

## Incidence of Vaginal Infections among Females of Different Age Categories in Delta State, Nigeria

Felix Oghenemaro Enwa<sup>1\*</sup>, Augustina Oghenevwaerhe Jewo<sup>2</sup>, Levinson Obaro Oyubu<sup>3</sup>, Collins Ohwonigho Adjekuko<sup>4</sup>, Victor Effiong<sup>1</sup>

<sup>1</sup>Department of Pharmaceutical Microbiology and Biotechnology, Faculty of Pharmacy, Delta State University, Abraka, Nigeria.

<sup>2</sup>Department of Microbiology, Faculty of Science, Delta State University, Abraka, Nigeria.

<sup>3</sup>Department of Science Laboratory Technology, Faculty of Science, Delta State University, Abraka, Nigeria.

<sup>4</sup>Department of Biological Sciences, Faculty of Science, University of Delta, Agbor, Nigeria.

### Abstract

The purpose of this research is to ascertain the prevalence of vaginal infections among females in Delta State across various age groups. Samples from female patients at Delta State's Central Hospitals and from women who visited private labs in Sapele, Abraka, Eku, and Oghara were used in the research. In order to detect vaginal infection, urine and higher vaginal swabs (HVS) were collected from 500 female subjects who had clinical signs of vaginitis. 88% of women had infected vaginal illnesses. A total of six (6) organisms were identified, namely; *Staphylococcus* spp., (54%; n=270), *Pseudomonas aeruginosa* (18%; n=90), *Streptococcus* sp., (16%; n=80), *Klebsiella* spp. (14%; n=70), *Candida* sp. (12%; n=60), and *Escherichia coli* (6%; n=30). 12% of the samples were not infected. Of the 500 samples examined, 120 (24%) samples had mixed infections, while 76% (n = 380) had a single infection. Age-wise distribution of the prevalence of vaginal infection reveals that a total of 90 samples were within the age group; of 14–19, with 66.7% appearing positive, 300 samples were within the age group of 20–30 years, with 96.76% (290) being positive, 110 samples were above the age of 30 years, with 81.8% (90) being positive. In this research, vaginal infections were very common. The age range of 20 to 30 years has a higher incidence of vaginal infections.

**Keywords:** Vaginitis, Age, *Candida*, *E. coli*, *Klebsiella*, *Staphylococcus*

**Corresponding author:** Felix Oghenemaro Enwa

**E-mail** ✉ [felixenwa@delsu.edu.ng](mailto:felixenwa@delsu.edu.ng), [felixenwa@yahoo.com](mailto:felixenwa@yahoo.com)

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**How to Cite This Article:** Enwa FO, Jewo AO, Oyubu LO, Adjekuko CO, Effiong V. Incidence of Vaginal Infections among Females of Different Age Categories in Delta State, Nigeria. Bull Pioneer Res Med Clin Sci. 2022;1(1):18-23.

### Introduction

The most prevalent health issue affecting women is vaginal infection, which has been related to a wide range of grave health risks. It is referred to as vaginitis in medicine and is a prevalent gynecologic disorder that accounts for 10 million doctor visits annually in Nigeria [1]. Normal mucous discharge from the female vagina keeps the vagina clean and moist. This common secretion is clear, odourless, and doesn't irritate. The existence of vaginal infections, or vaginitis, an inflammation or

infection of the vagina, is suggested by a deviation from this norm [2]. According to reports, one of the most prevalent gynecologic conditions for which women seek treatment is vaginal infection (vaginitis). In addition to having serious consequences like a greater risk for STDs, vaginitis can be a sign of possible sexual abuse [3]. Vaginitis prevalence has been linked to a number of risk variables, including age, sexual activity, and sexual behaviour. Studies have shown that vaginitis has a detrimental impact on women's quality of life, with some

voicing anxiety, shame, and hygiene concerns, especially in those who experience recurrent symptoms [4].

### *Significance of the study*

Management of vaginal infections is based on the presenting aetiological agent. Thus, this study will provide information on the various aetiological organisms responsible for vaginal infections which will aid in early recognition and treatment of the infection.

### *Background of the study*

One of the most frequent gynaecological issues seen in both general medicine and gynaecological practice is vaginal infection [5]. The annual number of office appointments attributable to vaginitis ranges between 5 and 10 million [6]. Any irritation or infection of the vagina is referred to as vaginal infections, or vaginitis, in medical terminology. It affects women of all ages, with one-third of them experiencing vaginitis at some point in their lifetimes [7]. The muscular passageway between the uterus and the exterior genital region is known as the vagina. Vaginitis can happen when the vaginal walls swell up as a result of an irritant upsetting the delicate balance of the vaginal region [6]

Normal mucous discharge from the female vagina keeps the vagina clean and moist. This common secretion is clear, odourless, and doesn't irritate. A deviation from this pattern, however, denotes vaginitis, an illness or inflammation of the vagina [2]. Alterations of the normal vaginal condition are favoured by various factors including poor genital-anal hygiene, new or multiple sexual partners (regardless of the frequency of sexual intercourse), bathing in swimming pools or bathtubs, pregnancy, diabetes, parasitosis, urinary or faecal incontinence, stress, congenital malformations of the genital tract, frequent use of antibiotics, hormones, use of oral topical contraceptive preparations, vaginal medications, immunological deficiency, wearing tight clothing, smoking, presence of herpes simplex virus 2 (HSV-2) antibodies, and changes in the normal microbial flora such as a loss of production of H<sub>2</sub>O<sub>2</sub> by lactobacilli [8].

According to Sim *et al.* 2020 and Ranjit *et al.* (2018), vaginal symptoms like discharge, odour, itching, irritation, or a burning feeling, as well as discomfort, are the most common complaints among patients who visit obstetrics and gynaecology clinics [9, 10]. However, some vaginal infections have few or no signs at all [11]. According to Mondeja *et al.* (2010), 20–62% of women of reproductive age experience vaginal infections, and about 20% of these cases are the outcome of changes brought on by birth control pills or antibiotics [8]. According to Martinez *et al.* (2018), between 24% and 37% of VIs are sexually transmitted, and 21.5 to 54.4% of them impact pregnant women [8].

Vaginal inflammation, or vaginitis, is brought on by a variety of infectious and non-infectious causes [12]. Vaginitis has been classified based on the cause, with the three most prevalent kinds being: Candida or "yeast" infection, bacterial vaginosis, and Trichomoniasis vaginitis [7]. A common health issue for women is vaginal disease, including bacterial vaginosis, candidiasis, and trichomoniasis [11]. There were many different types of pathogenic organisms found in the vaginal microflora. The preponderance of vaginal infections in women of reproductive age is caused by bacterial vaginosis, candidiasis, and trichomoniasis, respectively [13]. The findings of various studies conducted to determine how frequently the most prevalent infectious agents for vaginitis occur have varied. Between 8% and 75% of cases of BV, 2.2% to 30% of cases of VVC, and 0% to 34% of cases of trichomoniasis were found to be prevalent [7].

## **Materials and Methods**

### *Study area*

The study was undertaken using samples collected from females visiting the Central Hospitals and private laboratories spread across Sapele, Abraka, Eku and Oghara, Delta State.

### *Collection of samples*

A sample of 500 female individuals who had vaginal symptoms was taken. 500 pee and higher vaginal swabs (HVS) samples were collected from patients following the instructions in Cheesbrough, 2005 [14] (for the HVS samples).

### *HVS samples and urine samples culture*

The Nutrient, sabouraud dextrose and blood agar were prepared and sterilized in an autoclave (Clifton, England) at 121°C for 15 minutes. Thereafter the media were poured aseptically into plates after cooling to 45°C. Following collection, the urine and HVS samples were cultured on agar plates using the streak plate technique and incubated for 24 hours at 37°C.

### *Identification of micro organisms*

The organisms obtained after using the streak plate method were then isolated in pure culture by picking a colony of each organism and inoculating it using flamed wire loop on nutrient agar slants. These slants then served as reservoir of the organisms obtained from each sample and was used for identification using the standard identification procedures of Cultural characteristics, Gram stain reaction and biochemical methods such as catalase, coagulase, indole, sugar fermentation test, simmons citrate and hydrogen sulphide test.

### Cultural characteristics (morphology)

#### a. Growth on solid media (plate culture)

The pattern of growth of the organisms on plate cultures were examined to determine the similarity to those recorded in approved literatures.

#### b. Growth on differential media

The growth pattern and colour of the colonies on McConkey agar were observed to ascertain whether the collected organisms were lactose fermenters or not. It was specifically used to identify and confirm the presence of *Escherichia coli*.

Also the growth pattern and colour of the colonies on Mannitol agar were observed. This was done specifically to differentiate *Staphylococcus aureus*, a mannitol fermenter from *Staphylococcus epidermis* which does not ferment mannitol.

The growth pattern and colour of colonies on blood agar were also observed to identify *Streptococci* spp. [15].

### Staining reactions

The clinical isolates were stained using the Gram Staining Technique developed by Christian Gram in 1884. A clean slide was wiped with cotton wool containing methylated spirit to remove grease. Thereafter, a flame-sterilized bacteriological wire loop was used to touch the top of a colony which is then emulsified with sterilized distilled water on the slide until a smooth homogenous suspension was obtained. The slide was allowed to dry completely in air and the organisms fixed to the slide by passing it twice over a Bunsen flame and placed to cool on a staining rack over a sink. The organisms were first flooded with crystal violet (BDH, England) for 30 seconds and washed off with slow-flowing water. The film was then treated with lugol iodine (Fischer Company, USA) to fix the stain to the cell for 1 minute. The slide was washed with alcohol and counter-stained with saffranine for 2 minutes. The secondary dye was washed off slowly with water and the slide was allowed to dry in air before examination. The slides were mounted and examined under the microscope, first under a low power objective (to select a suitable field) and then under the oil-immersion objective.

### Biochemical reactions

#### i. Indole test

1.5g of peptone water was dissolved in 100mls of water and autoclaved at 120°C for 15 minutes. 5ml of the medium was transferred using a pipette into sterilized bottles, inoculated with the test organisms and incubated for up to 24 hours. After incubation, the culture broth was then added with 3–5 drops of Kovac's reagent (isoamyl alcohol, para dimethylaminobenzaldehyde, and concentrated hydrochloric acid), and the existence or absence of a red ring at the reagent layer of the medium's

surface was checked. A red ring signifies a positive test when it's present.

#### ii. Hydrogen sulphide test

Lead acetate paper strips are used for the detection of hydrogen sulphide production by microorganisms. 1.5g of peptone water was dissolved in 100mls of water and autoclaved at 121°C for 15 minutes. 5ml of the medium was transferred using a pipette into sterilized bottles and inoculated with the test organisms. Lead acetate paper strips were then immersed between the plug and the inner wall of the bottle, covered and incubated at 35-37°C for 24 hours. The blackening of the paper strips indicates a positive test.

#### iii. Simmons citrate test

The simmons citrate agar was prepared by dissolving 2.43g in 100ml of water and autoclaved at 121°C for 15 minutes. It was cooled to 45°C, poured on plates and allowed to solidify. After which the organisms to be tested were then inoculated on the plates by streaking using flame sterilized wire loop and incubated for 24hours. A blue colouration indicates a positive test. As described by Oghenemaro *et al.* 2021 [15].

## Results and Discussion

**Table 1.** Prevalence of Organisms Diagnosed from Urine and HVS Samples

Infective Organism	No. of females examined	No. of positive samples
<i>Staphylococcus</i> spp	500	270(54%)
<i>Streptococcus</i> spp.	500	80(16%)
<i>Escherichia coli</i>	500	30(6%)
<i>Kliebsella</i> spp.	500	70(14%)
<i>Pseudomonas aeruginosa</i>	500	90(18%)
<i>Candida</i> sp.	500	60(12%)
None	500	60(12%)

The table above shows the prevalence of organisms diagnosed from urine and HVS samples of females. The prevalence of infected vaginal infection from this study was 88%. A total of six (6) organisms were identified namely; *Staphylococcus* spp, *Streptococcus* spp., *Escherichia coli*, *Kliebsella* spp., *Pseudomonas aeruginosa* and *Candida* sp. 12% (n=60) of the samples examined were devoid of infectious organisms, thus were not infected. The most prevalent organism identified was *Staphylococcus* spp., (54% n=270), which is closely followed by *Pseudomonas aeruginosa* (18%; n=90), *streptococcus* sp., (16%; n=80), *Kliebsella* spp. (14%; n=70), *Candida* sp. (12%; n=60). The least prevalent organism identified was *Escherichia coli* (6%; n=30).

**Table 2.** Mixed and Single Infections in Urine and HVS Samples

No of samples examined	No with mixed infections	No with single infections
500	120(24%)	380(76%)

The table above shows the prevalence of mixed and single infection. Of the 500 samples examined, a total of 120 (24%) samples had mixed infections (more than one infectious organisms), while 76% (n=380), had single infection.

**Table 3.** Prevalence of Infection in Relation to Age

Age	No. of Female samples	No. of Positives	No. of Negatives
14-19	90	60(66.7%)	30(33.3%)
20-30	300	290(96.76%)	10(3.3%)
Above 30	110	90(81.8%)	20(18.2%)
<b>Total</b>	<b>500</b>	<b>440(88%)</b>	<b>60(12%)</b>

The table above shows the distribution of infection in relation to age. 90 females samples were within the age group; 14-19, with 66.7% appearing positive. 300 samples examined were within the age group of 20-30 years, however, 96.76% (290) were positive. A total of 110 samples examined were above 30 years of age, with 81.8% (90) being positive. The overall prevalence of vaginal infection was 88% (n=440). Age group of 20-30 years were more represented in this study, and had the highest prevalence of vaginal infection, followed by those above 30 years, with the least being 14-19 years.

Vaginal infection is a widespread gynecological problem among females, especially reproductive females. The aim of this study was to determine the prevalence of vaginal infection among females and evaluate the age-wise distribution.

According to the study's results, females in the community under study had vaginal infections at a high prevalence of 80%. Al-Mamari (2020), who claimed a prevalence of 74%, made a similar finding [5]. A prevalence of 81% among female students at the University of Calabar was also found by Lennox *et al.* in 2013. By Bhargava *et al.* (2016), a lower prevalence of 46.96% was found [12]. Both established and developing nations struggle with a serious public health issue related to vaginal infections. The effects of females' high vaginitis prevalence have not gotten enough focus.

Vaginal infection is a widespread gynecological problem among females, especially reproductive females. The aim of this study was to determine the prevalence of vaginal infection among females and evaluate the age-wise distribution.

The results of this research have demonstrated that females in the community under study have vaginal infections, with a prevalence of 80%. Al-Mamari [7] (2020), who reported a prevalence of 74%, found findings that were comparable. Additionally, 81% of female students at the University of Calabar were affected, according to Lennox *et al.*'s (2013) [16] study. Bhargava *et al.* (2016) found a lower prevalence of 46.96% [17]. Both in established and developing nations, vaginal infections are a significant public health issue. There hasn't been enough focus on the effects of the high incidence of vaginitis in women.

Six (6) aetiological agents were found in this study's community, including *Staphylococcus* species, *Streptococcus* species, *Escherichia coli*, *Klebsiella* species, *Pseudomonas aeruginosa*, and *Candida* (61) species. *Gardnerella vaginalis*, *Lactobacillus* species, *Streptococcus agalactiae*, *Candida albicans*, *C. tropicalis*, and *C. glabrata* are some of the organisms that Al-Mamari (2020) discovered [7].

Six (6) aetiological agents were found in this study's community, including *Staphylococcus* (62) species, *Streptococcus* species, *Escherichia coli*, *Klebsiella* species, *Pseudomonas aeruginosa*, and *Candida* species. Organisms isolated by Al-Mamari (2020) [7] include *Gardnerella vaginalis*, *Lactobacillus* spp., *Streptococcus agalactiae*, *Candida albicans*, *C. tropicalis*, and *C. glabrata*. In this current study, the most prevalent organism identified was *Staphylococcus* spp. (54%; n = 270), which is closely followed by *Pseudomonas aeruginosa* (18%; n = 90), *Streptococcus* sp., (16%; n = 80), *Klebsiella* spp. (14%; n = 70), and *Candida* sp. (12%; n = 60). The least prevalent organism identified was *Escherichia coli* (6%; n = 30). Of the organisms, the majority were bacteria, while one was yeast. Thus, bacterial vaginosis and vulvovaginal candidiasis were responsible for vaginal infection, with bacterial vaginosis being the most prevalent. This is similar to the findings of Martinez *et al.* (2018), who reported vaginal infections due to bacteria as the most common cause [8]. Bhargava *et al.* (2016) also reported that the majority of those with vaginal infections had bacterial vaginosis [17]. Al-Mamari (2020) stated that BV was the second most common infection, coming in at 43 (29%), and that VVC was the most common, with 68 (49%). According to Lennox *et al.* (2013) [13], 180 people (35.29%) had bacterial vaginosis, whereas 330 (64.71%) had candidiasis. No trichomoniasis cases were found in the current research. Al-Mamari (2020) provided a summary that was comparable. Alli *et al.* (2011) and Kamara *et al.* (2000) did find a 2% incidence of trichomoniasis [18].

Pathogens resulting in vaginal infections may occur as single infections or as co-infections (mixed infections). In this study, a total of 120 (24%) samples had mixed infections (more than one infectious organism), while

76% (n = 380) had a single infection. Atting *et al.*, (2018) also reported the presence of co-infection in the pathogenesis of vaginal infections [1]. Lennox *et al.* (2013) reported a prevalence of 51% single infections and 19% mixed infections. Bhargava *et al.*, (2016) reported the prevalence of mixed infection to be 18.1%.

In this present study, age-wise distribution of the prevalence of vaginal infection was carried out. A total of 90 samples were within the age group 14–19, with 66.7% appearing positive. A total of 300 samples examined were within the age group of 20–30 years, however, 96.76% (290) were positive. A total of 110 samples examined were above 30 years of age, with 81.8% (90) being positive. 88% of women (n = 440) had vaginal infections overall. The age range from 20 to 30 years had the greatest prevalence of vaginal infection in this research, followed by those over 30 years, with 14 to 19 years having the lowest prevalence. Similar findings were earlier reported by Al-Mamari (2020), who found that married women between the ages of 21 and 35 had a significantly higher incidence of vaginal infections. The outcome was comparable to that reported by Gibney *et al.* (2001) in Nigeria, who discovered that women between the ages of 26 and 30 had the highest incidence of vaginal infection. According to Attinge *et al.* (2018), people between the ages of 16 and 30 had the greatest prevalence of infections. According to Lennox *et al.* (2013), respondents between the ages of 21 and 25 had the greatest prevalence of the infection (76.36%). According to Bhargava *et al.* (2016), vaginitis was more prevalent in women aged 20–29 (56.1%). The greatest prevalence may be related to the age group of 21 to 35 years being the most reproductively active and having a high rate of sexual exposure. Nayak *et al.* (2020), however, found the opposite results, stating that women between the ages of 36 and 45 were more likely to experience vaginal infections [15].

## Conclusion

It has been investigated how common vaginal diseases are. This research found a high prevalence of vaginal infections. In this study, vaginal infections were more common in women aged 20 to 30. The majority of the samples examined were obtained from females in the age range of 20–30 years. This could possibly infer that vaginal symptoms are more common in this age group.

## Recommendations

Based on the findings of this study, the following recommendations are given:

Females should be educated on the risk factors associated with vaginal infections.

Further studies should assess factors that increase susceptibility to vaginal infections in the same population.

**Acknowledgments:** None

**Conflict of interest:** None

**Financial support:** It was funded by the Department of Pharmaceutical Microbiology and Biotechnology, Delta State University, Abraka.

**Ethics statement:** Ethical clearance was obtained from the Research and Ethics Committee, Faculty of Science, Delta State University, Abraka, Nigeria at the meeting held on 3rd October, 2022. Ref: REC/FOS/DEL/22/03/10.

## References

1. Atting IA, Christopher MA, Onwueze IA, Opara KN. Aetiologic Agents of Vaginitis in Sexually Active Women in a Traditional Sprawling Town in the Niger Delta, South–South Nigeria. *Asian J Med Health.* 2018;13(1):1-9.
2. Okiki PA, Amiegheme NE, Oyinloye J. Evaluation of microorganisms associated with vaginal infections in Owo, Nigeria. *Adv Appl Sci Res.* 2015;6(9):79-83.
3. Adams JA, Farst KJ, Kellogg ND. Interpretation of medical findings in suspected child sexual abuse: An update for 2018. *J Pediatr Adolesc Gynecol.* 2018;31(3):225-31.
4. Bilardi JE, Walker S, Temple-Smith M, McNair R, Mooney-Somers J, Bellhouse C, et al. 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(9):e74378.
5. Baek JC, Jo HC, Lee SM, Park JE, Cho IA, Sung JH. Prevalence of Pathogens and Other Microorganisms in Premenopausal and Postmenopausal Women with Vulvovaginal Symptoms: A Retrospective Study in a Single Institute in South Korea. *Medicina.* 2021;57(6):577.
6. Brown H, Drexler M. Improving the Diagnosis of Vulvovaginitis: Perspectives to Align Practice, Guidelines, and Awareness. *Popul Health Manag.* 2020;23(S1):S3-S12. doi:10.1089/pop.2020.0265
7. Al-Mamari A. Determining the Prevalence of Bacterial Vaginosis & 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 J Med Microbiol.* 2020;10(3):114-28.
8. Martínez JF, Muñoz AP, Otálvaro AF, González JD, Vergara SM. Risk factors associated to vaginal infections and squamous intraepithelial lesions in university students in Medellín, Colombia. *Enferm Glob.* 2018;(50):97-106.
  9. Sim M, Logan S, Goh LH. Vaginal discharge: evaluation and management in primary care. *Singapore Med J.* 2020;61(6):297-301. doi:10.11622/smedj.2020088
  10. Ranjit E, Raghubanshi BR, Maskey S, Parajuli P. Prevalence of Bacterial Vaginosis and Its Association with Risk Factors among Nonpregnant Women: A Hospital Based Study. *Int J Microbiol.* 2018;2018:8349601. doi:10.1155/2018/8349601
  11. Mondeja A, Diana L, Almanza Martínez C, Fernández Limia O. Diagnosis and prevalence of vaginalis infection. *Rev Cuba Obstet Ginecol.* 2010;36(2):62-103.
  12. Abdul-Aziz M, Mahdy MA, Abdul-Ghani R, Alhilali NA, Al-Mujahed LK, Alabsi SA, et al. Bacterial vaginosis, vulvovaginal candidiasis and trichomonal vaginitis among reproductive-aged women seeking primary healthcare in Sana'a city, Yemen. *BMC Infect Dis.* 2019;19:1-0.
  13. Yenidunya S, Hatlas H, Bayrak R. To determine of the prevalence of Bacterial Vaginosis, Candida sp, mixed infections (Bacterial Vaginosis+ Candida sp), Trichomonas Vaginalis, Actinomyces sp in Turkish women from Ankara, Turkey. *Ginekol Pol.* 2012;83(10):744-8.
  14. Cheesbrough M. *District Laboratory Practice in Tropical Countries, Part 2.* Cambridge University Press, 2005 - Medical - 440 pages.
  15. Oghenemaro EF, Oise IE, Cynthia D. The Effects of Securinega Virosa Leaves on Methicillin-Resistant Staphylococcus Aureus (MRSA). *Int J Pharm Res Allied Sci.* 2021;10(2):29-34.
  16. Cummins Jr JE, Christensen L, Lennox JL, Bush TJ, Wu Z, Malamud D, et al. Mucosal innate immune factors in the female genital tract are associated with vaginal HIV-1 shedding independent of plasma viral load. *AIDS Res Hum Retroviruses.* 2013;22(8):788-95. doi:10.1089/aid.2006.22.788
  17. Bhargava D, Kar S, Saha A, Saha M. Prevalence of vaginitis in females attending National medical college and teaching hospital, Birgunj, Nepal. *Indian J Med Res Pharm Sci.* 2016;3(7):39-43.
  18. Alli JA, Okonko IO, Odu NN, Kolade AF, Nwanze JC. Detection and prevalence of Candida isolates among patients in Ibadan, Southwestern Nigeria. *J Microbiol Biotech Res.* 2011;1(3):176-84.