group of 25-31 years followed by the participants belonging to age group of 32-38 and 39-45 years (both 23.33%). Maximum number of women belonged to urban (66.66%) and were homemakers 91.33%. Among the study participants, 72% of them were pregnant. It is observed that 50% of respondents possess symptoms of BV whereas 50% of them did not show any symptoms. Also, 72.66% of the study respondents showed a pH value of more than 4.5.
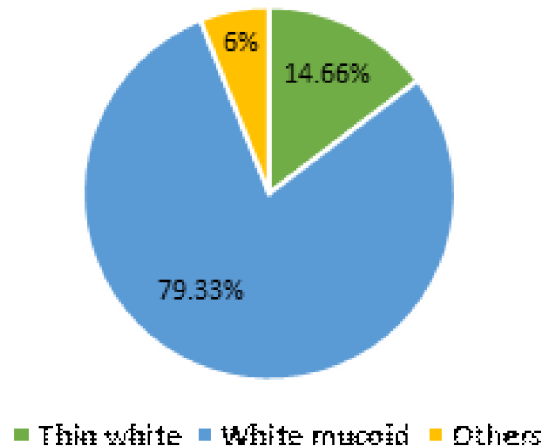

Figure 1. Pie chart representing the Distribution of Participants according to types of Discharge.

The pie chart revealed that white mucoid discharge was observed in a maximum number of participants (79.33%) followed by a thin white type of discharge (14.66%).
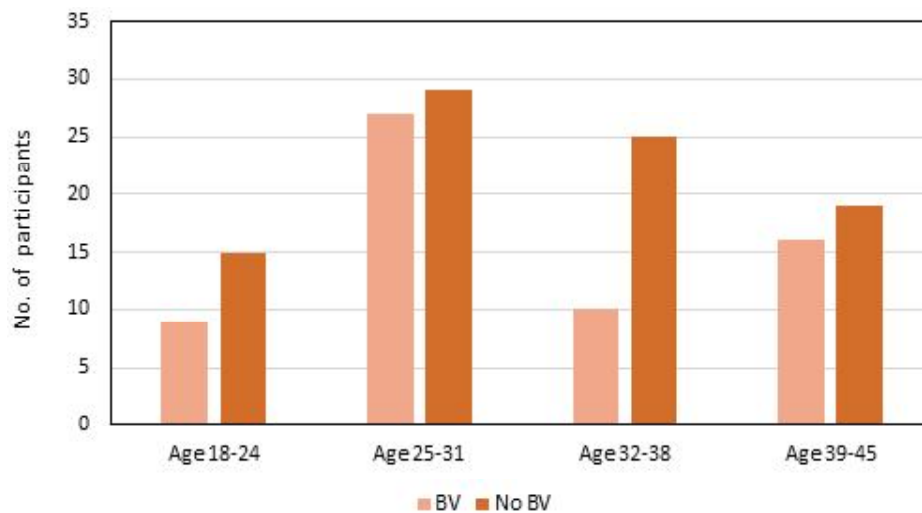

Figure 2. Representation of age-wise participants with BV and without BV

The above bar diagram shows that the maximum number of BV cases are from the age group of 25-31 years followed by the participants belonging to the age group 39- 45 years for BV and 32-38 years for No BV as given in table-4.

Table-4. Age-wise distribution of participants according to BV and No BV

Age	BV	No BV
18-24	9	15
25-31	27	29
32-38	10	25
39-45	16	19

Table-5. Distribution of participants according to Nugent's score

Si. no.	Characteristics		BV	No BV	Odds ratio	Chi-square	P-value
1	Age	18-24	9 (37.5)	15 (62.5)	1.403 (0.486, 4.054)	3.866	0.2762
		25-31	27(48.214)	29(51.78)	0.9044 (0.388,2.109)		
		32-38	10 (28.571)	25 (71.428)	2.1052 (0.782,5.666)		
		39-45	16(45.71)	19(54.285)	1 (0.390, 2.561)		
2	Residence	Urban	45(45)	55(55)	0.629	1.6633	
		Rural	17(34)	33(66)	(0.311, 1.275)		0.1971
3	Educational level	Illiterate	3(42.85)	4(57.14)	1.1428 (0.225,5.798)	1.164	0.8839
		Primary	2(33.33)	4(66.66)	1.7142 (0.280, 10.47)		
		Secondary	14(48.27)	15(51.72)	0.9183 (0.351, 2.405)		
		PU	25(36.23)	44(63.76)	1.5085 (0.679,3.352)		
		Degree	18(46.15)	21(53.84)	1		
4	Occupation	Housewife	56(40.87)	81(59.12)	1.239	0.1363	0.711
		Employed	6(46.153)	7(53.84)	(0.396, 3.886)		
5	Economic status	Low income	2(66.66)	1(33.33)	0.3448 (0.031, 3.889)	0.095	0.7579
		Middle income	60(40.816)	87(59.183)			
6	Pregnancy	Yes	43(39.81)	65(60.183)	1.2487	0.3667	0.5447
		No	19(45.23)	23(54.76)	(0.608, 2.564)		
7	Symptoms	Yes	34(45.33)	41(54.66)	0.7183	0.9897	0.3198
		No	28(37.33)	47(62.66)	(0.374, 1.379)		

8	Type of discharge	Thin white	7(31.81)	15(68.18)	2.678 (0.545, 13.157)	0.7563	0.6422
		Whit mucoid	50(4.20)	69(0.008)	1.7250 (0.441, 6.750)		
		Others	5(55.55)	4(44.44)	1 (0.156, 6.420)		
9	Clue cells	Present	42(43.75)	54(56.25)	0.7563 (0.382, 1.499)	0.6422	0.4228
		Absent	20(37.03)	34(62.96)			
10	Whiff's test	Amine fishy odour	49(87.5)	7(12.5)	0.0229 (0.009, 0.061)	78.544	0*
		No amine fishy odour	13(13.82)	81(86.17)			
11	pH>4.5	>4.5	53(48.62)	56(51.37)	0.2971 (0.130, 0.681)	8.7409	0.00311*
		≤4.5	9(21.95)	32(78.04)			

*the results are significant,

In Table-5, the Odds ratio, Chi-square, and P value were calculated, Where Chi-square is used for testing the association between various characteristics with cases of BV and P value < 0.05 indicating that the results are significant. We observed that Whiff's test and pH showed significant results.

BV is one of the lower genital tract infections among reproductive-age women which can be diagnosed based on the clinical findings by Amsel's criteria and Laboratory testing by Nugent's scoring system. In a study by Prasanna Kumar Shetty et.al., in 2021 they found 18% prevalence according to Nugent scoring and 14.5% according to Amsel's criteria. In this study, we found a 41.33% prevalence of BV and 20% according to Amsel's criteria.

In the study by A. Anandhi et.al.,[2] in 2021, the asymptomatic cases were more than the symptomatic cases with a P value of 0.502.

In the present study, we got similar results with more asymptomatic cases with the P value 0.3198, which shows no statistical significance between symptomatic and asymptomatic BV. According to one of the studies made by Shridevi et.al., in the year 2021, the difference in the vaginal pH between women with and without BV and the Whiff test results was significant with a P value less than 0.001. In the present study, similar results were obtained with significant P values of 0.0031 and 0 respectively. The study revealed that there is a significant association between odour types with BV and No BV cases with a P value of 0.

The present study imparts the odds ratio for symptoms as 0.7183 and the P value 0.3198 which reveals that there is no significant association of symptoms with that of BV and No BV cases.

In the present study, the pH and Whiff test can be used as the best and most cost-

effective method to detect BV in women of reproductive age irrespective of being symptomatic or asymptomatic. By doing so the asymptomatic BV individuals (37.33%) can be diagnosed in the early stage and this can improve the health of the women. To arrive at reliable results one can go for a large sample study. In futuristic work, we are trying to inhibit the quorum-sensing activity of vaginal pathogens using nanomaterials as treatment against BV.

Conflict of Interest: There are no conflicts of Interest

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