PREVALENCE AND ASSOCIATED RISK FACTORS OF TRICHOMONIASIS AMONG PREGNANT WOMEN RECEIVING ANTENATAL CARE IN AMAC, FCT ABUJA, NIGERIA

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ABSTRACT

Background: Trichomoniasis is a global public health concern threatening pregnant women and female neonatal health.

Aim: The study was designed to determine the prevalence and associated risk factors of trichomoniasis among pregnant women receiving antenatal care in Abuja Municipal Area Council, FCT, Abuja.

Materials and Method: A cross-sectional descriptive study was employed, and 422 HVS and MSU samples were collected from pregnant women aged 20-50 years and analyzed microscopically using direct wet mount. A self-structured interview questionnaire was administered to collect data on the risk factors associated with trichomoniasis.

Result: The result showed that out of 422 samples tested, 97(23.0%) had the infection. Pregnant women aged 21-25 years had the highest prevalence rates of trichomoniasis with 28.9% and is relatively more (25.6%) among those in their second trimester. Educational status (χ^2 = 71.27, P = 0.0290), marital status (χ^2 = 51.95, P = 0.0140), occupational status (χ^2 = 9.76, P = 0.0180), income (χ^2 = 14.72, P = 0.0020), number of sexual partners (χ^2 = 6.22, P = 0.0130), condom use (χ^2 = 16.55, P = 0.025), and ignorance (χ^2 = 7.15, P = 0.0010) were the risk factors associated with trichomoniasis among the study population.

Conclusion: The study discovered that the overall prevalence of trichomoniasis in the

study population was 23.0% with urine samples having a higher detection rate compared to high vaginal swab samples, though, this may be due to lager urine samples. The pregnant women aged 21-25 years and those in their second trimester of pregnancy had the highest prevalence rates of trichomoniasis. While, marital status, occupation, education, household income, condom use and ignorance were the risk factors associated with trichomoniasis infection. Therefore, there is a need for public health enlightenment to reduce the rate of infection and create more awareness among the study population.

Keywords: Prevalence, risk factors, Trichomoniasis, Pregnant women, AMAC, Nigeria.

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BACKGROUND OF STUDY

Trichomoniasis is a sexually transmitted disease (STD) caused by *Trichomonas vaginalis* (TV), a flagellated, motile, and unicellular parasitic protozoan[1,2]. According to Rasha[3], trichomoniasis affects the urinogenital systems of both men (anterior urethra, epididymis, semen, and prostate) and women (vagina, vulva, cervix, and urethra), and is the most common and widespread sexually transmitted protozoan infection in Nigeria[4&2]. The parasite can transfer from an infected penis to a vagina, or an infected vagina to a penis, or an infected vagina to another vagina[5], a major contributor to pathology in obstetrics and gynecology indeed. It is principally transmitted during sexual interactions through oral, anal, or vaginal intercourse, more so, the non-sexual methods of transmitting the parasite include sharing undergarments or towels with infected individuals[1]. The infection affects between 2.0% and 17.0% of female babies born to infected mothers[6]. Moreover, associated risk factors linked to a high incidence of *T. vaginalis* infection include multiple sexual partners, lack of barrier contraception, co-infection with other Sexually Transmitted Infections, low socio-economic status, poor personal hygiene, intravenous drug use, older age, menstrual cycle, and under-development[2]. Personal hygiene behaviors such as inadequate genital hygiene, frequent or excessive douching, sharing personal items may disrupt natural vaginal flora and introduce pathogens or irritate genital tissue, thus, increasing the risk of trichomoniasis[2]. A healthy vagina of women of childbearing age has a pH of 3.8–5.0, which is moderately acidic[7]. However, disruptive factors like excessive douching can alter this balance, shifting the pH to a more basic level, creating an ideal environment for *T. vaginalis* to thrive, and increasing the risk of trichomoniasis[8]. Sharing personal items like towels, washcloths, or underwear can potentially spread trichomoniasis[9].

Also, people who have previously contracted a sexually transmitted infection (STI), such as syphilis, gonorrhea, or chlamydia, may have had changes in the vaginal microbiota or damage to the tissues of the genital tract. This may have compromised barrier function or disrupted the normal flora of the vagina[10]. Saeed *et al.*,[11] reported that a low level of education indeed influences the prevalence and impact of trichomoniasis in various ways, such as individuals with poor education

may have limited awareness and understanding of sexually transmitted infections (STIs), including trichomoniasis; underestimating their risk of acquiring trichomoniasis and other STIs due to limited knowledge about sexual health and risk factors; holding misconceptions or stigma about STIs, including trichomoniasis, which can hinder open communication about sexual health and discourage seeking medical care which can perpetuate the spread of infection within communities and contribute to the persistence of trichomoniasis. Without access to accurate information and education programs, individuals may be less equipped to protect themselves from infection and may not understand treatment instructions or the importance of completing a full course of medication for trichomoniasis, leading to lower treatment adherence rates and increasing the risk of recurrent or persistent infections, as well as the potential for spreading the infection to sexual partners.

Socioeconomic status significantly influences the prevalence and impact of trichomoniasis in various ways, for instance, individuals living in poverty often face barriers to accessing healthcare services, including STI testing and treatment, resulting in delays in diagnosis and treatment, allowing the infection to persist and spread[12]. Moreover, poverty is associated with lower levels of education and health literacy, leading to limited awareness and knowledge about trichomoniasis and other STIs[13]. Furthermore, economic disadvantage can also contribute to engagement in higher-risk sexual behaviors, such as substance abuse and transactional sex, increasing the likelihood of trichomoniasis transmission[14]. As well, poverty can restrict access to condoms and other forms of contraception, essential for preventing trichomoniasis and other STIs[12].

Moreso, the infection is a gateway to other sexually transmitted infections such as human immunodeficiency virus (HIV), *Chlamydia trachomatis*, and *Neisseria gonorrhoeae*, as well as a predisposing factor to cervical cancers[1 & 2]. Although, women experience symptoms more frequently than men, 10-50% of female cases remain asymptomatic[15] and those infected with *T. vaginalis* may experience symptoms such as foamy-greenish vaginal discharge, dysuria, vaginal erythema (redness), dyspareunia, vulvovaginal itching and swelling, pain during urination, and elevated vaginal pH (>5)[1]. It has also been reported that, this infection is linked to several health issues, such as prostatic cancer, cervical cancer, pelvic inflammatory disease (PID), reversible infertility in men and women, and major pregnancy problems like intra-amniotic or chorio-amnionitis, tubal factor infertility, ectopic pregnancy, premature labor, low birth weight, postabortion infections, preterm delivery, and neonatal mortality as well as morbidity[16 & 17] and can result in reduced sperm motility, prostatitis, urethritis, and epididymitis in males[18 & 19].

Worldwide, *T. vaginalis* infection is common; about 270 million cases are estimated to occur annually[20]. The distribution of *T. vaginalis* infection varies from 2% to more than 50% depending on the geographical location (region, country), gender, age, sex, and environment of the study populations as well as the procedures used for the diagnosis in various studies[21]. According to Samuel *et al.*[22], trichomoniasis is approximately 42.8

million in Africa; the prevalence among pregnant women is between 17% and 20% in Africa, 16% to 53% in the US, and 0.8% in Asia[23]. The pooled prevalence of *T. vaginalis* infection among women of reproductive age in Nigeria was significantly higher among sexually active women and pregnant women. Moreover, the prevalence of trichomoniasis varies widely in Nigeria with significantly higher among sexually active women and pregnant women[24,.25], in 2022, found a prevalence of 10.3% of trichomonas vaginalis infection among pregnant women receiving antenatal care in Abeokuta, Nigeria, and identified risk factors such as age, marital status, and occupational status among the study population[25,.26] found a prevalence of 30.9% of trichomoniasis among pregnant women attending antenatal clinics in Katsina State, Nigeria, and incriminated age, number of sexual partners, method of douching, and type of latrine as risk factors in the study population. Another prevalence study[27, 28] of Trichomoniasis among pregnant women in Kano, Nigeria, highlighted the need for routine screening and treatment of pregnant women found a prevalence of 12.1% of *T. vaginalis* infection among pregnant women attending antenatal care in Nigeria; and that there was a significantly higher prevalence[29] of trichomoniasis among pregnant women (61.4%) compared to non-pregnant women (38.6%). Also, it was revealed associations existed between trichomoniasis and lower socioeconomic status[24, 28], history of vaginal discharge, multiple sexual partners, and lack of condom use. It has been found[30] that associations exist between trichomoniasis and younger age (<25 years), lower education level, multiple sexual partners, history of STIs. The prevalence of *T. vaginalis* infection was higher among pregnant women in Nigeria, with a significant association between the infection and socio-demographic factors[31]. A study on the Prevalence and Correlates of *T. vaginalis* Infection among Women Attending a Primary Healthcare Facility in Nigeria revealed that the prevalence of *T. vaginalis* infection was higher among sexually active women and pregnant women attending a primary healthcare facility in Nigeria[32]; and found that the number of vaginal samples analyzed and the prevalence of Trichomoniasis decreased during the COVID-19 pandemic[33]. A study published in Venereology in 2022 discussed novel treatment approaches to combat Trichomoniasis, including the use of antimicrobial peptides and nanoparticles[34]. Additionally, most *T. vaginalis* infections remain undiagnosed because about half of infected men and women experience no signs or symptoms[15]. *Trichomonas vaginalis* infection is the most common sexually transmitted parasitic disease in Nigeria, however, estimating the incidence of the infection can be challenging due to the asymptomatic presentation in roughly half of the infected persons[2]. Despite all of these studies on Trichomoniasis and associated risk factors, none has been done in AMAC, FCT, Abuja, and there is paucity of information regarding *T. vaginalis* infections among pregnant women receiving antenatal care in Abuja Municipal Area Council (AMAC), FCT, Abuja. Therefore, this study was designed to determine the prevalence and associated risk factors of trichomoniasis among pregnant women receiving antenatal care in AMAC, FCT, Abuja, in order to create

more awareness and provide base-line data for future reference.

MATERIALS AND METHOD

Study design

A cross-sectional descriptive study design was adopted to determine the prevalence and associated risk factors of trichomoniasis among pregnant women attending antenatal care in Abuja Municipal Area Council (AMAC), (FCT), Abuja, Nigeria.

Study area

The Abuja Municipal Area Council (AMAC) in the Federal Capital Territory (FCT), Abuja, Nigeria, is located in the eastern section of the Federal Capital Territory and consists of twelve (12) wards, each represented by an elected Councillor. According to the 2022 projection, AMAC has a population of around 1,693,400 [(35)], 9 tertiary, 45 secondary, and 207 primary health facilities, and housing numerous Federal institutions, Ministries, Departments, and Agencies [(36)].

Study population

The study population comprised all pregnant women that received antenatal care in Federal Medical Centre (FMC), Abuja, Nigeria during the study period.

Inclusion criteria

Pregnant women aged 20-50 years, that received antenatal care in the Federal Medical Centre (FMC), Abuja, Nigeria, during the study period.

Exclusion criteria

Those who were very sick. Pregnant women who had previous vaginal bleeding and genital pathology (such as cervical cancer and premature membrane rupture), or a history of antibiotic treatment (metronidazole) in the past one week, to minimize potential biases in prevalence estimates.

Ethical clearance

The ethical approval with reference number: FMCABJ/HREC/2024/138 for this study was obtained from the Federal Medical Centre Abuja Health Research Ethics Committee (HREC) before the commencement of the study. The committee's institutional norms, rules, and regulations were accordingly complied with. Informed consent was also obtained from all participants, and their confidentiality and privacy were ensured throughout the study.

Sample size determination

Sample size used in this study was determined using an unknown population formula reported by Okoroiwu, (2021):

$n = Z^2 P (1-P)/d^2$

Where;

n = Minimum sample size

Z = Z = 1.96 (Statistical constant)

P = A provisional prevalence of 50% (0.5) was used as a baseline estimate.

d = 5% (0.05) = Desired error of precision (= 0.05)

n = 384 + 10% attrition rate

n = 384+38.4 = 422.

Sampling technique

A simple random sampling technique was employed to select participants from pregnant women receiving antenatal care at the Federal Medical Centre, Abuja, Nigeria, because it allowed for the inclusion of all eligible pregnant women.

Study instruments

This study employed a dual-method approach, a structured questionnaire, and clinical laboratory testing. A structured questionnaire was administered to gather data on the socioeconomic-demographic characteristics, sexual behaviours, personal hygiene practices. Additionally, laboratory testing tools were used to collect and examine high vaginal swabs and mid-stream-urine samples for objective determination of the prevalence of trichomoniasis among the study population.

Method of data collection

This was done through questionnaire for socio-demographic factors and laboratory test to gather original data on the prevalence and associated risk factors of T. vaginalis infection among the pregnant women.

Sample collection

A total of 422 samples (345 mid-stream-urine samples and 77 High Vaginal Swab (HVS) were collected from consented eligible pregnant women receiving antenatal care in the Federal Medical Centre, Abuja, Nigeria. The study participants were instructed to collect the mid-stream-urine samples into pre-labelled and sterile containers [(22)], while, gynaecologists collected High Vaginal Swab (HVS) samples from consented participants by inserting and rotating sterile swab sticks in the vagina for 10-30 seconds, thereafter each swab was labelled with a unique participant identity code. The collected HVS and urine samples were promptly transported to the Medical Microbiology Unit of Federal Medical Centre Abuja, for processing and microscopic examination within one hour to preserve the organism's motility and prevent moisture-related degradation.

Laboratory processing and microscopic examination of samples

The samples were processed using the wet mount preparation method and examined by a microscopic technique. Each mid-stream-urine sample was prepared by centrifuging 10 mL in a sterile test tube at 5,000 rpm for 5 minutes. The supernatant was discarded, and a drop mixture of sediment and normal saline was placed on a clean, grease-free microscope slide, covered with a coverslip, and examined microscopically using x10 and x40 objective lenses. The *T. vaginalis* was easily identified in positive samples by its oval shape and jerky or twitching movement [(38)]. Each high Vaginal Swab (HVS) sample was prepared by immersing it in 0.5 mL of 0.9% normal saline solution in sterile vials and gently twisting. A drop of the resultant suspension was then placed

on a clean, grease-free slide, covered with a coverslip, and examined microscopically using x10 and x40 objective lenses to detect *T. vaginalis*. The *T. vaginalis* was confirmed in a positive sample as explained in Urine samples [39 & 22].

Data analysis

Chi-square testing was used to establish the relationship between the prevalence of trichomoniasis and its associated risk factors in the study population.

RESULTS

The study revealed a 23.0% overall prevalence of *T. vaginalis* infection, with a higher detection rate in urine samples (24.1%) compared to high vaginal swab (HVS) samples (18.2%), this may be due to larger urine sample (345) compared to that of 77 HVS samples tested. The study revealed that pregnant women aged 21-25 years and those in their second trimester of pregnancy had the highest rates of trichomoniasis. Additionally, educational status(p=0.0290), marital status(p=0.0140), occupational status(p=0.0180), number of sexual partners(p=0.0130), condom use(p=0.0025), and ignorance of trichomoniasis(p=0.0010) were identified as risk factors significantly associated with trichomoniasis in the study population.

Table 1: Overall Prevalence of Trichomoniasis in the Study Populations.

Specimen Type	No. Examined (n)	No. Positive (%)	No. Negative (%)
Urine	345	83 (24.1)	262 (75.9)
HVS	77	14 (18.2)	63 (81.8)
Total Number (%)	**422**	**97 (23.0)**	**325 (77.0)**

Table 1 showed that the overall prevalence of Trichomoniasis among the study population is 23.0%, while, the urine samples yielded 24.1% prevalence rate of the infection, HVS samples revealed 18.2% infection rate.

Table 2: Age-related Prevalence of Trichomoniasis in the Study Population.

Age group (yrs)	No. Examined	No. Positive (%)	No. Negative (%)
≤ 20	0	0 (0.0)	0 (0.0)
21 – 25	38	11 (28.9)	27 (71.1)
26 – 30	176	39 (22.2)	137 (77.8)
31 – 35	65	13 (20.0)	52 (80.0)
36 – 40	117	31 (26.5)	86 (73.5)
41 – 45	25	3 (12.0)	22 (88.0)
46 – 50	1	0 (0.0)	1 (100.0)

Table 2: showed that the age-group of 21-25 years old had the highest prevalence (28.9%) of trichomoniasis infection, followed by those in age-group of 36-40 years old who had 26.5% of the infection, while, those in age-groups of <20 years and 46-50 years had the least with 0.0% respectively.

Table 3*:* Prevalence of Trichomoniasis by Pregnancy Stages (Trimesters) of the Study Population

Trimester	No. Examined	No. Positive (%)	No. Negative (%)
1st Trimester	88	21(23.9)	67 (76.1)
2nd Trimester	164	42 (25.6)	122 (74.4)
3rd Trimester	170	34 (20.0)	136 (80.0)

Table 3, showed that Trichomoniasis infection is relatively more (25.6%) among the pregnant women in their second trimester of pregnancy, followed by those in their first trimester (23.9%) of pregnancy.

Table 4: Risk Factors Associated with Trichomoniasis in the Study Population

Variables	No. Examined	No. Positive (%)	No. Negative (%)	χ^2	*P*-Value
Marital status					
Single	6	1 (16.7)	5 (83.3)		
Married monogamous	377	69 (18.3)	308 (81.7)		
Married polyandrous	29	20 (69.0)	9 (31.0)		
Divorced	3	2 (66.7)	1 (33.3)	51.95	0.0140*
Widow	7	5 (71.4)	2 (28.6)		
Religion					
Christianity	269	66 (24.5)	203 (75.5)		
Muslim	153	31 (20.3)	122 (79.7)	0.78	0.3800
Others	0	0 (0.0)	0 (0.0)		
Educational status					
Tertiary	283	35 (12.4)	248 (87.6)		
Secondary	112	42 (37.5)	70 (62.5)		
Primary	24	18 (73.9)	6 (25.0)	71.27	0.0290*
No Formal Education	3	2 (66.7)	1 (33.3)		
Occupational status					
Civil Servant	167	19 (11.4)	148 (88.6)		
Businesswoman	198	57 (28.8)	141 (71.2)		
Force Personnel	5	2 (40.0)	3 (60.0)		
Farmer	3	0 (0.0)	3 (100.0)		
Student	31	9 (29.0)	22 (71.0)	9.76	0.0180*
Housewife	6	1 (16.7)	5 (83.3)		
Unemployed	4	4 (100.0)	0 (0.0)		
Others	8	5 (62.5)	3 (37.5)		
Household income					

≤#50,000	73	29 (39.7)	44 (60.3)		
#51,00 - 100,000	129	23 (17.8)	106 (82.2)		
#101,000-150,000	122	27 (22.1)	95 (77.9)	14.72	0.0020*
≥#151,000	98	18 (18.4)	80 (81.6)		
No. of sexual partners					
Single	419	94 (22.4)	325 (77.6)	6.22	0.0130*
Multiple	3	3 (100.0)	0 (0.0)		
Condom use					
Always	13	3 (23.1)	10 (76.9)		
Sometimes	202	29 (14.3)	173 (85.6)	16.55	0.0025*
Never	208	65 (31.25)	143 (68.8)		
Ignorance of Trichomoniasis					
Yes	189	70(37.0)	119(63.0)	7.15	0.0010*
No	233	58(24.9)			

Table 4 showed that Marital status(p=,0.0140), educational status(p=0.0290), occupational status(p=0.0180), household income(p=0.0020), number sexual partners(p=0.0130), condom use(p=0.0025), and ignorance of Trichomoniasis(p=0.0010) were the risk factors associated with prevalence of trichomoniasis in the study area.

DISCUSSION

Trichomonas vaginalis is a protozoan parasite and is the most prevalent non-viral sexually transmitted infection worldwide causing the curable sexually transmitted disease called trichomoniasis [40]. In this study, an overall prevalent of 23.0% rate of trichomoniasis was discovered among the pregnant women, indicating a significant burden of the infection among the study participants. It is, however, noted that Trichomoniasis was more in urine samples than that of HVS and may be attributed to the number of urine samples (345) examined compared to 77 HVS samples tested. This rate of infection among the pregnant women receiving antenatal care in MAC, FCT, Abuja, may be attributed to among other things, low socio-economic status, educational status, poor personal hygiene, sharing of under-wears [2]. Moreover, personal hygiene behaviours, such as inadequate genital hygiene, frequent or excessive douching, and sharing of personal items may disrupt natural vaginal flora, thereby introducing pathogens or irritate genital tissue, thus increasing the risk of trichomoniasis. A healthy vagina of women of childbearing age has a pH of 3.8-5.0, which is moderately acidic [7]. However, disruptive factors like excessive douching can alter this balance, thus, shifting the pH to a more basic level, creating an ideal environment for Trichomonas vaginalis to thrive, thereby increasing the risk of trichomoniasis [8]. This level of prevalence, is consistent with previous studies on pregnant women. For instance, [23], posited that the prevalence of trichomoniasis among pregnant women is between 17.0% to 20.0% in Africa, 16.0% to 53.0% in the United States and 0.8% in Asia. This prevalence of 23.0% when compared with the results of previous studies such as [41]

in Lagos, [42] in Abeokuta, [28] in Nigeria and [25] in Abeokuta, who revealed prevalent rates of 3.3%, 20.0%, 12.1% and 10.3% , is high, it is, however, low when compared with the works of [26] in Katsina, [29] in Anambra state of Nigeria, who variously got 30.9% and 61.4% respectively in their studies, it is high. The differences in the prevalence rates may be attributed to the area of studies, study population, method of screening and personnels involved in the screening, as well as educational and occupational status of the participants.

On the age-related prevalence of this study population, the age-group of 21-25 years age-cohort had the highest prevalent rate of 28.9%, followed by those in the age-group of 36-40 years, who had infection rate of 26.5% of the infection, while, the least rate of infection went to the age-group of 46-50 years who got a share of 0.0% prevalent rate. This result is in agreement with the works of [42] who recorded highest prevalent of 21.3% of trichomoniasis among the age-group of 20-24 years age cohort, as well as [43] that showed 26.6% among the age-group of 20-24 years. Nevertheless, the result did not align with those of [41] who reported 1.8% among the age-group of 21-30 years cohort and that of [44] and [45], who in their various studies revealed higher prevalent rates within the age-brackets of 40-49 years and 30-39 years populations. The elevated prevalence among individuals aged 21-25 years may be attributed to increased sexual activity and decreased condom use during this life stage. In contrast, the lower prevalence among individuals aged 41-45 years age-group may be due to safer sex practices, fewer sexual partners, and a greater likelihood of seeking medical attention for symptoms, ultimately reducing their risk of infection. In addition, 46-50 years who had 00.0% prevalence may be due to the extremely small sample size or that older adult women do not have much sexual partners as the younger ones. While, the absence of participants aged ≥ 20 years suggests that younger individuals in the study population may not have been married or pregnant.

The study revealed that pregnant women in their second trimester of pregnancy had the highest rates of trichomoniasis, with prevalence rates of 25.6%. While, third trimester had the least prevalent of 20.0%, this corroborates the work of [46], who had 24.5% in their study, also claiming that the third trimester is least infected with Trichomoniasis. The slight disparities between these findings may be as a result of variations in study populations, sampling methods, and diagnostic techniques employed.

On the associated risk factors, the study showed that Marital status(p=0.0140), educational status(p=0.0290), occupational status(p=0.0180), household income(p=0.0020), number sexual of partners(p=0.0130), condom use(p=0.0025), and ignorance of Trichomoniasis(p=0.0010) were the risk factors associated with prevalence of trichomoniasis in the study area. It is worthy to note that a number of authors such as [39], [31], [47], [48], [49], [50], [51] are in agreement with findings of this study. Nevertheless, [52], did not align with the result, positing that condom use is never a risk factor to trichomoniasis infection, also, [53] argued that douching is not a risk factor as [38] disagreed with the fact that ignorance is an associated risk factor of

trichomoniasis infection. The differences in infection rates between Christian and Muslim participants may be attributed to differences in health-seeking behaviours, sexual health knowledge, and cultural and social norms. The discrepancies in these findings may be due to differences in study design, population, and cultural practices.

In conclusion, the study discovered that the overall prevalence of trichomoniasis in the study population is 23.0% with urine samples having a higher detection rate compared to high vaginal swab (HVS) samples, this may be as a result of the number of urine samples (345) to HVS (77). The pregnant women aged 21-25 years and those in their second trimester of pregnancy had the highest prevalence rates of trichomoniasis. While, marital status, occupation, education, household income, condom use and ignorance were the risk factors associated with trichomoniasis infection. These findings highlight the urgent need for a public health awareness campaign to educate the study population and reduce the infection rate of trichomoniasis.

Conflict of interest

The authors declare that they have no competing interests. Funding

Funding

The authors did not receive any external funding for this research work.

Acknowledgement

The authors acknowledge the pregnant women for availing themselves for the study, the contributions of the Doctors, Nurses, and Laboratory Scientists at the FMC, AMAC,FCT, Abuja.

Authors' Contributions

Gideon Okoroiwu and J. Omogu conceived the research idea, Gideon Okoroiwu, Nwanganga I Ubosi and Joseph Omogu analyzed the data, Gideon Okoroiwu wrote the first draft of the manuscript. Joseph Omogu and Nwanganga Ihuoma Ubosi collected the data. The final draft has been read and approved by all the authors.

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