

Bayero Journal of Pure and Applied Sciences, 14(1): 7 - 14 ISSN 2006 – 6996

DISTRIBUTION AND ANTIBIOGRAM OF BACTERIA ASSOCIATED WITH VAGINAL DISCHARGE FROM PATIENTS ATTENDING TURAI YAR'ADUA CHILD AND MATERNITY CENTER KATSINA

¹Ahmad, M. A., ¹Rukayya, K. Y., ¹Mujahid, H., ²Ibrahim, D. and ³Garba, M.R.

¹Department of Microbiology, Umaru Musa Yar'adua University, Katsina
 ² Department of Integrated Science, Federal College of Education, Zaria
 ³ Turai Umaru Yar'adua Maternity and Children Hospital, Katsina
 *Corresponding author: <u>ahmad.abubakar@umyu.edu.ng</u>
 Ahmad, M. A. Orcid ID: <u>https://orcid.org/0000-0003-2546-5253</u>
 Mujahid, H. Orcid ID: <u>https://orcid.org/0000-0002-9725-620X</u>

ABSTRACT

Vaginal discharge remains a great public health concern due to the increased risk of the acquisition of sexually and non-sexually transmitted infections leading to infertility and drug resistance. Several conditions and organisms are associated with the discharge but are underreported especially in local communities (like Katsina). Thus, the study aimed to determine the distribution of bacteria associated with vaginal discharge and their antibiotic susceptibility profile. Conventional methods of bacterial identification were used to identify the organisms and the modified method of Kirby Bauer for the antibiotic susceptibility testing. A total of 101 high vaginal swab (HVS) samples were collected and analyzed, out of which 81 samples showed varying bacterial growth. Staphylococcus aureus, 41 (40.6%), was the most prevalent followed by Escherichia coli, 17 (16.83%), Streptococcus pyogenes, 16 (15.84%) and Proteus mirabilis, 7 (6.93%) with the least occurrence among the isolates identified. The majority of women with abnormal discharge had co-existing gynecological complaints of itching around the vulva and rashes. About 53.09% of the women showed whitish vaginal discharge while 48.15% experienced nonoffensive odour. The highest number of bacteria was recorded among married women (76.54%) followed by Widows (12.35%) and Single (8.64%). S. aureus, the most prevalent Gram-positive isolate was found to be resistant to Ampiclox, Ampicillin, and Chloramphenicol while E. coli (Gram-negative) showed a high level of resistance to Nalidixic acid and Augmentin. In conclusion, lack of personal hygiene, insertion of traditional medicine and other related materials were found to be predisposing factors to abnormal vaginal discharge with a high number of bacteria.

Keywords: Antibiogram, Antibiotics, Prevalence, Resistance, Vaginal discharge/swab

INTRODUCTION

Vaginal discharge caused by microorganisms present in the vaginal environment remains one of the most common gynecological health challenges among females of reproductive age. The discharge is responsible for a disease condition called vaginosis. The human vagina is naturally colonized by diverse micro-biota mostly of the Lactobacillus species serving as normal flora of the environment providing a health benefit to the women through protection and maintaining a balanced pH, but when altered or disrupted, impacts negatively on the reproductive health of women (Olusola et al., 2019).

vaginal infection worldwide that affect women in both developed and developing part of the world (Muzny, 2016). It is estimated that about onethird of the global women population suffers from this polymicrobial syndrome leading to a decreased concentration of beneficial bacteria (e.g. *Lactobacilli*) and an increase in pathogenic bacteria (Bohbot *et al.*, 2012). The dominance of sexually and non-sexually transmitted infectious organisms leads to an imbalance of beneficial bacteria, thus increasing the amount of discharge, colour, and smell with or without irritation, itching and burning sensation in or around the vagina (Amina *et al.*, 2015).

Bacterial vaginosis is known to be a common

Mahdieh *et al.* (2014) reported *Enterococcus, Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Klebsiella spp., Proteus vulgaris, Pseudomonas aeruginosa, Serratia spp.,* and *Candida albicans* to be among the most commonly isolated microbes.

The high prevalence of bacteria in the vagina reported in different parts of the world may be attributed to the use of orthodox and traditional medicine, lack of personal hygiene as well as in limited awareness of the consequences of predisposing behaviors among women especially those in developing regions of the world. As such, this study aimed at identifying the distribution of bacteria associated with vaginal discharge and their antibiotic susceptibility profile among patients attending Turai Yar'adua Maternity and Children Hospital, Katsina, which is one of the most attended hospitals by women of reproductive age in the state.

MATERIALS AND METHODS

Sampling site

The study was conducted at Turai Yar'adua Maternity and Children Hospital, Katsina. The state has a latitude of $12^{0}59'26.95''$ N and a longitude of $7^{0}36'6.37''$, its located within the Northwestern part of Nigeria in the West African sub-regional continent. The state shares a nearby border with the Republic of Niger. The population of Katsina state individuals is estimated to be around 5,801,584, according to the National Population Commission of Nigeria (2006 census).

Inclusion and Exclusion Criteria

Inclusion criteria of the research include women within the reproductive age group attending the facility between May to July 2022 that has not been exposed to any antibiotic treatment during the last seven days of the sample collection. All those under antibiotic medication for seven days or less were excluded.

Determination of Sample size

The minimum sample size (*n*) was estimated using Fischer's Formula ($n = Z^2 pq/d^2$). Where *Z* is the standard normal deviation (1.96) at a 95% confidence interval, *p* is the proportion of the target population estimated to have an abnormal discharge (40.1 %) as reported by Rasheedat *et al.* (2017), *q* is the proportion of failure which is 1.0-*p* and *d* is the degree of accuracy set as 0.05, *n* was calculated to be 87. An additional 14% attrition was included by adding 14 samples thereby giving an approximate sample size of 101. Thus, a minimum sample size of 101 estimated at a 95% confidence interval was collected and used for the research.

Ethical Clearance and Sample Collection

Samples were collected after obtaining ethical clearance and issuance of a questionnaire as well as seeking consent from the authorities and patients respectively. The vaginal the environment was observed for any signs of discharge, colour, smell and consistency. High vaginal swab (HVS) samples were collected by placing the patients in a dorsal position thereby inserting an appropriately sized sterile cotton swab gently into the vagina. The swab was gently removed and aseptically transported to the Microbiology laboratory of Umaru Musa Yar'adua University, Katsina for further investigations.

Identification of Isolates

Microorganisms were identified by their macroscopic, microscopic biochemical and characteristics. Nutrient agar, Chocolate agar, Blood agar and MacConkey agar were prepared according to the manufacturer's instructions and used for the Macroscopic identification of the organisms. The swab sticks were swabbed onto the surface of each agar plate and incubated at 37°C for 24 - 48 hours in aerobic conditions while the chocolate agar was incubated in anaerobic conditions, after which plates were then examined for growth. Plates with visible growth were further sub-cultured until pure cultures of the isolates were obtained. The pure isolates were then identified and characterized by conventional identification techniques of Gram staining for microscopic identification and further subjected to biochemical tests of Catalase, Citrate, Coagulase, Indole, Methyl red (MR), Voges Proskauer (VP), Oxidase, Motility, Urease, Triple Sugar Iron (TSI).

Antibiotic Susceptibility Testing

The antibiotic susceptibility testing of the identified bacteria was determined using the modified Kirby-Bauer diffusion method. Combined antibiotic discs obtained from optun laboratories Nigerian limited were used for the study.

Result analyses and Interpretation

Tables and charts were used to present the results generated while the chi-square test was used to ascertain the statistical association of the variables collected using the Questionnaire. All the results generated from the research were analyzed using Microsoft Excel 2016.

RESULTS

Results obtained from this study revealed that out of the 101 patients studied, *S. aureus* (41%), had the highest occurrence followed by *E. coli* (17%), *S. pyogenes* (16) and *P. mirabilis* (7%) recorded the least occurrence rate as shown in Figure 1.

The results of Socio-demographic characteristics of women studied showed a higher prevalence among women of 21-40 years of age, married (76.54%), full-time housewives (51.81%), urban resident (55.56%) with middle (secondary) educational qualifications (49.38%) as shown in Table 1. Chi-square analysis on the Maternal behavioural factors considered showed that there is a significant association between the numbers of parity in relation to the discharge (P<0.05). It was observed that women engaged in the use of Traditional medicines, underwear and disposable pad have a higher percentage 87.65%, 82.72% 43.32% rate of and respectively as shown in Table 2. The characteristics of the discharge showed that those with white colour (53.09%), watery (46.91%), non-offensive smell (48.15%) and also associated with gynaecological complaints of itching (64.2%) are higher than other characters examined as shown in Table 3.



Figure 1: Distribution of Bacterial species identified among patients with Abnormal vaginal discharge in Turai Yar'adua Maternity and Children Hospital, Katsina.

Variable (n= 101)	Frequency of th	e Isolates	X ² , df.	P- value
	Abnormal Vagin	al Discharge		
	Present (%)	Absent (%)		
	(n=81)	(n=20)		
Age			7.06, 3	0.07
18-20	9 (11.11)	2 (10.00)		
21-30	28 (34.56)	12 (60.00)		
31-40	32 (39.50)	2 (10.00)		
41-Above	12 (14.81)	4 (20.00)		
Marital status			2.93, 3	0.40
Married	62 (76.54)	12 (60.00)		
Single	7 (8.64)	4 (20.00)		
Widow	10 (12.35)	3 (15.00)		
Divorced	2 (2.47)	1(5.00)		
Occupation			1.42, 3	0.70
Civil servant	12 (14.81)	1 (5.00)		
Business	16 (19.75)	4 (20.00)		
Full-time Housewife	42 (51.81)	12 (60.00)		
Others	11 (13.58)	3 (15.00)		
Residence			0.59, 1	0.44
Urban	45 (55.56)	13 (65.00)		
Rural	36 (4.44)	7 (35.00)		
Education level			3.96, 3	0.27
None/primary	22 (27.16)	8 (40.00)		
Secondary	40 (49.38)	5 (25.00)		
Tertiary	12 (14.81)	4 (20.00)		
Others	7 (8.64)	3 (15.00)		
Total	81 (80.2)	20 (19.8)		

 Table 1: Socio-demographic characteristics of women attending Turai Yar'adua Maternity

 and Children Hospital, Katsina, Katsina State.

Variable (n=101)	Freque	ncy	X ² , df	P- Value
	Abnormal Vaginal Discharge			
	Present (%)	Absent(%)		
	(n=81)	(n=20)		
Parity				
0	9 (11.11)	4 (20)	12.20, 3	0.006*
1-2	20 (24.69)	9 (45)		
3-6	43 (53.68)	2 (10)		
> 7	9 (11.11)	5 (25)		
Use of traditional			0.79, 1	0.37
medicines				
Yes	71 (87.65)	16 (80)		
No	10 (12.35)	4 (20)		
Use of Under			1.14, 2	0.57
wears				
Yes	67 (82.72)	15 (75)		
No	5 (6.17)	1 (5)		
Not always	9 (11.11)	4 (20)		
Type of Pad use			2.54, 2	0.28
Disposable	44 (43.32)	12 (60)		
Reuse	12 (14.81)	5 (25)		
Both	25 (30.86)	3 (15)		
Total	81(80.2)	20 (19.8)		

Special Conference Edition, June, 2023 Table 2: Maternal factors of women attending Turai Yar'adua Maternity and Children Hospital, Katsina, Katsina State

 Table 3: Features of Abnormal Vaginal Discharge among Women Attending Turai
 Yar'adua Maternity and Children Hospital, Katsina State.

Variable (n=101)	Frequency		X ² , df	P - value
	Abnormal Vagina	al Discharge		
	Present (%)	Absent(%)		
	(n=81)	(n=20)		
Colour				
White	43 (53.09)	11(55)	0.93, 3	0.82
Yellow	23 (28.4)	4 (20)		
Clear	2 (2.47)	1 (5)		
No discharge	13 (12.87)	4 (20)		
Odour			3.29, 3	0.35
Fishy	14 (17.28)	2 (10)		
offensive	15 (18.52)	7 (35)		
Non-offensive	39 (48.15)	7 (35)		
No discharge	13 (16.05)	4 (20)		
Consistency			1.79, 3	0.62
Watery	38 (46.91)	9 (45)		
Clear	6 (7.41)	0 (0)		
Thick	24 (29.63)	7 (35)		
No discharge	13 (16.05)	4 (20)		
Gynecological			1.57, 3	0.67
Complain				
Itching	52 (64.2)	15 (75)		
Rashes and itching	21 (25.93)	3 (15)		
Itching and redness	2 (2.47)	1 (5)		
None	6 (7.41)	1 (5)		
Total	81(80.2)	20 (19.8)		



Figure 2: Antibiotic Susceptibility Profile of the identified Gram-positive Isolates (n=57) Key:



Figure 3: Antibiotic susceptibility Profile of the identified Gram-negative Isolates (n=24) Key:

PEF = Reflacine, CPX = Ciprofloxacin, NA = Nalidixic acid, AU = Augmentin, PN = Ampcilin, CN = Gentamicin, S = Streptomycin, OFX = Tarivid, SXT = Septrin, CEP= Ceporex.

DISCUSSION

The incidence of vaginal discharge, infection and antimicrobial resistance among the aetiologic agents are matters of public health concern and thus this study was conducted to determine the prevalence, percentage rate and antibiogram of bacteria associated with vaginal discharge among 101 patients attending Turai Yar'adua Maternity and Child Hospital, Katsina between the period of May to July 2022. The most prevalent bacteria associated with the vaginal discharge found in this study are *Staphylococcus* (41%), aureus Escherichia coli (17%), Streptococcus pyogenes (16%) and Proteus *mirabilis* (7%). Several studies and reviews have described bacteria to be the most predominant organisms associated with vaginal discharge (Rajnit *et al.*, 2018; Majigo *et al.*, 2021). But the review of Uwakwe *et al.* (2018) showed fungi especially the *Candida* genus to be the most predominant specie causing vaginal discharge. Similarly, this study agrees with the work of Adena *et al.* (2017) which identifies *E. coli, S. pyogenes, S. aureus*, and *P. mirabilis* from sample vaginal discharge with a higher frquency among *S. aureus* (40.6%) and *E. coli* (16.8%) respectively.

Out of the 101 patients used in this study and grouped based on some demographic criteria, 81 (80.2%) samples were found to be positive and 20 (19.8%) were negative. This finding agrees with the findings of Oparaugo et al. (2022) who carried out a cross-sectional study on vaginitis prevalence among Women of Reproductive age in Lagos, Nigeria. Their study reported that 81% of the total samples analyzed were positive for the infection and 19% negative. Although in another study conducted by Adane et al., (2017) across the sub-Saharan countries of Kenya, Botswana and Zimbabwe, lesser prevalences of 37%, 38% and 32.5% respectively were reported. The prevalence variations reported from other studies when compared to this study may be attributed to the differences in the study population, methods and criteria adopted in detecting the vaginosis infection (Majigo et al., 2021).

The highest prevalence rate of 32 (39.50%) and 28 (34.56%) was recorded among the patients within the age range of 31-40 and 21-30, but the lower prevalences of 9 (11.11%) and 12 (14.81%) among the age range of 18-20 and 41 above. The observed differences may be a result of hormonal and physiological variation among the women at varying age frames, coupled with sexual activities. Many studies showed that women within the age group of 20 to 40 years are sexually more active because their reproductive structure tends to be more enhanced which aids in hormonal enhancement thereby producing more estrogen (Irene et al., 2023). On the other hand, women below the age group of 20 or above 40 normally have an elevation of pH which causes a decline in the estrogen level. Lower pH and estrogens levels aid in creating an optimal environment for the growth of organisms other than the normal flora. The finding in this study agrees with the work of Sahoo et al. (2018) that reported a 39.2% prevalence rate among the 26 - 35 years age group and also the findings of Uzoh et al. (2017) that reported (38.5%) among the women of 20-29 years in Southern part of Nigeria. Hitherto, the findings contradict the studies of Oparaugo et al. (2022) who reported a higher prevalence rate of (57.1%) among the age group of women of less than 21 years.

Furthermore, the study revealed that married women had a higher prevalence of 73.3% of vaginal discharge when compared with unmarried with 26.7% with a p-value difference of 0.40. These findings agree with the studies carried out by Abdullateef *et al.* (2017) that recorded a 90.6% prevalence among married women when compared with the unmarried. But in contrast with studies by Al-Mamari (2020) and

Ranjit et al. (2018) that reported 74.4% and 24.2% prevalence of the infection from the unmarried women against the married. Generally lack of sexual activities or on the other hand safe and hygienic sexual practices do not have a clear impact in the occurrence of vaginal discharge, because there some cases of 18% prevalence rate among women that have never had sex as reported by Koumars et al. (2017). This proofs that; vaginal discharge can also occur due to the presence of some other predisposed risk factors rather than sexual activities alone.

More so, the infection was found to be higher among the full-time housewives at 51.81% compared to the working class and other women with a significant p-value of (P=0.70). Women residing in urban areas were observed to have a higher prevalence rate of 55.56% than those living the rural areas (P= 0.44). This report agrees with the work of Oparaugo et al. (2022), which reported an 82.6% prevalence of vaginal discharge among women living in urban areas. Looking at the educational perspective, it was observed that those with secondary school qualifications only have a higher prevalence of 49.38% than those with primary tertiary and other qualifications. A study conducted by Achondou (2016), reported a significant level of Vaginal discharge in association with a low level of education. This may be because in so many environments especially in developing countries, those in lower social class are tagged with a high risk of sexual behaviours leading to an increase in reproductive tract infections. More so, in contrast to this study, Oparaugu et al. (2022) reported a higher prevalence of the infection (82.6%) among women with tertiary school education than others. Thus, may be justified by the fact that people in tertiary schools are sexually more active due to their age and other demographic conditions allowing predisposed/increased vulnerability to sexual activities thereby making them more prone to infections.

There were no significant differences between the parity levels of the participant in relation to the infection, it can be deduced that single or multiple births do not pose a risk of infections. However hygienically it was observed that a high prevalence rate was recorded among the participant that uses traditional medicine and underwear (87.65%) and (82.72%). It is widely known that the frequent use of few underwear without proper and adequate cleaning can increase the chances of acquiring urethral itching and discharge, due to the socioeconomic status of the community, many of the participants are low-income earners which

makes some of the basic hygienic items unaffordable. More so, many people within the study community tend to be using traditional medicines as sexual enhancers, douching agents or even engaged in intravaginal practices. This concoction may disrupt the microbial flora of the environment thereby vaginal causing an imbalance within the flora that may pave the way for the thriving of pathogenic organisms, leading to urinary tract infection which at some points is associated with or lead to female genital discharge. The findings can be supported by the report of Irene et al. (2023) who described that a high rate of disturbance of normal genital microbial flora can lead to the proliferation of pathogenic organisms. Also, the research of Abdullateef et al. (2017) reported that vaginal douching can be among the prevailing risk factors associated with vaginal discharge, depending on the frequency and nature of the douching agent.

Generally, the study also observes the nature, colour odour and consistency of the discharge, it was observed that 46.91% of the discharge was white in colour, watery in nature with a non-offensive odour. And gynecological complaints of itching were recorded from 64.2% of the patients, though in some a combined effect of itching and redness or itching and rashes were recorded. This report is in agreement with the work of Woelbe *et al.* (2020); Sravani (2020) and the review work of Sofiyah and Andarwuan

REFERENCES

- Abdullateef, R.M., Ijaiya, M.A., Abayomi, F., Adeniran, A.S. & Idris, H. (2017). Bacterial vaginosis: Prevalence and associated risk factors among nonpregnant women of reproductive age attending a Nigerian tertiary hospital. *Malawi Medical Journal*, 29 (4): 290-293
- Achondou, A.E., Fumoloh, F.F., Aseneck, A.C., Awah, A.R and Utokoro, A.J. (2016). Prevalence of bacterial vaginosis among sexually active women attending the CDC central clinic Tiko, South West Region, Cameroon. *Afr J Infect Dis*; 10(2):96-101
- Adane. B., Yeshiwork. A., Delayehu. B., and Amete. M. (2017). Prevalence of Bacterial Vaginosis and Associated Risk Factors among Women Complaining of Genital Tract Infection Hindawi *International Journal of Microbiology.*, Article ID 4919404, 8 paghttps://doi.org/10.1155/2017/49194 04.
- Al-Mamari. A.(2020). Determining the prevalence of bacterial vaginosis &

(2021), who all reported itching to be the most common symptom of a clinical vaginal discharge. The antibiotic susceptibility profile of the identified isolates showed varying average resistance (zone of inhibition) to the used antibiotics. The gram positive organisms (*S. pyogenes* and *S. aureus*) showed almost similar resistance patterns with the average highest resistance (largest zone of inhibition) recorded to Ampicillin and the lowest to ciprofloxacin. Conversely, among the gram negative bacteria (*E. coli* and *P. mirabilis*). the highest zones of inhibition (resistance) was recorded to Nalidixic acid while the lowest was to reflacine in *E. coli* and gentamicin among *P. mirabilis*

CONCLUSION

This study found the most prevalent bacteria associated with the vaginal discharge to be *Staphylococcus aureus* (41%), *Escherichia coli* (17%), *Streptococcus pyogenes* (16%) and *Proteus mirabilis* (7%) among women with vaginal discharge attending Turai Yar'adua child and maternity center Katsina with the highest frequency documented among the married women (76.54%) with several gynecological disorders among different individuals. The isolates also showed varying resistance pattern to the tested antibiotics. Thus, appropriate measures must be ensured to curtail the incidence of the vaginitis and its associated threats within the population.

vulvovaginal candidiasis among married and unmarried women & evaluating the association socio-demographic risk factors & symptoms-related variables in women attending gynecology clinic in hargeisa group hospital, hargeisa city, Somaliland. *Open Journal of Medical Microbiology*, 10, 114-128

- Irene, V.R. Sajeeth, C.I. Karthikeyan, V. & Sabitha, J. (2023). Assessment of Risk Factors for Developing Vulvovaginal Candidiasis Among Women at Various Age Groups. *Biosciences Biotechnology Research Asia*. 20(1), 359-365
- Majigo, M.V., Kashindye, P., Mtulo, Z. & Joachim, A. (2021) Bacterial Vaginosis, the Leading Cause of Genital Discharge among Women Presenting with Vaginal Infection in Dares Salaam, Tanzania. *African Health Sciences*, 21, 531-537.
- Oparaugo, C.T., Iwalokun, B.A., Nwaokorie, F.O., Okunloye6, N.A., Adesesan, A.A., Edu-Muyideen, I.O. Adedeji, A.M., Ezechi, O.C. & Deji-Agboola, M.A. (2022). Occurrence and Clinical Characteristics of Vaginitis among

Women of Reproductive Age in Lagos, Nigeria. *Advances in Reproductive Sciences*, 10, 91-105

- Ranjit. E., Raghubanshi, B.R Maskey, S. & Parajuli, P. (2018). Prevalence of Bacterial Vaginosis and Its Association with Risk Factors among Nonpregnant Women: A Hospital Based Study. *Hindawi International Journal of Microbiology*.Article ID 8349601,
- Sahoo, S., Mohanty, I., Parida, B. and Patnaik, S. (2018) Prevalence of Vulvovaginal Candidiasis in Sexually Active Females with Antifungal Susceptibility Patterns of the Isolates. *International Journal of Clinical and Biomedical Research*, 4, 38-41.
- Sofiyah, S. and Andarwuan, S. (2021). Literature Review: the effect of using non-herbal panty liners on abnormal vaginal discharge in adolescents girls. *Basic and Applied Nursing Research Journal*, 2(2), 60-64.
- Sravani, J.S.G. (2020). Clinicomicrobiological spectrum of abnormal discharge from vagina in women in costal Anndhra

Pradesh. *International Journal of Reproduction, contraception, obstetrics and gynecology*, 10(1), 150-153.

- Uwakwe, K.A., Iwu, A.C., Obionu, C.N., Duru, C.B., Obiajuru, I.C and Madubueza, U.C. (2018). Prevalence, pattern and predictors of Abnormal Vaginal Discharge among women attending Heal Care Institutions in Imo State, Nigeria. *Journal of community Medicine and Primary Health Care*, 30(2), 22-35.
- Uzoh, C.V., Iheukwumere, I.H., Umezuruike, K.C and Onyewenjo, S.C. (2017). Prevalence of Candida Albicans among Women Attending Federal Medical Centre Asaba, Delta State, Nigeria. *International Journal of Biochemistry and Biotechnology*,6, 735-739.
- Woelber, L., Prieska, K., Mendling, W., Schmalfeidt, B., Tietz, H.J. and Jaeger, A. (2020). Vulvar Pruritus- Causes, Diagnosis and Therapeutic approach. *Deutsches Arzteblatt International*, 117, 126-133.