Detection and Prevalence of Genital Pathogens among Attendees of Sti Clinic of a Tertiary Care Hospital in Ibadan, Southwestern Nigeria

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Abstract: This study aimed at detecting and determining the prevalence of genital pathogens among attendees of sexually transmitted infections (STIs) clinic of a tertiary care hospital in Ibadan, Southwestern Nigeria. One hundred consecutive patients (43 males and 57 females) who attended the STI clinic of a tertiary care hospital at Ibadan, with one or more of the complaints as enunciated by WHO in its syndromic approach for the diagnosis of STIs, were included as subjects. Detailed history, demographical data and clinical features were recorded and screened for common STIs by standard microbiological methods. Samples of urethral swab (for the males), endocervical and high vaginal swab (for the females) were collected per patients and processed using standard laboratory procedures for the isolation of genital isolates. The results obtained were analysed using SPSS 17.0 statistical methods. Majority came with the complaint of genital discharge (18 males; 20 females), followed by candidiasis (7 females), gonococcal urethritis (5 males), haematuria and infertility (3 males, 3 females), PID (2 females) and dysuria (1 female) while 22.0% did not state their clinical presentations and 19.0% came for check ups. Though no Trichomonas vaginalis was detected in the samples examined; Neisseria gonorrhoeae, Gardnerella vaginalis, Klebsiella species and Escherichia coli was found in the same proportion (25.0% respectively). In conclusion, this study showed a high prevalence of genital bacterial infection. The genital colonization by these isolates (Neisseria gonorrhoeae and Gardnerella vaginalis) among the patients was high (25.0%), thus, emphasizing the importance of routine screening of patients thereby assisting in prevention of bacterial STIs.

Key words: Antibiotics • Pathogens • Genital colonization • STI • Nigeria

INTRODUCTION

Many organisms such as Neisseria gonorrhoea, Chlamydia trachomatis, Gardnerella vaginalis, Treponema pallidum, Trichomonas vaginalis etc. has been incriminated as etiological agents of Sexually Transmitted Diseases (STDs). Sexually transmitted diseases (STDs) are a group of infectious or communicable diseases in which the primary mode of transmission is through sexual contact and are among the major causes of illnesses in the world, especially in the developing countries [1]. STDs are classified according to the type of organism causing the infection, which could be bacterial, fungal, viral or of parasitic origin [2]. Some of the common sexually transmitted diseases include: Bacterial vaginosisis, herpes, Chlamydia, trichomoniasis, gonorrhoea, Hepatitis B virus, HIV and syphilis [2]. More than 25 infectious organisms are transmitted primarily through sexual activity and studies reveal that STDs are among the many related factors that affect the broad continuum of reproductive health [3].

Sexually transmitted infections (STIs), continue to present major health, social and economic problems in the developing world, leading to considerable morbidity, mortality and stigma [4]. The prevalence rates apparently are far higher in developing countries where STI treatment is less accessible [4]. Gonococcal infections have existed as sexually transmitted diseases since early times and have never been regarded as intractable diseases [5]. In Japan, the numbers of gonococcal infections,
including those resistant to antimicrobial therapy, have gradually increased since the mid-1990s [5]. *Neisseria gonorrhoeae*, the causative agent of the sexually transmitted infection, gonorrhoea, is an obligate human pathogen that primarily colonizes the urogenital tract [6]. *Neisseria gonorrhoeae* is the aetiological agent of gonorrhoea of sexually transmitted infection in the world, which remains a global public health problem. Most worryingly, *N. gonorrhoeae* has developed high-level resistance to all antimicrobials used in the traditional treatment of gonorrhoea, for example penicillins, tetracyclines and fluoroquinolones [7-8]. Surveillance of gonococcal antimicrobial resistance and the molecular characterization of the mechanisms underlying these resistance phenotypes are essential in order to establish correct empirical therapies, as well as to describe the emergence of new mechanisms in local bacterial populations [9]. However, *Chlamydia trachomatis* is the most common cause of sexually transmitted infection in the world [10]. Other pathogens that make up vaginitis are *Candida albicans* (Candidiasis), *Trichomonas vaginalis* (Trichonomiasis) and Bacterial vaginosis [10].

Bacterial vaginosis (BV) is a clinical entity that is characterized by a change in vaginal ecology whereas the normal flora of lactobacillus morphotypes is replaced by a mixed microbial flora consisting of anaerobes and *Gardnerella vaginalis* [11]. The changes in vaginal ecosystem (decreasing number of H₂O₂ producing *Lactobacillus* spp. and increasing number of *Mobiluncus* spp., *Gardnerella vaginalis*, *Atopobium vaginae*, *Prevotella* spp., *Mycoplasma hominis*, *Peptostreptococcus* spp.) appears to be a major cause of bacterial vaginosis (BV) [12]. Bacterial vaginosis is also associated with infectious complications in pregnant and non-pregnant women and increasing risk of STI [12].

Bacterial vaginosis is the single entity caused by many organisms including *Gardnerella vaginalis*, *Mobiluncus* spp, *Mycoplasma hominis*, *Bacteroides* spp, Gram positive anaerobic cocci (*Peptococcus* and *Peptostreptococcus*) species [10, 13]. These organisms and other sexually transmitted pathogens are associated with high risk for HIV infection [14] by causing genital lesions which facilitate viral entry or by increasing the number of target cells for HIV (activated monocytes) [10]. *Gardnerella vaginalis* is a marker for a variety of infections caused by different bacteria including aerobic and anaerobic streptococci and staphylococci. The normal microbial flora of the vagina plays an important role in preventing genital and urinary tract infections in women [11]. Microflora is replaced largely by *Gardnerella vaginalis* in women with BV.

Paramount in control of transmission of sexually transmitted infections (STIs) is their prompt recognition and appropriate treatment [15]. In countries whereas definitive diagnoses are difficult, a ‘syndromic approach’ to management of STIs is recommended and practiced, yet many STIs have common symptoms or are asymptomatic and therefore go undetected and untreated [15]. This is of particular concern with the recognition that HIV transmission is increased with co-existent STIs: the attributable risk for each STI varying with the prevalence within a particular population. Hence, HIV public health prevention approaches must include STI preventative strategies to be effective [15]. Even then, microbiological screening is incorporated into STI control strategies; lack of access to appropriate services (especially in rural and remote areas), reluctance of at-risk populations to attend for treatment, fear of invasive genital examinations and lower sensitivities of conventional diagnostic assays reduces the effectiveness of such programmes. Therefore, accurate, cost-effective, reliable diagnostic assays (preferably those which can be used in the field) are needed to impact on the incidence of the various STIs, as well as HIV [15].

The availability of baseline information on the epidemiology of sexually transmitted infections (STIs) and other associated risk behaviours is essential for designing, implementing and monitoring successful targeted interventions [4]. Also, continuous analysis of risk assessment and prevalence-based screening studies are necessary to evaluate and monitor the performance of syndromic management [4]. This study aimed at detecting and determining the incidence of isolates of genital infection among patients attending special treatment clinic at UCH in Ibadan, Nigeria.

**MATERIALS AND METHODS**

**Study Area:** The study was carried out in the municipal area of Ibadan, which is made up of five local government areas. Ibadan city lies 3°5' E and 7°23' N. The city is characterized by low level of environmental sanitation, poor housing and lack of potable water and improper management of wastes especially in the indigenous core areas characterized by high density and low income populations.

**Study Population:** One hundred consecutive patients (47 males and 53 females) of different ages and socioeconomic status, who attended the STI clinic of a tertiary care hospital in Ibadan, with one or more of the complaints as enunciated by WHO in its syndromic
approach for the diagnosis of STI [4] were included as subjects. Followed up patients and asymptomatic patients were excluded from the study. Detailed history, demographical data and clinical features were recorded from all the patients. Other relevant information of all participants was obtained using a proforma, especially designed for this purpose. All were screened for common STIs by standard microbiological methods [4, 16].

**Specimen Collection:** Urethral swab, high vaginal swab (HVS) and endocervical swab (ECS) were collected from males and females, respectively and subjected to direct examination by wet preparation, Gram staining and culture plate inoculation at the Department of Medical Microbiology & Parasitology, UCH, Ibadan. Gram stain was carried out on both ECS and HVS and examined with 100x objective under oil immersion for Gram negative diplococci and clue cells.

**Isolation and Identification of Neisseria gonorrhoea:** Urethral swab, high vaginal swab (HVS) and endocervical swab (ECS) specimens were inoculated into blood agar and Thayer Martin agar (prepared as described by Thayer and Martin, 1966) while HVS specimens were inoculated into blood agar [Biotec, Ipswich, UK]. A presumptive diagnosis of gonococcal infection was made on observing polymorphonuclear leucocytes (PMNLs) with Gram-negative intracellular diplococci (ICDC). If the smear showed five or more PMNLs in the absence of Gram-negative ICDC, a presumptive diagnosis of nongonococcal urethritis (NGU) was made in men [4, 16]. For the isolation of Neisseria gonorrhoeae, swabs were directly inoculated on the chocolate agar plate containing vancomycin, colistin and amphotericin-B and incubated in 5-10% carbon dioxide for 24-48 h. Isolates were identified as N. gonorrhoeae on the basis of colony morphology, Gram staining, oxidase test and rapid carbohydrate utilization test (RCUT) [4, 16].

**Isolation and Identification of Gardnerella vaginalis:** This was carried according to the methods of Cheesbrough [16]. Gardnerella vaginalis was identified by a combination of Gram staining reaction and the pH of the discharge. The wet preparation showed abundance of ‘clue cells’ [squamous epithelial cells whose surfaces were smothered with masses of micro-organisms], the pH of the saline preparation was found to vary between 5.0 - 5.6 [i.e. higher than normal pH of 3.0 - 4.5] when measured with a pH indicator paper (BDH, UK) and in a Gram stain of positive cases, the normal lactobacilli flora was almost or completely replaced with masses of Gram variable organisms. Submitted specimens were inoculated onto enriched blood agar (EBA) (tryptic soy agar base [Difco, Detroit, Mich.] supplemented with 5% defibrinated sheep blood [Cleveland Scientific, Bath, Ohio], 1% horse serum [BBL, Becton Dickinson, Cockeysville, Md.] and 1% yeast extract [GIBCO Laboratories, Lawrence, Mass.]), on phenyl ethanol agar (BBL) supplemented with 5% sheep blood and on MacConkey agar (Difco). Specimens were also cultured in thioglycollate supplemented with 1% hemin (Sigma Chemical Co., St. Louis, Mo.) and 1% vitamin K (Sigma). The EBA and phenyl ethanol agar plates were incubated for 96 h at 35 to 37°C in a 5% CO₂ environment. The MacConkey agar and thioglycollate were incubated aerobically at -5 to 37°C for 24 and 96 h, respectively. Nonhemolytic colonies appearing on EBA after 48 h of incubation were subcultured onto EBA for further characterization. A commercial bacterial identification system (Rapid STREP bacterial identification system; Analytab Products, Inc., Plainview, N.Y.) was used to identify gram-negative to gram-variable bacilli that were catalase and oxidase negative. Additional tests, which have been used as a means of identifying G. vaginalis included detection of hemolysis on media containing sheep, rabbit, or single- or bilayer human blood; susceptibility to metronidazole, sulfisoxazole and sodium polyanetholesulfonate (SPS). Enriched blood agar was used to detect hemolysis of sheep blood. Tryptic soy agar base (Difco) supplemented with 5% defibrinated rabbit blood (Cleveland Scientific), 1% yeast extract (BBL) and 1% horse serum (GIBCO) was used to detect hemolysis of rabbit blood. Human blood-Tween (HBT) agar (BBL) was used to detect diffuse beta-hemolysis on bilayer human blood agar. Vaginalis agar (BBL) was used to detect diffuse beta-hemolysis on single layer human blood agar.

**Isolation and Identification of Other Isolates:** The High vaginal swabs collected were inoculated onto sheep blood agar, Todd-Hewitt broth containing colistin (10 micrograms/ml) and nalidixic acid (15 micrograms/ml) and Neomycin-Nalidixic tryptic-soy blood agar and incubated at 35°C -37°C for 16-48 hours inside candle extinction jar (or CO₂ incubator). The isolates were identified to species level by conventional biochemical tests, which have been used as a means of identifying G. vaginalis included detection of hemolysis on media containing sheep, rabbit, or single- or bilayer human blood; susceptibility to metronidazole, sulfisoxazole and sodium polyanetholesulfonate (SPS). Enriched blood agar was used to detect hemolysis of sheep blood. Tryptic soy agar base (Difco) supplemented with 5% defibrinated rabbit blood (Cleveland Scientific), 1% yeast extract (BBL) and 1% horse serum (GIBCO) was used to detect hemolysis of rabbit blood. Human blood-Tween (HBT) agar (BBL) was used to detect diffuse beta-hemolysis on bilayer human blood agar. Vaginalis agar (BBL) was used to detect diffuse beta-hemolysis on single layer human blood agar.

**Wet Preparation and Identification of Trichomonas vaginalis:** This was carried according to the methods of Cheesbrough [16]. The nature of the collected samples was noted such as the colour, consistency and odour; the samples were then put in 0.3 mL of sterile physiological
saline. Wet mounts of all swab samples were made in sterile normal saline on clean slides and examined under the low power (10x) and high power (40x) magnifications for *Trichomonas vaginalis*. The resulting suspension was put on a clean slide, covered with a cover slip and examined immediately under the microscope. A smear of the secretion was also made on a slide, air dried and fixed in absolute methanol for 1 min. Diluted Giemsa stain and Leishman’s stain was poured on the smear and allowed to stain for 10 min after which it was washed, air dried and examined under the microscope. The smears were examined immediately by direct illumination for motile Trichomonads. *Trichomonas vaginalis* was identified by its characteristics morphology and darting motility as described by Cheesbrough [16]. The *Trichomonas vaginalis* has a jerky movement and stains blue with Leishman’s stain.

**Data Analysis:** The proportions were calculated for various syndromes and disease prevalence. The results were analyzed using the $\chi^2$-test, with the level of significance set at $p < .05$.

### RESULTS

A total of 100 patients presented different types of STDs at the STC of the University College Hospital, Ibadan, Southwestern Nigeria. Table 1 shows demographical profile of the subjects and their clinical presentations. The age of subjects ranged from <20 to >30 years, 35.0% of them was in the age group of 21-30 years and 31.0% of them did not disclose their age. Fifty-three percent (53.0%) of the subjects were female, while 43.0% were males and the female-to-male ratio was 2:1. Forty-eight percent of the subjects (48.0%) were married at the time of presentation while 30.0% were single. Seventy-five percent (75.0%) of the subjects had one sexual partner while 14.0% had multiple sexual partners. Twenty-nine percent (29.0%) of the male subjects had one sexual partner and 10.0% had multiple sexual partners. In contrast, most of the female subjects (46.0%) had one sexual partner. The intervals from the last sexual intercourse to the onsets of symptoms that brought the subjects to the clinic varied from 1 to 35 days with the mean at 18 days. From Table 1, it can be deduced that

<table>
<thead>
<tr>
<th>Clinical presentation</th>
<th>No. Tested (%)</th>
<th>No. Males (%)</th>
<th>No. Females (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaginitis/vaginal discharge</td>
<td>20(20.0)</td>
<td>00(0.0)</td>
<td>20(100.0)</td>
</tr>
<tr>
<td>Urethral itching/discharge</td>
<td>18(18.0)</td>
<td>18(100.0)</td>
<td>00(0.0)</td>
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<tr>
<td>Candidiasis</td>
<td>07(7.0)</td>
<td>00(0.0)</td>
<td>07(100.0)</td>
</tr>
<tr>
<td>Gonococcal urethritis</td>
<td>05(5.0)</td>
<td>05(100.0)</td>
<td>00(0.0)</td>
</tr>
<tr>
<td>Haematuria</td>
<td>03(3.0)</td>
<td>00(0.0)</td>
<td>03(100.0)</td>
</tr>
<tr>
<td>Infertility</td>
<td>03(3.0)</td>
<td>03(100.0)</td>
<td>00(0.0)</td>
</tr>
<tr>
<td>P.I.D.</td>
<td>02(2.0)</td>
<td>00(0.0)</td>
<td>02(100.0)</td>
</tr>
<tr>
<td>Dysuria</td>
<td>01(1.0)</td>
<td>00(0.0)</td>
<td>01(100.0)</td>
</tr>
<tr>
<td>Check ups</td>
<td>19(19.0)</td>
<td>10(52.6)</td>
<td>09(47.4)</td>
</tr>
<tr>
<td>Not stated</td>
<td>22(22.0)</td>
<td>11(50.0)</td>
<td>11(50.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>No. Tested (%)</th>
<th>No. Males (%)</th>
<th>No. Females (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20</td>
<td>10(10.0)</td>
<td>01(10.0)</td>
<td>09(90.0)</td>
</tr>
<tr>
<td>21-30</td>
<td>35(35.0)</td>
<td>18(51.4)</td>
<td>17(48.6)</td>
</tr>
<tr>
<td>31 and above</td>
<td>24(24.0)</td>
<td>12(50.0)</td>
<td>12(50.0)</td>
</tr>
<tr>
<td>Not stated</td>
<td>31(31.0)</td>
<td>14(45.2)</td>
<td>17(54.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital status</th>
<th>No. Tested (%)</th>
<th>No. Males (%)</th>
<th>No. Females (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>48(48.0)</td>
<td>17(35.4)</td>
<td>31(65.6)</td>
</tr>
<tr>
<td>Single</td>
<td>30(30.0)</td>
<td>18(60.0)</td>
<td>12(40.0)</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>22(22.0)</td>
<td>12(54.5)</td>
<td>10(45.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sexual relationship</th>
<th>No. Tested (%)</th>
<th>No. Males (%)</th>
<th>No. Females (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sexual partner</td>
<td>01(1.0)</td>
<td>00(0.0)</td>
<td>01(100.0)</td>
</tr>
<tr>
<td>One sexual partner</td>
<td>75(75.0)</td>
<td>29(38.7)</td>
<td>46(61.3)</td>
</tr>
<tr>
<td>Multiple sexual partner</td>
<td>14(14.0)</td>
<td>10(71.4)</td>
<td>04(28.6)</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>10(10.0)</td>
<td>08(80.0)</td>
<td>02(20.0)</td>
</tr>
<tr>
<td>Total</td>
<td>100(100.0)</td>
<td>47(47.0)</td>
<td>53(53.0)</td>
</tr>
</tbody>
</table>
Table 2: Frequency and distribution of genital isolates from patients at the Special Treatment Clinic, University College Hospital, Ibadan, Southwestern Nigeria

<table>
<thead>
<tr>
<th>Isolate</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neisseria gonorrhoeae</td>
<td>2(25.0)</td>
</tr>
<tr>
<td>Klebsiella species</td>
<td>2(25.0)</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>2(25.0)</td>
</tr>
<tr>
<td>Gardnerella vaginalis</td>
<td>2(25.0)</td>
</tr>
<tr>
<td>Trichomonas vaginalis</td>
<td>0(00.0)</td>
</tr>
<tr>
<td>Total</td>
<td>8(100.0)</td>
</tr>
</tbody>
</table>

20.0% of the subjects presented with vaginitis/vaginal discharges, 18.0% presented with urethral itching/urethral discharges, 7.0% had candidiasis, 5.0% gonococcal urethritis, 3.0% had haematuria and infertility, 2.0% had PID and 1.0% had dysuria while 22.0% did not state their clinical presentations and 19.0% came for check ups.

Majority of the patients came with the complaints of discharge (20 females), followed by urethral itching/urethral discharges (18 males) as shown in Table 1. The prevalence of various STIs based on laboratory tests has been shown in Table 2. Genital herpes (IgM HSV-2) accounted for the maximum number of STI (86/300) followed by syphilis (71/300), genital wart (60/300), gonorrhea (58/300) and chlamydial infection (49/300). In all, 35% had more than one STI concomitantly at the time of presentation.

Table 2 shows the frequency of occurrence and the distribution of genital isolates recovered from patients at the Special Treatment Clinic, University College Hospital, Ibadan, Southwestern Nigeria. A total of 8 isolates were detected, isolated and identified in this study (Table 2), of which 2(25.0%) were N. gonorrhoeae, Klebsiella spp., E. coli and G. vaginalis. T. vaginalis was not detected in any the samples.

**DISCUSSION**

Gonorrhea is the most prevalent sexually transmitted disease (STD) in Nigeria [17]. Available data show that sexually transmitted diseases constitute great medical, social and economic problems in Nigeria [17]. In fact, in 1963, WHO found Lagos to have the highest gonorrhea rate in the world. Recent surveys report gonorrhea prevalence to be as high as 28.1% [17]. Most of the specimen collected contains polymorphonuclear neutrophils which show the evidences of bacteria infections. Bacteria agents were isolated and it was noted that genital infection increases as a result of sexual contacts, socio-economic status and the degree of promiscuity of the population studied [18]. This agrees with the findings of this study. Majority of the patients studied were within the working age of 21 to 40 years (55.0%), which is also the sexually active age and this will definitely affect the work force of the nation.

There is an increase in the prevalence of gonorrhea among girls, mostly due to sociocultural factors such as the belief that sexual intercourse with a girl who has urethritis cures the condition [17]. Gonorrhea is not always the most common form of urethritis, however. For example, in a study in Ibadan, 61% of male urethritis cases had nonspecific urethritis [17]. Most women at STD clinics have vaginitis and vaginal discharge [17]. Kehinde and Lawoyin [19] reported 16.7% prevalence for nongonococcal urethritis/cervicitis and 2.8% for gonorrhoea among special treatment clinic attendees in Ibadan, Nigeria. Vaginal discharge is one of the most common clinical complaints among women of reproductive age in many parts of the world. Most women at STD clinics have vaginitis and vaginal discharge [17]. In this study, only 10.0% of the females who presented with vaginitis/vaginal discharges had G. vaginalis colonization. This is comparable to what has been earlier reported [20]. According to Shazia et al. [21], Alteration in balance of normal vaginal organisms can cause the overgrowth of the bacteria that creates vaginal discharge. It is common among sexually active women yet there still remain gaps in our knowledge of this infectious disorder [21].

Microorganisms recovered from the subjects with features of infection include; E. coli (25.0%), Klebsiella spp. (25.0%), N. gonorrhoeae (25.0%) and G. vaginalis (25.0%). This is higher than the value reported in other studies. Anorlu et al. [22] reported a prevalence of 12.1% for E. coli among women in Lagos University Teaching Hospital, Lagos, Nigeria. Anorlu et al. [22] also reported a prevalence of 1.4% for Neisseria gonococcus among women in Lagos University Teaching Hospital, Lagos, Nigeria. Aboyeji and Nwabusi [23] reported prevalence of N. gonorrhoeae to be 1.3% among pregnant women in Ilorin, Nigeria. Sobngwi-Tambekou et al. [24] in an intention-to-treat analysis reported a prevalence rate of N. gonorrhoeae among intervention and control groups in South Africa to be 10.0% and 10.3% respectively. Usanga et al. [1] reported the prevalence of N. gonorrhoeae to be 5.2% among pregnant women in Calabar, Nigeria. Zero prevalence (0.0%) was reported by Rao et al. [25] in a rural setup. Also in other studies, White et al. [26] reported the prevalence of N. gonorrhoeae infection to be 9.8% among T. vaginalis positive female patients and 5.9% for T. vaginalis negative patients in USA. Mehta et al. [27] reported the incidence of infection due to N. gonorrhoeae to be 3.48 cases per 100 person-years among men in Kisumu, Kenya.
N. gonorrhoeae is one of the bacteria isolated from patients with sexually transmitted diseases [5]. Most of the STIs, both ulcerative and nonulcerative, are prevalent in Nigeria and constitute one of the major public health problems. Their profile varies with changes in socioeconomic, cultural, geographic and environmental factors prevalent in different parts of the country [28-29]. Gardnerella vaginalis was isolated simultaneously from urethral specimens of two gonorrhea patients. Variable patterns and routes of gonococcal infection have recently been discovered in individual patients, suggesting that specimens for bacterial isolation should be taken not just from one site but from various sites that might be infected [30]. This method may contribute to the successful treatment and epidemiological investigation of gonococcal infections [30]. However, the availability of baseline information on the epidemiology of STIs and other associated risk behaviors remains essential for the designing, implementing and monitoring successful targeted interventions [29].

Gardnerella vaginalis was first described by Gardner and Dukes in 1955 after it was isolated from women with nonspecific vaginitis [31]. Since that time, G. vaginalis has been isolated from many different human sources and there have been numerous reports describing the identification and characterization of G. vaginalis [32]. In the majority of these reports, identification of G. vaginalis was based on growth and biochemical characteristics. Also, several criteria were recommended for its identification. These include colonial and cellular morphology, catalase and oxidase reactions, hippurate hydrolysis, lack of hemolysis on sheep blood agar and diffuse betahemolysis on HBT agar [32]. Using these criteria, we found that two human isolates gave a presumptive identification of G. vaginalis. As has been reported for human isolates, growth of G. vaginalis was not observed until after 48 h of incubation and was observed only on blood agar plates incubated in a CO₂ environment [32,33]. Also in accordance with reported biochemical reactions of human isolates of G. vaginalis, considerable variation in fermentation reactions for the equine isolates of G. vaginalis was observed [32]. However, on the basis of similarities in cellular and colonial morphology and in some biochemical reactions, it was concluded that G. vaginalis had been isolated from the genital tracts of these subjects.

In this study, prevalence of G. vaginalis was found to be 25.0%. This is higher compared to what was reported in previous studies in Nigeria and outside Nigeria. Azargoon and Darvishzadeh [34] detected bacterial vaginosis in 16.0% of pregnant women. Murta et al. [35] reported 23.6% prevalence rate for Gardnerella vaginalis among women with human papilloma virus (HPV) infection among women in Brazil. A prevalence of 3.9% was reported by Aboyeji and Nwabuisi [23] among pregnant women in Ilorin, Nigeria. The 25.0% reported in this study is higher than the 17.0% reported by Adinma et al. [36] among Nigerian women; the 19.8% reported by Adad et al. [37] in 1988 and the 15.9% in 1998 among women in Uberaba, Brazil; the 18.8% prevalence rate reported by Anorlu et al. [22] among women in LUTH, Lagos, Nigeria; the 16.0% reported by Azargoon and Darvishzadeh [34] among pregnant women in Sennan, Iran; the 7.08% incidence rate reported by Nai et al. [38]; and 24.5% reported by Nwankwo et al. [39] among females of reproductive age in Kano, Nigeria.

However, the 25.0% reported for G. vaginalis in this study is lower than the 86% prevalence rate reported by Fernández-Limia et al. [20]; the 68.0% and 40.0% reported by Oyewole et al. [40] among HIV-infected and non-infected women in Sagemu, Ogun state, Nigeria respectively; and the 26.0% reported by Nwadioha et al. [41] among women in Aminu Kano Teaching Hospital, Kano, Nigeria; the 28.0% reported by Shazia et al. [21] among women at Ayub Teaching Hospital, Abbottabad, Pakistan; the 26.05% reported by Rao et al. [25] among in a rural setup in India; and the 25% in Nepal [42]. However, the prevalence of G. vaginalis in this study was much higher than some other published reports [39, 43, 44]. It is higher than the 0.9% prevalence rate reported by Usanga et al. [1] among non-pregnant women in Calabar, Nigeria; and comparable to the 2.1% prevalence rate reported by Usanga et al. [1] among pregnant women in Calabar, Nigeria.

That G. vaginalis is particularly associated with bacterial vaginosis has been reported [45, 46]. Though, no colonization G. vaginalis was found among subjects who presented with urethral itching/urethral discharges, candidiasis, gonococcal urethritis, haematuria and infertility, PID and dysuria and those who came for check ups; the involvement of microorganisms in infertility and pregnancy associated problems has long been widely described [46]. Although some workers have reported isolation of G. vaginalis from semen samples [47], its actual involvement in infertility and or pregnancy-related complications has not yet been very explicitly highlighted [46]. Generally, it does appear that the probable role of G. vaginalis infection in infertility and pregnancy may not be contrary to the established adverse effects of sexually transmitted infections (STI) [46]. This calls for special attention since hitherto; G. vaginalis have not been among the targeted organisms suspected to be critical in infertility and pregnancy complications [46].
There is no association between the colonization rate of STI agents and age and sex of the subjects. This is also comparable to the findings of some previous studies in Nigeria and outside Nigeria. Mehta et al. [27] showed that the incidence did not differ by circumcision status as a time-dependent variable or a fixed variable based on assignment. Mehta et al. [27] also showed that risks for incident STIs included an STI at enrollment, multiple sex partners within <30 days and sexual intercourse during menses in the previous 6 months; and that condom use was protective. Mehta et al. [27] showed that circumcision of men in Kisumu, Kenya did not reduce their risk of acquiring these nonulcerative STIs. Improved STI control will require more-effective STI management, including partner treatment and behavioral risk reduction counseling.

In our study, the peak age group of patients ranges from 20 to 30 years (62%) and vast majority of them were male (64%), thus constituting the major bulk of the STI patients. Also, majority of the male patients had promiscuous behavior as 71.4% of males had multiple sexual partners, suggesting that professional prostitution still remains the main source of STI among men having promiscuous behaviour [1]. Studies have also showed that adolescent with earlier debut tend to have multiple sexual partners per unit time [48]. Also in our study, multiple symptoms were seen in some of patients. This is a matter of concern in the context of HIV transmission as genital ulcer facilitates the transmission of and enhances susceptibility to HIV infection by sexual contact while nonulcerative STIs like gonorrhea and chlamydia increase shedding of the HIV virus in the genital tract by recruiting HIV-infected inflammatory cells as part of normal host response [1].

A marked increase in bacterial STIs has been reported from different regions of Nigeria. This is deviation from what was reported by from different regions of India [1]. They reported a marked decline in bacterial STIs, resulting in an apparent increase in viral STIs from different regions of India [1, 28, 49]. Our study confirmed a similar pattern of higher incidence of bacterial STIs which could be due to the increased usage of antibiotics. Previous studies from different parts of the country have also supported these observations [1, 49].

In conclusion, bacterial STIs constitute the major burden of the STI clinic and enhance the susceptibility of an individual to acquire or transmit infections through sexual contact. Detection and treatment of STI may be important strategies in reducing human immunodeficiency virus (HIV) transmission through sexually transmitted infection control. The importance of routine screening especially among the young is advocated. It is recommended that routine screening for STDs should be incorporated into antenatal care.

REFERENCES


