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Prevalence of *Treponema pallidium* amongst Students of Delta State University, South-South Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Objective: Infection due to *Treponema pallidum (*syphilis) is a major challenge and continues to be a public health problem around the world. It is a bacterial infection transmitted commonly through sexual contact, blood and also through mother-to-child (vertical). A cross-sectional study to investigate the prevalence of syphilis among students of Delta State University, Abraka was carried out between September 2022 and January 2023.
Method: Data and blood samples were collected randomly from 500 participants from the various faculties of the University. Blood samples were collected in EDTA bottles following aseptic techniques and subsequently screened for syphilis using the rapid test (RT) method.
Results: Of the 500 samples screened, 143 were positive for *T. pallidium* giving an overall prevalence of 48.6%. Students from the faculty of science recorded the highest prevalence of 68%,

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this was followed by students from the faculty of Arts (33%) while students from the faculty of Basic Medical Sciences recorded the least prevalence of 15%. This difference in prevalence among the faculties was statistically insignificant (P=0.695). Overall, a higher prevalence (40.4%) was recorded for males than females (16.8%) (P=1.24). The highest prevalence of 42% was recorded among males from the faculty of science while the lowest was recorded among females from the faculty of Education. The difference in prevalence among genders in the various faculties when compared was not statistically significant (P=0.201).

Conclusion: This study has revealed a relatively high level of infection with syphilis (*T. palladium)* among students of Delta State University Abraka and should be a concern. There is therefore a dire need for proper enlightenment on this disease and behavioural change among this vulnerable population.

Keywords: Prevalence; syphilis; T. palladium; students.

1. INTRODUCTION

Syphilis is a blood borne sexually transmitted infection (STI) caused by an infectious spirochete bacterium, *Treponema pallidum*, which are widespread in both developed and developing countries and constitute a major public health problem [1-4]. It is a highly pathogenic bacterium characterized as an infection of chronic progression [5] and if left untreated can have long-term, severe sequelae including infertility, pelvic inflammatory disease, and damage to internal tissues and organs [6]. Syphilis is a major challenge to public health globally due to the significant increase in diagnosed cases [7,8]. In Brazil for example, the detection rate of acquired syphilis was 72.8 cases per 100,000 inhabitants, with notification of 152,915 cases [3]. In 2019, the WHO estimated the occurrence of new cases of syphilis reaching about 6.3 million and with earlier estimates suggesting more than 12 million new syphilis infections every year in the world [9,10]. Syphilis in most cases is asymptomatic, and this makes the transmission chain control a challenge especially if not treated adequately [11]. Transmission of syphilis can be acquired (mainly sexually) or congenital (via the placenta or hematogenously from contact with infected fluids [12] which if unattended to leads to four different clinical stages; primary syphilis, latent syphilis, tertiary and congenital syphilis [13]. Reports have shown that certain populations are vulnerable to syphilis; this includes individuals living in seclusion, homeless people, drug users, men who have sex with men (MSM), those co-infected with human immunodeficiency virus (HIV), and pregnant women [14,15]. It is important to note that syphilis just like other sexually transmitted diseases is a major health concern among college and university students and reports from Africa has shown that students comprise a very sexually active population [16]. There is therefore a need to investigate the prevalence of this disease among students of the Delta State University, Abraka.

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out in Delta State University, Abraka, Delta State Nigeria. Abraka is a university town and its geographical coordinates are 5^{o} 47'' North, 6^{o} 6' 0'' East. Abraka has a tropical wet that runs between March through October and dry climate that covers the remainder of the months with the typical harmattan season between the months of November and February [17]. Abraka town is a favourite destination for domestic and international tourists because of its beaches along the famous River Ethiope. Abraka is also a university town as it houses one of the State's universities. The inhabitants are predominantly students and civil servants as well as the indigenous people who are mainly farmers, fishermen and traders. The map of the area is presented in Fig. 1.

2.2 Study Population

The study population comprised of students from the different faculties of the Delta State University, Abraka who volunteered and were randomly selected for the study.

2.3 Study Design

Between September 2022 and January 2023, a cross-sectional study was conducted across five (5) faculties of the university aimed at providing baseline information on the prevalence of syphilis among students. Hundred students comprising

males and females of all ages from each of the faculties were chosen using systematic random sampling. The study was designed to allow reliable estimation of the prevalence of syphilis infection within the student community of the university.

2.4 Sample and Data Collection

Using a disposable sterile needle, 2 ml of blood samples from each of the 500 participants were collected through the median cubital vein into EDTA containers. The blood samples were then centrifuged at 500/rpm for 5minutes to obtain serum.

2.5 Screening for Syphilis Antibody

Serum samples were screened for the presence of *Treponema pallidum*. antibodies using the Syphilis Rapid Test Strip (Houston Texas laboratory, USA). All the tests were carried out following the manufacturer's instructions. Briefly, the test strip was removed from the seal and used immediately. Using the dropper, about 2 drops of the serum were dropped onto the specimen pad of the test strip and then 2 drops of buffer was added. The timer was started and stopped after ten minutes. The colored line or band which appeared in the control band region (C) and another colored line or band appearing in the test band region [T] indicated a positive result. The appearance of colored line or band in the control band region [C] and absence of colored line or band in the test band region [T] indicated a negative result. Similarly, the appearance of colored line or band in the test band region [T] and absence of colored line or band in the control band region [C] indicated an invalid result. The intensity of the color in the positive cases varied depending on the concentration of *Treponema pallidum* antibodies.

2.6 Statistical Analysis

Data collected were analysed using the SPSS version 26.0 to determine significant differences between parameters. The Chi-square was also employed to check for association between variables. The confidence level was held at 95% and $P < 0.05$ was considered significant.

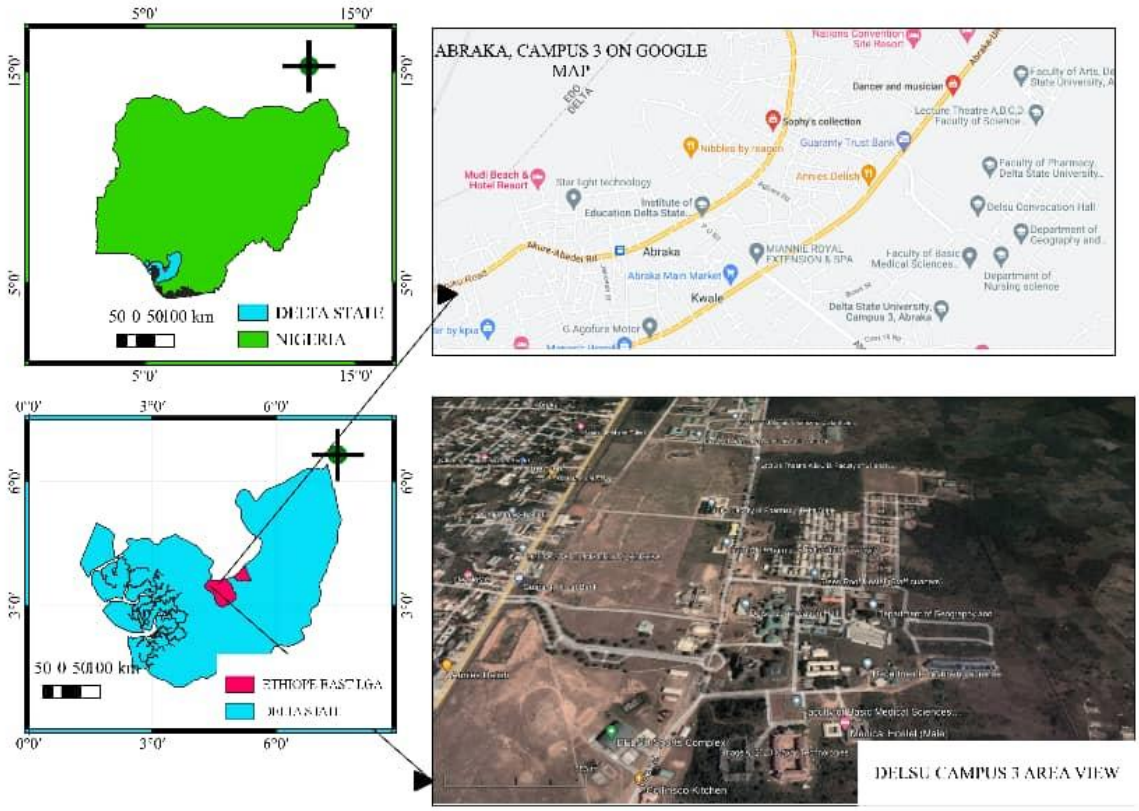

Fig. 1. Map showing location of Delta State University

3. RESULTS

Out of the 500 samples screened, Syphilis was detected in 143 giving an overall prevalence of 28.6%. Students from the faculty of science recorded the highest prevalence of 68%, this was followed by students from the faculty of Arts (33%) while students from the faculty of Basic Medical Sciences recorded the least prevalence of 15%. This difference in prevalence among the faculties was not statistically significant (P>0.05) the result in presented in Table 1.

Overall, males had a higher prevalence (40.4%) than females (16.8%) (P=1.24) as presented in Table 2.

The highest prevalence of 42% was recorded among males from the faculty of science while the least was recorded among females from the faculty of Education. The difference in prevalence among sex in the various faculties when compared was not statistically significant (P=0.201), result is presented in Table 3.

4. DISCUSSION

The overall prevalence of syphilis among students of the Delta State University from this study was 28.6%. this is high when compared to findings around the world and calls for swift action. The reason for this result can be attributed to several factors. First of which could be that the students do not make effort to get screened regularly for syphilis and other sexually transmitted diseases and this could be risky as most cases of STDs in men are asymptomatic especially in the early stages. Secondly as stated earlier, the university is population of students comprise a very sexually active group [16] and could been involved in indiscriminate sex with very poor sex education. Sex education with knowledge of safe sex practices will help curb the spread and transmission of syphilis and other STDs. This view is also echoed by MacDonald, UNICEF, UNAIDS, & WHO, Kurkowski AND Reuter et al. [18-21] who further stressed the need to improve young adults' understanding, perception and awareness around these issues of sex education. Results from table two also showed that students from the faculty of science were more infected and those from the faculty Pharmacy and Basic Medical Sciences were least infected. The medical knowledge and exposures may have accounted for the low-level prevalence recorded for the BMS and Pharmacy students. Furthermore, this is a call to the university health management to make screening for syphilis and other STDs a routine protocol for students at regular intervals coupled with counselling. This will go a long way to compliment government strategies on combating STDs. A few reports on the prevalence among students in colleges and higher institutions have been documented [22], reported an overall prevalence of 15.4% in students from a tertiary

Table 1. Prevalence of *Treponema pallidum* amongst students in the different faculties of Delta State University, Abraka

Faculty	Number Examined	Number Positive	Prevalence (%)
Basic Medical Sciences (BMS)	100	15	15
Science	100	68	68
Pharmacy	100	5	5
Education	100	22	22
Arts	100	33	33
Total	**500**	**143**	**28.6**

P>0.05 (0.695)

Table 2. Prevalence of *Treponema pallidum* in relation to sex amongst students of Delta State University, Abraka

Sex	Number Examined	Number Positive	Prevalence (%)
Male	250	101	40.4
Female	250	42	16.8
Total	**500**	**143**	**28.6**

P>0.05 (1.24)

Table 3. Prevalence of *Treponema pallidum* in relation to gender amongst students in the various Faculties of Delta State University, Abraka

Faculty	Sex			
	Male		Female	
	No. Examined	No. Positive (P%)	No. Examined	No. Positive (%)
BMS	50	8 (16)	50	7 (14)
Science	50	42 (84)	50	26 (52)
Pharmacy	50	2 (4)	50	3 (6)
Education	50	20 (40)	50	2 (4)
Arts	50	29 (58)	50	4 (8)

P>0.05 (0.201)

institution in Nigeria, [23,24] reported prevalence of 5.7% among college students in China, reported a prevalence 0f 5.2% in students in Ethiopia, [16] documented a prevalence of 16.7% in Copperbelt University. This variation in prevalence has been attributed to factors earlier discussed including culture, awareness, perception and behavioural factors. This study also revealed a higher prevalence in males than females even though equal numbers of males and females were sampled. This is in consonance with other studies which have documented higher prevalence in males [16] reported higher prevalence of 6.5% in males as against 2.9% in females though this finding attributed this to the difference in sample size between males and females [25] reported a prevalence of 18.6 and 11.4% in males and female college students in Benin City Nigeria while [26] also reported a higher prevalence in male than in female college students in China. Higher prevalence in males has been associated with several factors chief among which is males sleeping with males (MSM) [24,26]. Motoyuki et al. [27] recorded a global prevalence of 7.5% from year 2000-2020. Could this be a development among students of Delta State University Abraka? A question that needs answer.

5. CONCLUSSION AND RECOMENDATION

This study has revealed a high prevalence of infection with syphilis among students of the Delta State University and must be taken seriously. The university management in collaboration with the health services must work together to see how this is addressed. Further indebt studies covering a larger sample size and most importantly addressing the associated risk factors for this disease. Public health enlightenment and routine screening for syphilis and other sexually transmitted diseases are hereby recommended.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval was obtained from the Research and Ethical Committee, Delta State University, Abraka.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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