Innovations

Prevalence of Sexually Transmitted Infections among Women in South-South Nigeria

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Abstract

Background: *Every day, one million sexually transmitted infections (STIs) are acquired worldwide. STIs have anfegative impact on women's health, as they are linked to cervicitis, urethritis, pelvic inflammation, reproductive health issues, and poor pregnancy outcomes. This study aims to determine the prevalence of sexually transmitted infections among Nigerian women.* ***Method:*** *The study design was cross sectional analytic, carried out among sexually active women in Orhuwhorun community in Udu Local Government Area of Delta State. Multi-stage sampling technique was employed to recruit 230 women from May to June 2021. Vaginal swabs were collected by trained nurses using the flobam female collection kit with the aid of disposable speculum. Data analysis was done with SPSS v. 25.0.* ***Result****: Two hundred and thirty women of mean age 41.08 years (SD ± 8.45) were enrolled. The overall STI prevalence rate was 62.3% and presence of multiple STI was 20.2%. Of the 228 samples analyzed, 225(98.7%) were negative for neisseria gonorrhea while 3(1.3%) were positive. For chlamydia trachomatis, 219(96.1%) were negative while 9(3.9%) were positive. Over half of the samples 125(54.8%) were positive for ureaplasma spp while 103(45.2%) were negative. For mycoplasma hominis, 177(77.6%) were negative while 51(22.4%) were positive. Regarding herpes simpex virus type 2, 221(96.9%) were negative while 7(3.1%) were positive.* ***Conclusion****: STIs are among the top five disease categories for which individuals seek medical attention, and they have a significant influence on sexual and reproductive health globally. It is, therefore, very vital that promotion campaigns among women and their spouses are heightened.*

Keywords: *sexually transmitted infections, prevalence, south-south Nigeria.*

Introduction

In communities, sexually transmitted infections (STIs) are a widespread health problem. Every day, one million sexually transmitted infections are acquired

worldwide.[1] The World Health Organization estimated that 376.4 million new infections with frequently curable STIs [Trichomonas vaginalis (TV), Treponema pallidum (TP), Chlamydia trachomatis (CT), and Neisseria gonorrhoeae (NG)] occurred over the world in 2016.[2] Women have a high burden of TV (11, 8%) and CT (5, 0%) across Africa, which contributes for 69 million new infections of curable STIs.[2] STIs have a negative impact on women's health, as they are linked to cervicitis, urethritis, pelvic inflammation, reproductive health issues, and poor pregnancy outcomes.[3]

More than 30 different bacteria, viruses, and parasites are responsible for sexually transmitted infections (STIs), which are mostly transmitted through sexual intercourse, including vaginal, anal, and oral sex. Skin-to-skin sex may facilitate the transmission of some STIs. Additionally, non-sexual methods like the transfer of tissue and blood products might spread the STI-causing microbes. During pregnancy and childbirth, several STIs, such as chlamydia, gonorrhea, hepatitis B, HIV, HPV, HSV2, and syphilis, can also be passed from mother to child. STIs are among the top five disease categories for which individuals seek medical attention, and they have a significant influence on sexual and reproductive health globally. Chlamydia, gonorrhea, syphilis, and trichomoniasis are the four sexually transmitted infections that around 500 million individuals worldwide contract each year. HSV2 affects more than 530 million people worldwide. One of the most prevalent STIs, HPV infection affects more than 290 million women worldwide. STIs can have negative effects that go beyond the symptoms of the infection.

• Some STIs can more than triple the chance of contracting HIV.
• Stillbirth, neonatal mortality, low birth weight, preterm, sepsis, pneumonia, neonatal conjunctivitis, and congenital abnormalities are all possible outcomes of mother-to-child transmission of STIs. Every year, 305 000 fetal and neonatal fatalities are attributed to syphilis during pregnancy, and 215 000 infants have an increased chance of dying from congenital illness, preterm, or low birth weight.
• Each year, HPV infection results in 275 000 deaths from cervical cancer and 530 000 new cases of the disease.
• STIs such as gonorrhoea and chlamydia are major causes of pelvic inflammatory disease, adverse pregnancy outcomes and infertility.

Numerous microorganisms that might lead to genital disease are found in great numbers in the complicated, humid environment of the female reproductive tract. To what extent these species cooperate to contribute to disease pathogenesis or compete with one another is still completely unclear. Additionally, it is unclear which species are harmful and which ones preserve human health. A large percentage ofcervical cancer cases are caused by a range of sexually transmitted disease (STD) pathogens, indicating that STD pathogens are crucial in promoting

HR-HPV carcinogenesis.[4] According to studies, exposure to specific STD bacteria may lower immunity, cause immune evasion, and raise the risk and severity of HR-HPV infection.[5,6] Other pathogens that colonize in the genitourinary tract, such as Chlamydia trachomatis (CT), Ureaplasma urealyticum (Uu), and Mycoplasma hominis (Mh), can also harm people and spread through sexual contact. Damage to tissue and organs can result from CT, which frequently co-infects with other STDs.[7] Mycoplasma is a genus of bacteria that primarily attaches to the vulnerable cell receptors of the host by its unique surface structure, causing host cells to get damaged. Generally, Uu is divided into two clusters, or 'biovars': Biovar 1/parvo biovar, and biovar 2/T960.[8] Biovar 1 consists of four genotypes (1, 3, 6 and 14), while biovar 2 includes 10 serovars.[9,10] It is widely accepted that biovar 1 shows fewer signs of danger, while biovar 2 tends to be much more aggressive.[11] Herpes simplex virus II (HSV II) can cause cervical cancer.[12] Specifically, HSV-DNA integrates into the DNA of normal tissues, leading to cervical cell lesions.[13] Other STD pathogens, like Neisseria gonorrhoeae (NG), Uu, Mh, and Mycoplasma genitalium (Mg), have been found in some studies to produce recurrent infections and alter the environment of the genital tract to cause cervical cancer. In the context of genital tract infection, the risk of cervical cancer rises as microbial species do.[14]

The most typical sexually transmitted pathogen in women is Chlamydia trachomatis (C. trachomatis), an intracellular bacteria with a distinctive biphasic life cycle. Despite the fact that C. trachomatis can cause pelvic inflammatory disease (PID), infertility, and ectopic pregnancy, the clinical course is typically subacute and weakly symptomatic, and the microbe is rarely found in people who do not have any obvious signs of infection.[15]

Parthenis et al conducted a research in Greece and found STIs in 82 women (23.8%). Ureaplasma spp was the most frequently detected pathogen, which was found in 63 (76.8%) women, followed by Mycoplasma spp (21 women, 25.6%) and Chlamydia trachomatis (5 women, 6.1%).[16] In a Mexican population, a study was done to estimate the prevalence of STIs in 201 cervical samples from patients who underwent annual routine gynecological exams. The overall prevalence of STIs was 57.7%, and the most frequent infection was Ureaplasma spp (UP) (39.8%), followed by Gardnerella vaginalis (GV) (25.9%), Chlamydia trachomatis (CT) (1.5%), and Mycoplasma genitalium (MG) (0.5%).

Methodology

Study area

This study was conducted in Orhuwhorun community in Udu Local government area (LGA), one of the 15 rural LGAs in Delta state. Delta state is one of six states in the oil-rich South-South region of Nigeria. It was estimated from the 2006 census figures that Udu LGA has a population of 142,480 including Orhuwhorun. Orhuwhorun has

grown to be the second prominent and fast developing town in the Udu LGA due to the establishment of Delta Steel Company built in the 1970s. There is a primary health centre in Orhuwhorun

Study Design and Population

A cross-sectional analytic study design was employed on230 asymptomatic women between 30 to 65 years of age who were resident in Orhuwhorun community. NOTE: this study was a subset of a study on self-sampling and clinician-collected samples for HPV testing. HPV testing is recommended by WHO for women over 30 years of age due to the transient nature of HPV infections in younger women. Women who were pregnant, experiencing monthly menstrual flow, had history of total hysterectomy and mental illness were ineligible to participate. Also excluded are women who did not give consent.

Sampling Method and Procedure

A multistage sampling technique was used to select 230 participants that provided vaginal samples which were analyzed to determine the prevalence of six sexually transmitted infections. Community leaders in the selected community were duly informed on the purpose and protocol of the research thereafter, a digital town crier was engaged to create a jingle on sexually transmitted infections and announce around the clusters selected for the study. Study participants were invited to the Orhuwhorun primary health centre. On each day for data collection, a brief health education on STIs and research aim was done. Trained nurses collected the samples using a flobam female sample collection kit. Each woman lays on the bed in a gynecological position. A sterile disposable speculum was gently inserted into the vagina to expose the cervix. After sampling according to the manufacturer's instructions, the swab head was immediately broken into the collection vial containing a preservative solution and closed tightly. The vials were well labeled with each participant's study code, arranged neatly in a pack until evening (close of collection for the day) when it is stored at −20°C until it was transferred to the laboratory for STI detection. At completion of the sample collection phase, the collection vials were orderly arranged in dry ice packs and transported to College of Medicine, University of Lagos, Nigeria for analysis.

Detection of STIs

STD6 GenoArray Diagnostic Kit is an invitro nucleic acid amplification test for the qualitative detection of Neisseria gonorrhoeae, Chlamydia trachomatis, Ureaplasma urealyticum(Uuu, lUup1, Uup3,Uup 6, and Uup14), Mycoplasma hominis, Mycoplasma genitalium and Herpes Simplex Virus Type 11 using endocervical swabs, male urethral swabs, or male/female urine specimens.

Principle of the Test

Detection and Analysis is based on manual specimen preparation to obtain DNA, followed by PCR amplification of target DNA, amplified DNA amplicons are then hybridized with immobilized specified STD probes on the Hybrimem under the patented "Flow-through Hybridization" technique. Enzyme immunoassay method is applied for colour development in order to obtain test results. The assay was performed according to the manufacturer's protocol.

After storage at -20°C, DNA was extracted by using the DNA Mag – Ax kit HBMAx. DNA amplification was performed with the Hybribio – life express thermal cycler using 3ul of DNA template, 46.5ul of PCR mix and 0.5ul of DNA Taq polymerase. The protocol for amplification was 9 mins of denaturation at 95℃, 40 cycles of denaturation at 95℃ for 30sec each, 30sec of annealing at 58℃, 40sec of elongation at 72℃ and final extension for 5minutes at 72℃. This was done alongside positive and negative controls. After amplification, the biotinylated PCR amplified samples were denatured by heating at 95°C for 5 minutes, and kept on ice promptly for at least 2mins.

For hybridization, 0.8ml of Hybridization solution was pre- warmed for 3mins and incubated for 10minutes after pumping off and adding 0.5ml of Hybridization solution and all amplified DNA products from PCR tubes into designated reaction well at a temperature of 45°C. 0.8ml of 45°C pre- warmed washing buffer 1 was added and pumped off 3times.

At 25°C, 0.5ml blocking solution was added and incubated for 5minutes. This flow through hybridization procedure was performed with immobilized specified STD probes on the Hybrimem containing immobilized probes against which target molecules were directed. Streptavidin-Alkaline Phosphate conjugate stabilizer was added and incubated for 3mins to bind to the biotinylated PCR products. The direct visualization of the breakdown product (purple precipitate) of the substrate nitroblue tetrazolium-5-bromo-4-chloro3-indolylphosphate was interpreted as positive for the corresponding STD types

Data Analysis

Relevant data were coded and entered into Microsoft Excel. Statistical analyses was conducted using IBM SPSS statistics version 25 (IBM Corp., Armonk, NY, United States). Descriptive statistics were used to report the socio-demographics of the study participants. Percentages were used to identify the prevalence of each of the six sexually transmitted infections studied and the data were presented in frequency distribution tables

Ethical Considerations

Before the commencement of the study, approval was obtained from the Ministry of Health Research Ethics Committee (MOHREC) Asaba, Delta State with reference number HM/596/T/139. The procedures followed were in accordance with the ethical standards of the Helsinki Declaration of 2003. To ensure confidentiality, codes and not names were used. Informed consent was also gotten from study participants.

Results

Two hundred and thirty samples were collected but two got denatured, hence two hundred and twenty eight clinician-collected samples were analyzed for the detection of six sexually transmitted infections [Chlamydia Trachomatis (CT), Neisseria Gonorrhoea (NG), Ureaplasma Urealyticum (Uuu, Uup1, Uup3, Uup6, and Uup14), Mycoplasma Hominis (MH), Mycoplasma Genitalium (MG), and Herpes Simplex Virus Type 2 (HSV 2)].

Table 1: Socio-demographic characteristics of study participants

Characteristics	**Frequency (n=230)**	**Percentage (%)**
Age years		
30 – 39	112	48.7
40 – 49	76	33.0
50 – 59	34	14.8
60 – 65	8	3.5
Total	**230**	**100**
Mean age	**41.08 ± 8.45years**	
Marital Status		
Single	12	5.2
Married	209	90.9
Separated	4	1.7
Widows	5	2.2
Total	**230**	**100**
Religion		
Christianity	222	96.5
Islam	5	2.2
Traditional Worshippers	3	1.3
Total	**230**	**100**

Educational Level		
None	8	3.5
Primary	42	18.3
Secondary	102	44.3
Tertiary	78	33.9
Total	**230**	**100**
Occupation		
Civil servant	40	17.4
Health Worker	14	6.1
House wife	11	4.8
Artisan	165	71.7
Total	**230**	**100**

Table I showed that the mean age of the women was 41.08 ± 8.45 years, 112(48.7%) were within 30 and 39years, 76(33%) were within 40 and 49years, 34(14.8%) were within 50 and 59years while 8(3.5%) were within 60 and 65years age group.Most of them were married 209(90.9%), 12(5.2%) were single, 4(1.7%) were separated while 5(2.2%) were widows. Majority 222(96.5%) were Christians, 5(2.2%) were Islam while 3(1.3%) were traditional worshippers. The table also shows that 102(44.3%) had only completed their secondary school education, 78(33.9%) had attained tertiary level of education, 42(18.3%) stopped at primary school while 8(3.5%) did not go to school. Majority 165(71.7%) of the participants were artisans, 40(17.4%) were civil servants, 14(6.1%) were health workers while 11(4.8%) were full time housewives.

Table II: Sexual history of study participants

Characteristics	**Frequency (n=230)**	**Percentage (%)**
Age at marriage (years)		
< 15	3	1.3
16-19	47	20.4
>20	180	78.3
Age at first sex (years)		
< 15	3	1.3
16-19	91	39.6
>20	136	59.1
Number of children		

0-4	163	70.9
5 and Above	67	29.1
Number of sexual partners in last one year		
One	224	97.4
Two	4	1.7
More	2	0.9
Ever had STI?		
No	120	52.2
Yes	110	47.8
Have STI presently		
No	220	95.7
Yes	10	4.3

Table II shows that 180(78.3%) of the women married at 20years and above, 47(20.4%) married within 16 and 19years while 3(1.3%) married at 15 years or less. When asked age at sexual debut, 136(59.1%) said they had their first sex at 20years or above, 91(39.6%) said within 16 and 19 years while 3(1.3%) said less than 15years. Majority 163(70.9%) of them have 0 to 4 number of children while 67(29.1%) have 5 or more children. Majority 224(97.4%) of the women had only one sexual partner in the last one year, 4(1.7%) had two sexual partners while only 2(0.9%) had more than two sexual partners in the last one year. When assessed for ever having any sexually transmitted infection (STI) in the past, 120(52.2%) reported No while 110(47.8%) reported Yes. Majority 220(95.7%) reported they do not have any STI presently while 10(4.3%) reported currently having STI.

Table III: Prevalence and Distribution of STIs among the study participants

Characteristics	**Frequency (n=228)**	**Percentage (%)**
Overall STI Prevalence		
Negative	86	37.7
Positive	142	62.3
Total	228	100.0
Multiple STIs		
Negative	182	79.8
Positive	46	20.2
Total	228	100.0
Neisseria Gonorrhea (NG)		
Negative	225	98.7

Positive	3	1.3
Total	228	100.0
Chlamydia Trachomatis (CT)		
Negative	219	96.1
Positive	9	3.9
Total	228	100.0
Ureaplasma Urealyticum (UU)		
Negative	103	45.2
Positive	125	54.8
Total	228	100.0
Mycoplasma Hominis (MH)		
Negative	177	77.6
Positive	51	22.4
Total	228	100.0
Mycoplasma Genitalium (MG)		
Negative	227	99.6
Positive	1	0.4
Total	228	100.0
Herpes Simpex Virus Type 2 (HSV-2)		
Negative	221	96.9
Positive	7	3.1
Total	228	100.0

Table III reveals an overall STI prevalence of 142 (62.3%) and presence of multiple STI as 46 (20.2%). Of the 228 samples, 225(98.7%) were negative for neisseria gonorrhea while 3(1.3%) were positive. For chlamydia trachomatis, 219(96.1%) were negative while 9(3.9%) were positive. Also, it was shown that over half of the samples 125(54.8%) were positive for ureaplasma urealyticum while 103(45.2%) were negative. For mycoplasma hominis, 177(77.6%) were negative while 51(22.4%) were positive. Only 1(0.4%) sample was positive for mycoplasma genitalium while 227(99.6%) were negative. Regarding herpes simpex virus type 2, 221(96.9%) were negative while 7(3.1%) were positve.

Discussion

Our study revealed a notably high prevalence of sexually transmitted infections (STIs) at 62.3% among the women sampled, with Ureaplasma species being the most frequently detected pathogen, accounting for 54.8% of infections. This prevalence

substantially exceeds those reported in several other geographic locations, indicating significant regional and population differences in STI burdens. For example, Parthenis et al. reported a prevalence of 23.8%[16] among women in Greece, while studies in South Africa and Saudi Arabia documented rates of 22.9%[2] and 27%[17], respectively. Similarly, other reports have recorded STI prevalence rates of 11.4%[18] and 30.4% in Brazil[19], 49.2% in Italy[20], and 57.7% in Mexico[21] . The variation in STI prevalence across these populations may be influenced by diverse sociocultural, behavioral, and epidemiological factors.

One potential explanation for the elevated STI prevalence observed in our study could be linked to the sociocultural practices prevalent in the study area, particularly polygamy. The tendency for men to have multiple concurrent sexual partners increases the risk of both acquiring and transmitting STIs within their sexual networks, thereby elevating infection rates among their female partners. This dynamic creates a continuous cycle of reinfection and sustained transmission, underscoring the critical role of male partner behavior in women's sexual health outcomes.

Consistent with findings from Parthenis et al., Ureaplasmaspp emerged as the predominant pathogen in our study population, detected in 54.8% of women, with Mycoplasmaspp and Chlamydia trachomatis following at lower rates. Parthenis et al. similarly found Ureaplasmaspp in 76.8% of cases, establishing a pattern of high prevalence of this pathogen in diverse populations. Other studies corroborate the predominance of Ureaplasmaspp in STI profiles: 39% in Italy[20], 70.2% in South Africa[2], 13% in Saudi Arabia[22], 28.3% in Italy[23], 47.1% in Korea[24], and 19.16% in China[25]. This consistent trend highlights Ureaplasmaspp as a critical pathogen warranting attention in STI screening and management programs.

Nonetheless, the most common STI agents vary across populations. For example, Chlamydia trachomatis was more frequently detected (6.7%) among Brazilian university students[18], differing from our findings where it was less prevalent. Other studies report Trichomonas vaginalis as a leading pathogen in Brazilian populations[19] and bacterial vaginosis as highly prevalent among female sex workers in Western Kenya[26]. These differences may reflect variations in sexual behaviors, access to healthcare, diagnostic methodologies, and underlying microbiota compositions that influence pathogen colonization and persistence.

Overall, our data reinforce the importance of targeted STI screening that includes Ureaplasmaspp alongside other common pathogens, particularly in settings with socio-cultural practices that may enhance STI transmission dynamics. Moreover, interventions aimed at educating men about sexual health and promoting safer

sexual practices could be pivotal in reducing STI prevalence and subsequent complications such as cervical intraepithelial neoplasia and other reproductive health issues in women.

Conclusion

STIs are among the top five disease categories for which individuals seek medical attention, and they have a significant influence on sexual and reproductive health globally. This study recommends that sexually transmitted infection testing and cervical cancer screening programs should be in collaboration, incorporated in primary healthcare facilities to reach those in the grassroots. There is need for the government and non-governmental organizations to increase sexually transmitted diseases and promotion campaigns. Women's spouses should also be targeted for health education.

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Conflict of interest

The author declares no conflict of interest.

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