

Health, Social and Economic burden of Bacterial vaginosis (BV) among Nigerian women of child bearing age: Can Probiotics restore the vaginal dysbiosis?

Chinwe E. Ejike¹, Nneka R. Agbakoba^{2*}, Chinyere C. Ezeanya³ and Kingsley C. Anukam^{2,4*}

¹Department of Medical Microbiology, Chukwuemeka Odimegwu Ojukwu University, Awka Campus, Nigeria; ²Department of Medical Laboratory Science, Nnamdi Azikiwe University, Nnewi Campus, Nigeria; ³Department of Medical Microbiology, Edo University, Iyamho, Edo State, Nigeria; ⁴Uzobiogene Genomics, London, Ontario, Canada.

ABSTRACT

Background: This study aimed to determine the knowledge of Bacterial Vaginosis (BV), its impact on the social, economic life and the use of probiotics for prevention and treatment among reproductive aged Nigerian women. **Method:** A total of 171 participants comprising 86 female students and 85 healthcare practitioners were randomly selected for this study. Structured questionnaires were used to collect data on demographic, social, health burden and knowledge on BV among the students. Data on knowledge, recurrences and financial burden of BV were collected from the healthcare practitioners. **Results:** Of the participants, 79.5% had heard of bacterial vaginosis from school (43.5%). Majority (45.1%) alleged that vaginal discharge is the most common symptom associated with BV while 34.6% admitted previous BV infection and 41.7% reported recurrences. Social burden of BV revealed that 53.7% indicated that BV makes them avoid having sex while 29.5% avoid closeness with people. Though 42% of the healthcare professionals indicated treatment of BV as combination therapy, none of them have ever used Probiotics to treat BV. The estimated cost for treatment of BV were between 2,500 – 10,000 naira. **Conclusion:** BV has an impact on the health, social and economic status of females. Appropriate treatment and education on BV is crucial.

Key words: Bacterial Vaginosis, Burden, Nigerian women, Probiotics.

Running Title: Health and socio-economic burden of BV

*Corresponding authors: Email: nr.agbakoba@unizik.edu.ng; Cell Phone: +234 8033244122

ORCID iD:0000-0001-5122-5988.

Email: kanukam@gmail.com; **ORCID iD:** 0000-0002-2346-3345

Author's contributions: This work was carried out and approved in collaboration between all the authors. NRA and KCA designed the study; CEE sourced for funding; KCA, CEE wrote the protocol; CEE, KCA, CCE contributed in literature search; CEE and CCE did the survey; CEE did statistical analysis; CEE drafted the manuscript; NRA and KCA supervised the study; NRA and KCA Wrote the final manuscript; NRA and KCA proofread the manuscript

Received: April/30, 2019; **Accepted:** June/20, 2019; **Published:** August 31, 2019.

Citation: Ejike CE, Agbakoba NR, Ezeanya CC and Anukam KC. Health, Social and Economic burden of Bacterial vaginosis (BV) among Nigerian women of child bearing age: Can Probiotics restore the vaginal dysbiosis? **J Med Lab Sci, 2019; 29: 37-48**

INTRODUCTION

Bacterial vaginosis (BV) is a common vaginal infection with high occurrence in women of child-bearing age¹. Although the etiology of BV is still controversial, it is likened to a polymicrobial condition attributed with disorder of the vaginal ecosystem. This results to partial or total displacement of *Lactobacilli* by anaerobes such as *Gardnerella vaginalis*, *Prevotella*, *Bacteroides* and *Mobilincus species* and other bacteria including *Mycoplasma* and *Ureaplasma species*²⁻⁴. It is a clinical condition characterized by a thin, gray or white homogenous, malodorous (fishy odour), vaginal discharge of pH > 4.5, noticeable after intercourse and menses⁵. Other diagnostic features of BV include: Presence of clue cells, few or no Lactobacilli with small number (<1/hpf) of polymorphonuclear leucocytes (PMNLs)⁶. Due to asymptomatic state in 50% of women with BV, the actual prevalence of BV is masked^{7,8}. Globally, it is estimated that 20% – 30% of reproductive aged women attending sexually transmitted infection (STI) clinics suffer from BV with prevalence as high as 50% – 60% within a high –risk population such as commercial sex workers⁴. In Africa, an estimated prevalence range from 30% - 50%⁹. These authors also reported a 14.2% prevalence of BV among Nigerian women. A high prevalence of 40.8% was reported among women in Eastern part of Nigeria¹⁰, and 38% in Cameroon among women who practiced vaginal douching¹¹.

Several studies have identified certain behavioral factors that predispose women to BV. Such factors include: Multiple sex partners, consistent douching, use of contraception and tender age at first intercourse¹²⁻¹⁶. Other epidemiological risk factors which have been implicated to a lesser degree include; Cigarette smoking¹⁷ and female genital mutilation¹⁸. However, limited cases of BV could result from the dysbiosis

of the vaginal flora with no obvious external cause. It is therefore paramount to study the relationship of the gut and vaginal flora. With the anatomical position of the vagina having close proximity to the anus, organisms most likely migrate from anus to vagina thereby resulting to dysbiosis.

Bacterial vaginosis has been associated with obstetric and gynecological complications. These include second trimester miscarriage and preterm birth, early failure of in-vitro fertilization, an increased risk of upper genital tract infection following termination of pregnancy, and an increased risk of infective complications after hysterectomy¹⁹. In addition, BV increases the risk of sexually transmitted infection and acquisition of human immunodeficiency Virus (HIV)^{20,21}.

Currently, the recommended treatment for BV is oral or vaginal antibiotics, such as Clindamycin or Metronidazole^{22,23}. Unfortunately, there is an increased number of recurrences of BV when the synthetic antimicrobials are used. Current studies have shown recurrence rates of up to 60% within 12 months of treatment²⁴. The recurrences may be attributed to the development of antimicrobial resistance²⁵. Few studies revealed that recurrent BV have a negative impact on women's social, personal, and work relationships^{12,26,27} thus, affecting their qualities of life²⁸. This report was confirmed by findings which reported that women with recurrent BV had inferiority issues¹⁴. It is therefore important to devise an alternative method for the treatment of BV. In developed countries, the use of probiotics for the prevention and treatment of BV has been adopted. However, in Nigeria and other developing countries it is yet to be accepted as treatment option. Probiotics aids in replacing already displaced *Lactobacilli* by pathogenic organisms. The introduction of *Lactobacilli* orally to balance their population in the vagina was reported for the first time in 2001²⁹. The organisms were introduced in a

milk base and proven to be recovered from the rectum³⁰. Thus, this supports the fact that ingested microbial strains migrate through the intestine, to the rectum, and potentially ascend to the vagina³¹.

Although various work has been done on BV in terms of its prevalence, risk factors; data on the emotional, sexual and social impact of living with BV is sparse in the literature. Moreover, few published works assessing the knowledge of women and health professionals about BV have been reported. Still, no work has been done on the impact of recurrent BV on the financial life of women. The study aimed to determine the level of knowledge of BV among women in Eastern Nigeria with the impact of the infection (recurrence and treatment failure) on their social, and economic life. Furthermore, the extent of knowledge on BV by the healthcare professionals in the locality and the use of probiotics for treatment of BV was determined.

MATERIALS AND METHODS

This was a descriptive, cross sectional study. A total of randomly selected 86 female students from College of Health, Obosi, Nigeria and 85 health workers which included: Qualified Medical practitioners,

Nurses, Pharmacists, Medical Laboratory scientists at General Hospital Onitsha and Amaku General Hospital Awka, Nigeria as well as patent medicine dealers. All the participants provided informed consent and participation was voluntary. Ethical approval for this study was granted by the ethics committee of the Nnamdi Azikiwe University Teaching Hospital Nnewi.

Structured questionnaires were used for collection of data such as knowledge and financial burden of BV from both the students and the health workers. Also, data on demographic, sexual behavior and social burden of BV was collected exclusively from the students and other female participants. Statistical analysis of demographic, knowledge, sexual behavior, diagnosis and treatment data were conducted using SPSS 20.0.

RESULTS

Table 1 shows the demographic data of respondents that participated in the study. Majority (77%) of the participants were between the age of 19 – 25 years. Most of the participants (86%) were single and majority of them were Christians (97.6%). Eighty (80%) percent of them were at the tertiary educational level and good number of them (83.9%) were unemployed

Table 1: Demographic data of the participants

CHARACTERISTICS	FREQUENCY	PERCENTAGE
AGE (YEARS)		
15-18	3	3.5
19-25	67	77.9
26-30	10	11.6
31-35	3	3.5
36-45	3	3.5
MARITAL STATUS		
Married	11	12.8
Single	74	86.0
Cohabiting	1	1.2
RELIGIOUS STATUS		
Christianity	84	97.6
Moslem	1	1.2
Others	1	1.2
EDUCATIONAL LEVELS		
Primary	1	1.2
Secondary	3	3.6
Tertiary	80	95.2
EMPLOYMENT STATUS		
Employed	9	16.1
Unemployed	47	83.9

Table 2 represents the knowledge evaluation of the female respondents that participated in the study. From the results, majority of the respondents (79.5%) had heard of bacterial vaginosis, with the main source of information being from school (43.5%) followed by Health care providers (30.6%). Only few of the participants (7.1%) had learned of BV from their friends.

Majority of the respondents (45.1%) believed that vaginal discharge is the most common symptoms associated with bacterial vaginosis and 25.7% also believed that vaginal itching could be among the symptoms. Other signs and symptoms identified by the respondents included: vaginal foul smell (24.8), vaginal burning (4.4%).

Table 2: Number and percentage of students with knowledge on Bacterial vaginosis

VARIABLES	FREQ- UENCY	PERCEN- TAGE	VARIABLES	FREQ- UENCY	PERCEN- TAGE
Information on BV			Knowledge on Symptoms of BV		
Aware of BV	66	79.5	Vaginal discharge	51	45.1
Not aware of BV	17	20.5	Vaginal burning	5	4.4
Source of Information on BV			Vaginal itching	29	25.7
Health-care provider	26	30.6	Vaginal foul smell	28	24.8
School	37	43.5	Knowledge on treatment of BV		
Social media	16	18.8	Metronidazole	21	23.9
Friends	6	7.1	Clindamycin	5	5.7
Knowledge on BV			Combination therapy	37	42.0
Highly Knowledgeable	8	10.4	Antifungals	17	19.3
Less Knowledgeable	69	89.6	Probiotics	4	4.5
Knowledge on predisposing factors to BV			Probiotics No knowledge	4	4.5
Multiple sexual partners	35	25.9	Estimated cost for treatment of BV		
Poor personal hygiene	40	29.6	500 – 2000	9	13.4
Use of caustic body wash or chemical for vaginal washing	31	23.0	2500 – 5000	21	31.3
Extended use of sanitary pad	14	10.4	5500 – 10000	23	34.3
Smoking	0.0	0.0	10500 – 20000	13	19.4
Use of antibiotics	2	1.5	No response	1	1.5
Sharing of underwear with infected person	7	5.2			
Public toilet					
Use of wet underwear					

Table 2 also showed that majority of the respondents (29.6%) were of the opinion that poor personal hygiene could predispose one to BV. Other reported predisposing factors include: multiple sexual partner (25.9%), Douching (23.0%), prolonged wearing of sanitary pads (10.4%). Only 1.5% of the respondents indicated that public toilet and use of antibiotics could be a predisposing factor. None of the respondents

acknowledged that smoking is a predisposing factor. 42% of the participants indicated that the drugs they knew for the treatment of BV were the mixture of antibiotics while majority of them indicated that the amount of money one can spend in treating a case of BV were between 2500 – 10000 naira (7 – 28 US dollars) while 19.4% indicated between 10,500 – 20,000 naira (29 – 56 US dollars).

Table 3: Health Burden Evaluation/Assessment among Participants

VARIABLES	FREQ- UENCY	PERCEN- TAGE
BV Infection		
Previous BV infection	27	34.6
Non-previous BV infection	51	65.4
BV Symptoms presented		
Itching	23	43.4
Vaginal discharge	10	18.9
Vaginal burning	1	1.9
Lower abdominal pain	5	9.4
Vaginal fishy odour	14	26.4
Recurrent BV		
Positive	13	41.9
Negative	18	58.1
Number of episodes of recurrent BV		
Once	15	41.7
Twice	8	22.2
Several times	13	36.1

Table 3 showed 34.6% of the respondents acknowledged that they had suffered from BV, and of this population, 41.9% had recurrences of the infection. Out of this population, 22.2% had recurrences only twice while 36.1% had recurrences for several times. Vaginal itching was the highest symptoms the respondent indicated that they observed when they have BV. Others include vaginal discharge (18.9%), foul smell (26.4%), vaginal burning (1.9%).

Table 4: Assessment of social burden of BV on infected participants

VARIABLES	FREQ- UENCY	PERCEN- TAGE	VARIABLES	FREQ- UENCY	PERCEN- TAGE
Social Life			Abstinence from work		
Impact on social life and practice	16	35.6	Present	3	7.1
Non-impact on social life	29	64.4	Absent	39	92.9
Communication barrier with Partner			Avoidance of social event		
Absent	34	75.6	Present	6	14.3
Present	11	24.4	Absent	36	85.7
Insecurity with Partner			Impact on association with others		
Present	19	43.2	Present	13	29.5
Absent	25	56.8	Absent	31	70.5
Sexual Abstinence from partner			Communication barrier with friends		
Present	22	53.7	Absent	23	53.5
Absent	19	46.3	Present	20	46.5
Work life			Attitude when infected		
Impact on work life	5	2.2	Poor self- esteem	14	20.6
Non-impact on work life	36	87.8	Sexual withdrawal	20	29.4
			Self-isolation	18	26.5
			Self-blame	13	19.1
			Feeling normal	3	4.4

From Table 4 above, 35.6% of the respondents indicated that BV affected their social life and practices while 64.4% indicated otherwise. Majority of respondents

(53.7%) acknowledged that the infection makes them to abstain from sex due to self-consciousness of vaginal odor. Majority of the participants (57.8%) indicated that having

the infection does not affect the works they do while very few of them claimed that it hinders them from their works. Few of the respondents (14.3%) indicated that the infection makes them to avoid social events. The experiences the respondents had when

they had BV include sexual withdrawal (29.4%), Self-isolation (26.5%), poor self-esteem (20.6%), self-blame (19.1%), and 4.4% of the respondents feel normal with the infection.

TABLE 5: Knowledge of BV and Expenditure on BV by Medical Professionals

Professionals (No)	Knowledge of BV (No/%)		Cases of BV (No/%)		Diagnosis Clin.		
	Minimal	High	Yes	No	Lab	Symp.	Both
Doctors (24)	5 (20.8)	19 (79.2)	21 (91.3)	2 (8.7)	13(54.2)	6(25)	5(20.8)
Pharmacist (19)	9(47.4)	10(52.6)	13(72.2)	5(27.8)	11(68.8)	3(18.8)	2(16.7)
Med Lab.Sc. (14)	4(28.6)	10(71.4)	8(57.1)	6(42.9)	9(75.0)	1(8.3)	2(16.7)
Nurses (24)	15(62.5)	9(37.5)	15(62.5)	9(37.5)	23(95.8)	1(4.2)	0(0)
Pat. Med Dealers (4)	0(0)	4(100)	4(100)	0(0)	4(100)	0(0)	0(0)
Total (85)	33(38.8)	52(61.2)	61(73.5)	22(26.5)	60(75)	11(13.7)	9(11.3)

Professionals (No)	Frequency		Differentiate BV and Candidiasis		Cases of BV Per Year				
	Not often	Very often	Yes	No	A	B	C	D	E
Doctors (24)	21(87.5)	3(12.5)	20(83.3)	4(16.7)	6(28.6)	9(42.9)	4(19.0)	1(4.8)	1(4.8)
Pharmacist (19)	12(66.7)	6(33.3)	13(76.5)	4(23.5)	9(47.4)	5(26.3)	3(15.8)	0(0)	2(10.5)
Med LS (14)	9(69.2)	4(30.8)	10(71.4)	4(28.6)	5(50)	3(30)	1(10)	1(10)	0(0)
Nurses (24)	23(95.8)	1(4.2)	16(66.7)	8(33.3)	15(62.5)	4(16.7)	3(12.5)	1(4.2)	1(4.2)
Pat. Med Dealers (4)	0(0)	4(100)	2(66.7)	1(33.3)	0(0)	2(50)	1(25)	1(25)	0(0)
Total (85)	65(78.3)	18(21.7)	61(74.4)	21(25.6)	21(32.8)	23(35.9)	12(18.6)	4(6.5)	4(6.5)

Professionals (No)	Drugs for treatment				Cost of Treatment					Rate of Recurrences	
	Me	CL	Bo	Pr	1	2	3	4	5	Not often	Very often
Doctors (24)	11(45.8)	5(20.8)	8(33.3)	0(0)	11(45.8)	4(16.7)	1(4.2)	1(4.2)	7(29.2)	20(83.3)	4(16.7)
Pharmacists (19)	1(5.9)	3(17.6)	13(76.5)	0(0)	5(26.3)	5(26.3)	1(5.3)	0(0)	8(42.1)	15(88.2)	2(11.8)
Med LS (14)	7(63.6)	0(0)	4(36.4)	0(0)	0	0	0	0	0	-	-
Nurses (24)	8(34.8)	2(8.7)	13(56.5)	0(0)	2(8.3)	9(37.5)	3(12.5)	0(0)	10(41.7)	23(95.8)	1(4.2)
Pat. Med Dealers (4)	0(0)	0(0)	4(100)	0(0)	0(0)	3(75.0)	1(25.0)	0(0)	0(0)	1(25.0)	3(75.1)
Total (85)	27(34.2)	10(12.7)	42(53.1)	0(0)	18(25.4)	21(29.5)	6(8.5)	1(1.4)	25(35.2)	59(85.5)	10(14.5)

KEYS

Drugs for Treatment	Cases of BV Per Year	Cost of Treatment (Naira)
Me - Metronidazole	A - None	1 = 500 - 2000
Cl - Clindamycin	B - 1 - 20	2 = 2500 - 5000
Bo - Both Me and Cl	C - 21 - 50	3 = 5500 - 10,000
Pr - Probiotics	D - 51 - 100	4 = 10,500 -20,000
	E - Cannot Estimate	5 = No Response

More than half of the medical professionals (61.2%) indicated to have good knowledge about BV. Seventy-three point five percent (73.5%) had cases of BV in the course of their practices. Only 60% of them keep records of their cases. Seventy-five percent (75%) indicated laboratory diagnosis as their method of diagnosis of BV while 13.8% uses only clinical features to make their diagnosis. Considering how many cases they have per year, 29.5% indicated to have between 1-20 cases. While 15.4% indicated 21 – 50 cases per year. 5.1% indicated 51 – 100 while 5.1% could not estimate the number. As for the drugs they prescribe for the treatment of BV, 34.2% indicated metronidazole, and 12.7% indicated Clindamycin, while 53.2% were using either of them. None of the Medical professionals have ever prescribed probiotics for BV. When asked about the cost of treating a case of BV, 25.9% of them indicated 2,500 to 5,000 naira (7-15 US\$) 8.2% indicated 5,500 – 10,000 naira (15.7-28.5 US\$). Majority of them (36.5%) did not respond to this. Talking about how often patients complain about recurrences of the infection, majority of them (84.0%) indicated not often while 16.0% indicated very often.

DISCUSSION

It is quite obvious that the word ‘BV’ is familiar to several women but majority of them seem to have just little knowledge of it. In this study, 79.5% female respondents from College of Health, Obosi, showed some awareness about BV. Majority of them could identify to some extent, some of the facts about BV in terms of the common symptoms and predisposing factors. This could be because the respondents were students in a school that is more of a health institute and so it is possible that they might have come across the word BV in the course of their studies in the school. Almost half of the respondents (43.5%) indicated to have got the information from the school and then 30.6%

from healthcare providers. In another study of those who had knowledge about BV, 38.7% of them learned about it from health care providers³². This is not surprising. Previous studies found that majority of girls in Africa got knowledge about sexually transmitted disease from their health care provider because of the perceived taboo associated with discussing sex related issues especially between parents and children³³. Some of the predisposing factors indicated by the respondents were poor personal hygiene (29.6%), multiple sexual partners (25.9%) and Douching (23.0%).

On the health burden of BV on women, the percentage of the respondents that acknowledged to have had the infection was 34% and out of this population, 41.7% had recurrences either twice or several times. This number was quite high and considering the facts that 50% of the cases of BV is usually asymptomatic⁷. It is possible that majority that did not indicate to have had the infection might be among the asymptomatic cases. In other words, the percentage should have been higher than 34.6% if the women were screened in the Laboratory for BV, thereby showing the health impact on the women.

Majority of the respondents who indicated to have experienced BV were single ladies in a tertiary institution, were between the ages of 19 – 25 years. This is not surprising as it is assumed that some single girls who are in tertiary institutions in their reproductive age are likely to be engaging in sexual intercourse and it is possible that majority might be having multiple sexual partners, which is a predisposing factor to BV. This fact was confirmed by the reports of workers who reported a high prevalence of BV (63%) among women with multiple sexual partners and out of this number, majority were less than 25 years old (61%)³⁴.

BV, although, it is not a deadly disease, it is capable of causing some terrible discomforts

to the sufferers. Some of the symptoms the respondents experienced include; itching, vaginal discharge, vaginal burning, foul smell etc. The highest percentage indicated itching, to be one of the symptoms. It is possible that some of them that had itching might be suffering from other vaginal diseases like Candidiasis, thinking that they were having BV coupled with the facts that we did not request for the Laboratory result or Doctor's report to have confirmed the diagnosis.

This study also surveyed the impact of BV on the social lives of women of reproductive age. The women reported various experiences, while few women stated that BV did not affect their social lives, majority experienced sexual withdrawal, self-isolation, poor self-esteem and feeling of self-blame.

Responses about their feeling with their partners during the infection showed that 43.2% indicated that they feel embarrassed and afraid that their partners will notice the symptoms. Fifty-three point seven percent (53.7%) avoid having sex with their partners due to self-consciousness about the vaginal foul smell. These findings were supported by a previous study which suggested that for many women, recurrent BV is a distressing condition that can have a major impact on their self-esteem, sexual relationships and quality of life¹⁴. A study on African American women experiencing recurrent BV, reported that women commonly feel shame, embarrassment and frustration at having recurrent BV²⁸. The study, also reported social and sexual avoidance behavior including avoiding others at work and in social situations abstaining from work and social events altogether and avoiding or abstaining from sexual activity due to self-consciousness around vaginal malodor²⁸.

In this present study, majority of the women agreed that they felt free to talk about their symptoms with their partners and friends

while few felt otherwise. This finding is in support of the study of investigators who reported that few women concealed their BV from partners and did not report any concern around sexual infidelity¹⁴. Contrary to our findings, other workers held a different view³⁵. They reported that women either did not disclose or selectively disclose their vaginal symptoms – most often to family or friends – for fear others may assume they were sexually promiscuous or that it may trigger arguments with their partners around infidelity – either theirs or their partners³⁵.

In this study, the economic burden of BV on the women were also evaluated. Although the cost of treatment per case varied, however, the average estimated cost is 5000 naira (14 US dollars) to treat a case of BV. Consequently, for cases of recurrences there will be multiple effects on the cost with the number of cases per-annum. This is quite high for a middle-income woman in our country, especially the students who are unemployed as it is in this study.

Majority of our respondents indicated that symptoms of BV do not affect their work. This is similar to another study where it was reported that having BV did not impact on the work of the respondents except for commercial sex workers¹⁴. Majority of our respondents however, were mainly students who could not have been free to reveal whether they were commercial sex workers or not.

Majority of the health personnel were knowledgeable about BV and many of them have been having cases of BV in the course of their practices although it was difficult to ascertain the exact number of cases they usually have per year since some of them hardly keep record of their cases. The fact still remains that there are quite a large number of cases of BV in our society. Among the medical professionals that were keeping records of their cases, up to 20% had approximately 50 cases per year. The drugs

that were usually prescribed by the medical professionals to treat BV are Metronidazole and Clindamycin as was also reported in the literature²³. Despite the usual treatment failures that resulted to recurrences, none of the respondents have tried to use probiotics as a treatment option. It is not surprising because according to the reports, majority of our health personnel are not aware of Probiotics³⁶. Unlike Africa and other developing countries, the use of probiotics in the treatment of BV is advancing in the developed countries in Europe and North America. Studies that examined the efficacy of probiotics in the treatment of BV have mostly reported improved cure and no adverse events^{37,38,39}. In terms of microbiome and probiotics research, few biomedical and clinical scientists in Nigeria are truly working on this area of scientific endeavor. Recently our research group has demonstrated that *Lactobacillus pentosus* KCA1⁴⁰, was able to down-regulate IL-1 beta, decreased vaginal microbiota associated with BV and modulated microbial genes related to metabolic functions in women of child bearing age in Nigeria (Manuscript in preparation).

CONCLUSION AND RECOMMENDATIONS

The findings revealed that BV has an impact on the health, social, sexual, emotional and economic status of females. Therefore, in managing BV, it is important to recognize that women experiences can extend far beyond the physical symptoms. The findings also revealed the need to make available of clinically tested probiotics in preventing and treating BV⁴¹ and the need for health educational programmes through different media to educate the public on the impact of BV and use of probiotics as an option for prevention and treatment of BV.

REFERENCES

1. Mascarenhas REM, Machado BF, Costa Silva BE. "Prevalence and Risk Factors for Bacterial Vaginosis and Other Vulvovaginitis in a population of Sexually Active Adolescents from Salvador," in Infectious Disease of Obstetrics Gynecology 2012, p. 6, Brazil, Bahia.
2. Hill GB. The microbiology of bacterial vaginosis. American Journal of Obstetrics and Gynecology 1993, 169: 682-692
3. Donders GG. In wet mount and fresh or delayed Gram's stain. Infect Dis Obstet Gynecol. 1996, 4: 2-6.
4. Bautista CT, Wurapa E., Warren B, Morris S, Hollingsworth B and Sanchez SL. Bacterial vaginosis: a synthesis of the literature on aetiology, prevalence, risk factors and relationship with Chlamydia and gonorrhoea infections. Mil Med Res 2016, 3:4
5. Easmon C, Hay P and Ison C. Bacterial vaginosis: a diagnostic approach. Genitourin Med. 1992; 68 (2): 134-8.
6. Begum N, Muazzam S, Shamsuzzaman A, Chowdhury A, Rashid and Islam D. Diagnosis of Bacterial Vaginosis by Acridine Orange Staining and its Comparison to Conventional Methods and Association of *Gardnerella vaginalis* with Bacterial Vaginosis. Bangladesh Journal of Medical Microbiology 2010. 4 (1):
7. Klebanoff MA, Schwebke JA, Zhang Y, Nandel TR, Yu KF and Andrews WW. Vulvovaginal symptoms in women with bacterial vaginosis. Obstetrics and Gynecology 2004, 104:267-272.
8. CDC. Sexually Transmitted Diseases Treatment guidelines, 2010

9. Anukam K and Reid G. Organisms associated with bacterial vaginosis in Nigeria women as determined by PCR-DGGE and 16s RNA gene sequence. *Africa Health Science*.2007, 7 (2) 69-73
10. Adinma JI, Okwoli RN, Agbai AO and Unaeze NC. *Gardnerella vaginalis* vaginosis in Nigerian Igbo women. *Tropical Journal of Obstetrics and Gynaecology* 2000, 17(1): 21-23
11. Akomoneh E, Foche F, Ajonins MU. Prevalence of BV among sexually active women attending the CDC Central clinic Tiko, South West Region, Cameroon. *African Journal of Infectious Diseases* 2016, 10(2):96 – 101.
12. Ness RB, Hillier SL, Richter HE, Soper DE, Stamm C. Douching in Relation to Bacterial Vaginosis, Lactobacilli, and Facultative Bacteria in the Vagina. *Obstet Gynecol* 2002, 100: 765–772.
13. Verstraelen H, Verhelst R, Vaneechoutte M, Temmerman M. The epidemiology of bacterial vaginosis in relation to sexual behaviour. *BMC Infect Dis* 2010, 10: 81. doi: 10.1186/1471-2334-10-81.
14. Bilardi JE, Walker S, Temple-Smith M, McNair R, Mooney-Somers J, Bellhouse C. The burden of bacterial vaginosis: women’s experience of the physical, emotional, sexual and social impact of living with recurrent bacterial vaginosis. *PLoS One* 2013, 8 doi: 10.1371/journal.pone.0074378.
15. Li XD, Wang CC, Zhang XJ, Gao GP, Tong F, Li X. Risk factors for bacterial vaginosis: results from a cross-sectional study having a sample of 53,652 women. *Eur J Clin Microbiol Infect Dis* 2014, 33 :1525–1532.
16. Marconi C, Duarte MT, Silva DC, Silva MG. Prevalence of and risk factors for bacterial vaginosis among women of reproductive age attending cervical screening in southeastern Brazil. *Int J Gynaecol Obstet* 2015, 131:137–141.
17. Schwebke JR and Desmond R. Risk factors for bacterial vaginosis in women at high risk for sexually transmitted diseases. *Sex Transm Dis* 2005, 32: 654–658.
18. Berg RC, Underland V, Odgaard-Jensen J, Fretheim A, Vist GE. Effects of female genital cutting on physical health outcomes: a systematic review and meta-analysis. *BMJ Open* 2014, 4 doi: 10.1136/bmjopen-2014-006316.
19. Hillier SL, Nugent RP, Eschenbach DA, Krohn MA, Gibbs RS. Association between Bacterial Vaginosis and Preterm Delivery of a Low-Birth-Weight Infant. *N Engl J Med* 1995, 333: 1737–1742.
20. Hay PE, Lamont RF, Taylor-Robinson D, Morgan DJ, Ison C. Delivery and late miscarriage. *BMJ* 1994, 308: 295–298.
21. Atashili J, Poole C, Ndumbe PM, Adimora AA, Smith JS. Bacterial vaginosis and HIV acquisition: a meta-analysis of published studies. *AIDS* 2008, 22(12):1493-1498.
22. Oduyebo OO, Anorlu RI, Ogunsola FT. The effects of antimicrobial therapy on bacterial vaginosis in non-pregnant women. *Cochrane Database System revised* 2008; (3): CD006055. doi:10.1002/14651858.CD006055.pub2. PMID 19588379.

23. Donders GG, Zozzika J and Rezeberga, D. Treatment of bacterial vaginosis: what we have and what we miss. *Expert Opinion on Pharmacotherapy* 2014, 15 (5): 645–657.
24. Bradshaw CS, Morton AN, Hocking J, Garland SM, Morris MB. High recurrence rates of bacterial vaginosis over the course of 12 months after oral metronidazole therapy and factors associated with recurrence. *J Infect Dis* 2006, 193: 1478–1786.
25. Beigi RH, Austin MN, Meyn LA, Krohn MA, Hillier SL. Antimicrobial resistance associated with the treatment of bacterial vaginosis. *American Journal of Obstetrics and Gynecology* 2004, 191:1124-1129
26. Holzman C, Leventhal JM, Qiu H, Jones NM and Wang J. Factors linked to bacterial vaginosis in nonpregnant women. *Am J Public Health* 2001, 91: 1664–1670.
27. Hutchinson KB, Kip KE, Ness RB. Vaginal douching and development of bacterial vaginosis among women with normal and abnormal vaginal microflora. *Sex Transm Dis* 2007, 34: 671–675.
28. Payne S, Cromer P, Stanek M and Palmer A. Evidence of African-American women's frustrations with chronic recurrent bacterial vaginosis. *J Am Acad Nurse Pract* 2010, 22: 101–108.
29. Reid G, Beuerman D, Heinemann C and Bruce AW. Probiotic *Lactobacillus* dose required to restore and maintain a normal vaginal Flora. *FEMS Immunol Med Microbiol* 2001, 32(1):37-41.
30. Gardiner GE, Heinemann C, Baroja ML. Oral administration of the probiotic *Lactobacillus rhamnosus* GR-1 and *L. fermentum* RC-14 for human intestinal applications. *International Dairy Journal* 2002, 12 (2-3): 191-196.
31. Morelli L, Zonenenschain D, Del Piano M and Cognein P. Utilization of the intestinal tract as a delivery system for urogenital probiotics. *Journal of Clinical Gastroenterol* 2004, 34 Suppl 2:107-110.
32. Okpalaokaka C and Atenchong N. Perspectives Towards Bacterial Vaginosis Among Nigerian Students. *Infectious Control Tips* 2007.
33. Jessica LM and Hamid R. Adolescent sexual and reproductive health: The global challenges. *International Journal of Gynecology & Obstetrics* 2016, Vol. 131.
34. Evelyn A, Pascual-Viduya M, Rivilla - Manalastas A, Fredrick DN, Fiedler TL, Marrazo JM. Molecular identification of bacterial vaginosis. *N. Engl J Med* 2005, 353: 1899 – 1911.
35. Karasz A and Anderson M. The vagina monologues: women's experiences of vaginal complaints in a primary care setting. *Soc Sci Med* 2003, 56: 1013–1021.
36. Anukam KC, Osazuwa EO, and Reid G. Knowledge of probiotics by Nigerian clinicians. *International Journal of Probiotics and Prebiotics* 2006, 1(1): 57-62
37. Mastromarino P, Vitali B, Mosca L. Bacterial vaginosis: a review on clinical trials with probiotics. *New Microbiol* 2013, 36: 229–238.

38. Homayouni A, Bastani P, Ziyadi S, Mohammad-Alizadeh-Charandabi S, Ghalibaf M, Mortazavian AM. Effects of probiotics on the recurrence of bacterial vaginosis: a review. *J Low Genit Tract Dis* 2014, 18:1.
39. Anukam KC, Osazuwa E, Osemene GI, Ehigiagbe F, Bruce AW, Reid G. Clinical study comparing probiotic *Lactobacillus* GR-1 and RC-14 with metronidazole vaginal gel to treat symptomatic bacterial vaginosis. *Microbes Infect* 2006, 8 (12-13):2772-2776.
40. Anukam KC, Macklaim JM, Gloor GB, Reid G, Boekhorst J, et al. Genome Sequence of *Lactobacillus pentosus* KCA1: Vaginal Isolate from a Healthy Premenopausal Woman. *PLoS ONE* 2013, 8(3):e59239. doi:10.1371/journal.pone.0059239
41. <https://isappscience.org/2017-updates-clinical-guide-probiotic-products-now-available/>