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Serological detection of human T-cell lymphotropic virus types I and II among pregnant women in Ilorin, Nigeria

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ABSTRACT

Human T-cell lymphotropic virus types I/II (HTLV-I/II) is endemic in some parts of the world including Nigeria. Reported prevalence rates in Nigeria have largely focused on blood donors. This study aims at determining the prevalence of HTLV infection among pregnant women in Ilorin North-central Nigeria. Serum samples from 276 pregnant women who were antenatal clinic attendees at General and Civil Service Hospitals in Ilorin were tested for the presence of HTLV-I/II antibodies using Enzyme Linked Immunosorbent Assay test kits from Diagnostic Automation INC., USA. Out of the 276 women tested, 3 tested positive giving a prevalence rate of 1.1%. The result was analyzed on the basis of age, marital status, nature of family, educational status, occupation, religion, parity, and gestational stage of the women. There was no statistical association of HTLV positivity with any of the variables. Although relatively lower than prevalence rate recorded among similar study groups in other parts of the country, the 1.1% prevalence in this study underscores the need for proper education and creation of awareness among antenatal clinic attendees, so as to reduce viral transmission and incidence of HTLV-related diseases.

KEYWORDS

HTLV-I/II; pregnant women; Ilorin; seroprevalence

Background

Human T-lymphotropic virus (HTLV)-I and HTLV-II belong to the retroviridae family and genus *Deltavirus*. They were first identified in the early 1980s[1] and have a number of biological characteristics in common including tropism for T-cell lymphocytes.[2] They share 65% of their nucleotide sequences.[3] Both viruses lead to lifelong infections in infected individuals with asymptomatic carrier state,[4] while a small proportion of infected individuals develop clinical disease.[5–7] HTLV-I has been etiologically linked

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with adult T cell lymphoma/leukemia,[1,5,8,9] a chronic neurological disorder termed HTLV-I-associated myelopathy/tropical spastic paraparesis[10–12] and pediatric infective dermatitis.[8] HTLV-II, on the other hand, though initially isolated from a patient with hairy cell leukemia [13], its pathogenicity is not clearly understood.[14] However, it has been linked with dermatopathic lymphadenopathy and lymphoproliferative disorder.[15]

Transmission of both viruses occurs via infected lymphocytes by three main routes; namely, sexually (both heterosexual and homosexual),[16] parenterally (via blood transfusion, needle sharing, and accidental pricks),[17–20] and vertical transmission (transplacental and breast feeding).[21] Vertical transmission remains an important mode of transmission especially in endemic areas as it occurs in up to about 25% of infants, breastfed by infected mothers.[22,23] Transmission by breastfeeding occurs by ingestion of infected milk-borne lymphocytes.[22]

Over 20 million people are believed to be infected with HTLV-I/II globally.[24,25] Prevalence varies greatly according to geographical area, ethnic and social background, and in specific risk groups such as commercial sex workers and intravenous drug users (IDUs).[26] Areas with reported high endemicity for HTLV-I include Japan, Central and South America, Melanesia, Sub-Saharan Africa, and parts of Middle East.[26] HTLV-II on the other hand is less prevalent with reported cases among Native American populations and thrives in IDUs worldwide.[27] Studies from different parts of Nigeria show that HTLV-I/II is endemic in the country.[28] Prevalence ranging from 0%[29,30] to 16.7%[31] has been reported from different parts of the country. However, most of the studies were carried out on voluntary blood donors who may be regarded as low risk group and therefore may not reflect the true picture of the infection in the country. Pregnant women represent an important epidemiological link in the transmission cycle of the infection. As sexually active group, there is increased chance of transmission to their sexual partners in addition to mother–child transmission. Unfortunately, there is dearth of information on the prevalence among this population especially in North Central Nigeria. This study therefore was carried out to determine the prevalence of HTLV-I/II among pregnant women who are antenatal clinic attendees of some selected hospitals in Ilorin metropolis, North Central Nigeria.

Materials and methods

Study population

This is a cross-sectional, hospital-based study conducted between January and May 2017. Pregnant women (age range: 16–40 years; mean: 28.2 years) who attended prenatal/antenatal care unit of two public hospitals in the

metropolitan area of Ilorin were recruited for the study. The institutions involved in the study were General Hospital Ilorin, a state-owned tertiary hospital which serves as a reference for high-risk obstetric patients located in the center of Ilorin, and Civil Service Hospital, which is also a state-owned institution located in the Government-reserved area of Ilorin. Informed consent was obtained from each participant before sampling. In the case of participants who are younger than 18 years, consent was obtained from their parents. Those who did not wish to take part in the study were excluded. Structured questionnaire were administered by a trained nurse to collect epidemiological, social, gynecological, and obstetric data from the participants.

Specimen collection and serological tests

About 5 mL of venous blood was collected from each participant and sera were separated and stored at −20°C until ready for analysis. To detect antibodies against HTLV-I/II, sera were tested with commercially available Enzyme Linked Immunosorbent Assay (ELISA) kit (manufactured by Diagnostic Automation, Inc., Calabasas, CA, USA). The plates were read with spectrophotometer at a wavelength of 450 nm. Interpretation of the results was then carried out according to the kit's manufacturer's instruction.

Ethics

An ethical clearance for the study was obtained from the Ethical Review Committee of Kwara state Ministry of Health, Nigeria. Approval was also obtained from management of the hospitals involved in this study.

Statistics

Data were analyzed using the software SPSS version 22 (SPSS Inc., Chicago, IL, USA). Pearson's Chi-square test was performed at 95% confidence interval. P values <0.05 were considered statistically significant. Chi-square tests do not assume normal distributions.

Results

Samples were collected from a total of 276 pregnant women. Their age ranged from 16–40 years (mean: 28.2 years; mode: 23 and 27 and median: 28 years). Majority (96%) of the women was married and about 88.0% of the women came from monogamous family. In terms of their educational qualifications, more than half of the women had post-secondary school education. The predominant (over 40%) occupation among the women was

trading followed by artisanship (28%), while about 4.7% and 7.6% were students and unemployed housewives, respectively. More than 60% of the study population practices Islamic religion; while the remaining practices Christianity (Table 1).

Data on parity showed that majority (83%) of the women had two or fewer children, while the remaining already had more than two children. Analysis also showed that majority (over 55%) of the women were in their second trimester at the time of sampling, while 22.5% and 21.7% were in their first and third trimesters, respectively (Table 2).

Of the 276 pregnant women, 3 were found to be seropositive to HTLV-I/II antibodies giving a prevalence of 1.1%, while the remaining 273 (98.9%) tested negative to HTLV-I/II antibodies (Figure 1). Table 3 shows the

Table 1. Socio-demographic variables of the pregnant women attending general and civil service hospitals in Ilorin.

Variable	Number	Frequency %
Age group (years)		
≤25	89	32.3
26–30	112	40.6
>30	75	27.2
Marital status		
Married	265	96.0
Single	11	4.0
Nature of family		
Monogamous	243	88.0
Polygamous	22	8.0
Single	11	4.0
Educational status		
≤Secondary	125	45.3
>Secondary	151	54.7
Occupation		
Trading	113	40.9
Schooling	13	4.7
Civil service	52	18.8
Artisanship	77	27.9
Housewife	21	7.6
Religion		
Christianity	107	38.8
Islam	169	61.2

Table 2. Gynaecological and obstetric variables of the pregnant women attending general and civil service hospitals in Ilorin.

Variable	Number	Frequency %
Number of children (parity)		
≤2	229	83.0
>2	47	17.0
Stage of pregnancy		
First trimester	62	22.5
Second trimester	154	55.8
Third trimester	60	21.7

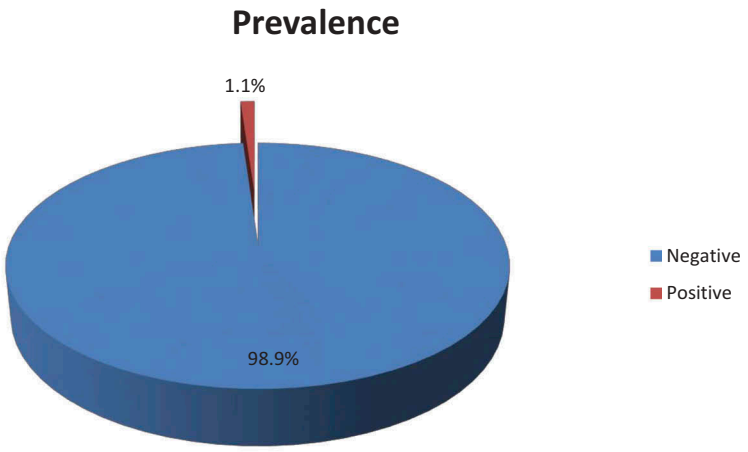


Figure 1. Pie chart of HTLV-I/II seropositivity among pregnant women attending general and civil service hospitals in Ilorin.

Table 3. Bivariate analysis of HTLV-I/II status and socio-demographic variables of the pregnant women attending general and civil service hospitals in ilorin.

		HTLV-I/II status		
Variables	Number tested (%)	Positive *n*(%)	Negative *n*(%)	χ^2 (*P* value)
Age group (years)				
≤25	89 (100)	0 (0)	89 (100)	2.496 (*P* = 0.28702)
26–30	112 (100)	2 (1.8)	110 (98.2)	
>30	75 (100)	1 (1.3)	74 (98.7)	
Marital status				
Married	265 (100)	3 (1.1)	262 (98.9)	0.245 (*P* = 0.62029)
Single	11 (100)	0 (0)	11 (100)	
Nature of family				
Monogamous	243 (100)	2 (0.8)	241 (99.2)	2.845 (*P* = 0.24106)
Polygamous	22 (100)	1 (4.6)	21 (95.5)	
Single	11 (100)	0 (0)	11 (100)	
Educational status				
≤Secondary	125 (100)	1 (0.8)	124 (99.2)	0.175 (*P* = 0.67572)
>Secondary	151 (100)	2 (1.3)	149 (98.7)	
Occupation				
Trading	113 (100)	1 (0.9)	112 (99.1)	1.156 (*P* = 0.88524)
Schooling	13 (100)	0 (0)	13 (100)	
Civil service	52 (100)	1 (1.9)	51 (98.1)	
Artisanship	77 (100)	1 (1.3)	76 (98.7)	
Housewife	21 (100)	0 (0)	21 (100)	
Religion				
Christianity	107 (100)	1 (0.9)	106 (99.1)	2.149 (*P* = 0.14265)
Islam	169 (100)	2 (1.2)	167 (98.8)	

n = number

association between HTLV-I/II status and socio-demographic variables, while Table 4 shows the association between HTLV-I/II status and some pediatric conditions of the study participants. There was no significant association between HTLV-I/II status and any of the analyzed variables.

Table 4. Bivariate analysis of HTLV-I/II status and some pediatric conditions among pregnant women attending general and civil service hospitals in Ilorin.

		HTLV-I/II status		
Variable	No. tested (%)	Positive *n* (%)	Negative *n* (%)	χ^2 (*P* value)
Number of children (parity)				
≤2	229 (100)	2 (0.9)	227 (99.1)	0.571 ($P = 0.45001$)
>2	47 (100)	1 (2.1)	46 (97.9)	
Stage of pregnancy				
First trimester	62 (100)	0 (0)	62 (100)	3.772 ($P = 0.151698$)
Second trimester	154 (100)	1 (0.7)	153 (99.2)	
Third trimester	60 (100)	2 (3.3)	58 (96.7)	

n = number

However, all the seropositive cases were recorded among participants that were married. There is also slightly higher prevalence (1.3%) among participants with post-secondary school education than participants with ≤secondary school education (0.8%) ($P > 0.05$).

Similarly, slightly higher prevalence (2.1%) of HTLV-I/II was recorded among women with more than two children, while women with ≤2 children had prevalence of 0.9% ($P > 0.05$) although the distribution is skewed in favor of the latter group. There was an increase in the prevalence of HTLV-I/II with advancing stage of pregnancy. Highest prevalence (3.3%) was recorded among women in their third trimester followed by women in their second trimester with 0.7%, while HTLV-I/II antibodies were not detected among women in their first trimester though the difference is not statistically significant [$\chi^2 = 3.772$ ($P = 0.151698$)].

Discussion

Considering their strategic importance in the chain of transmission of HTLV-I/II, women attending antenatal clinics are better in estimating the true burden of the infection in an endemic area like Nigeria. This study reports prevalence of 1.1% among this group in North Central Nigeria. Although there were few studies that focused on this group for comparison, the available ones reported higher prevalence rates. In a study among pregnant women and commercial sex workers in South Western Nigeria, Forbi and Odetunde[31] reported a prevalence of 16.7% among the former and 22.9% among the latter groups. Similarly in a study which examined the prevalence in mother–child pairs in South Western Nigeria, prevalence of 4.3% was reported among the mothers, while 1.1% was reported among the children.[32] The result of the present study confirms the endemicity of the infection in the country as earlier observed [28,33] and similar to 1.2% reported in the Gambia.[34] However, the relatively low prevalence in this study compared to reports from South Western part of the country indicates

a slightly different epidemiology of the virus in North Central Nigeria. This can be attributed to ethnic, social, cultural, and other differences which have all been noted to affect the distribution of the virus.[26] Although the exact way these factors affect the epidemiology have not been defined, direct link between these factors and progression of proviral loads (VLs) in infected individuals have been established.[35] Effect of ethnocentric dietary habits for example is illustrated by study which reported decrease in VLs as a result of consumption of green tea in Japan.[36] Higher prevalence of 2.1% [37] and lower prevalence of 0.66%[38] have also been reported from Accra-Ghana and Rio de Janeiro-Brazil, respectively, among similar study group.

Extensive studies have been carried out on the infection among blood donors in different parts of the country. The results show a significant geographic heterogeneity in the distribution pattern. Prevalence of 0% was reported from both Enugu in South Eastern[29] and Jos in North Central Nigeria.[30] On the other hand, prevalence of 1.0%[39] and 3.2%[40] were reported from Lagos and Ibadan of South Western Nigeria among blood donors. The relatively low prevalence was recorded among blood donors as against higher prevalence among pregnant women and commercial sex workers (CSWs) are not unexpected considering that the former represents low risk while the latter represents high risk groups, respectively. The varying prevalence ranges observed among blood donors may not be unconnected to the fact that some of the investigators used apparently healthy voluntary blood donors who may not be high risk groups as against some investigators who used mainly family replacement blood donors whose health status were not fully determined. The 1.1% recorded among pregnant women in the present study therefore falls into intermediate range when compared with the rates obtained among these blood donors. However, considering that the subjects in the present study are sexually active group with higher risk of contracting, spreading, and maintaining the virus in the community, the relatively low prevalence in this study is therefore surprising and contradicts known trends of higher prevalence in pregnant women than blood donors. Since there is lack of data on pregnant women in North Central Nigeria, it is therefore pertinent to deduce that the level of infection in this region of the country may be low. The result therefore corroborates earlier report of 0% prevalence among blood donors in Jos, Plateau State in the same North Central Nigeria.[30]

Although not statistically significant ($P > 0.05$), the slightly higher prevalence recorded among older participants (26 years and above) in this study is not unexpected and may indicate greater sexual involvement which is known to be a major mode of transmission of the virus. This result is consistent with previous studies which showed that HTLV infection increases with age from 20 to 40 years[28,33] in Nigeria as well as other endemic countries.[41,42] On further analysis, none of the other variables was

statistically significant when HTLV-I/II seropositive groups were compared with seronegative groups.

Conclusion

This study has reaffirmed the endemicity of HTLV-I/II in Nigeria and is prevalent among pregnant women. More extensive study is therefore required to generate a harmonized and more acceptable national prevalence from the pockets of results from different parts of the country. In the absence of vaccine against the virus and considering that screening for HTLV-I/II is not included in the routine antenatal care in Nigeria presently, attention should focus on proper education and awareness creation aimed at reducing viral transmission and incidence of infection-related diseases.

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Conflict of Interest

The authors declare that no conflict of interest exists regarding the publication of this research and that this study was self-funded by the authors.

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