



Research Article

Seroprevalence of Human T-Lymphotropic Virus Types 1 and 2 among Blood Donors at Selected Hospitals in Ilorin, Kwara State

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ABSTRACT

Human T-lymphotropic virus types 1 and 2 (HTLV-1/2) are transfusion-transmissible retroviruses that remain conspicuously absent from routine blood donor screening in Nigeria despite documented endemicity. This study determined the seroprevalence of HTLV-1/2 among blood donors at tertiary and secondary healthcare facilities in Ilorin, Kwara State, and examined its distribution by donor type, demographic characteristics, healthcare facility tier, and co-infection with other transfusion-transmissible infections. A descriptive cross-sectional study was conducted among 360 blood donors recruited by stratified systematic random sampling from the University of Ilorin Teaching Hospital, Children Specialist Hospital and Sobi Specialist Hospital, Sobi, Ilorin, Kwara State. Serum samples were screened for HTLV-1/2, HIV, and Hepatitis B and C virus antibodies by enzyme-linked immunosorbent assays. Associations were tested using Chi-square, Fisher's exact, and independent-samples t-tests, with significance set at $p < 0.05$. The HTLV-1/2 seroprevalence was 1.11% (4/360; 95% CI: 0.43–2.82%). Seroprevalence was higher among family replacement donors (1.81%) than voluntary non-remunerated donors (0.52%), though this difference did not reach statistical significance, and was closely similar between the tertiary facility (1.16%) and the two secondary facilities combined (1.06%). No demographic variable was significantly associated with seropositivity, and none of the HTLV-1/2-positive donors had co-infection with HIV, Hepatitis B, or Hepatitis C. The HTLV-1/2 circulates among blood donors in Ilorin at a level approaching the World Health Organization's operational threshold for donor screening, supporting consideration of routine HTLV-1/2 screening and continued promotion of voluntary non-remunerated donation within Kwara State's blood transfusion services.

Keywords: Blood donors; Co-infection; Ilorin; HTLV-1/2; Kwara State; Seroprevalence; Transfusion safety

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INTRODUCTION

Human T-lymphotropic virus 1/2 (HTLV-1/2) are oncogenic retroviruses belonging to the genus of Deltaretrovirus that survive in the population mainly through clonal growth of the infected T-lymphocytes rather than viral reproduction and play important

roles as blood-borne agents in the world (Legrand *et al.*, 2022). The HTLV-1 is responsible for adult T-cell leukaemia/lymphoma as well as HTLV-1-associated myelopathy/tropical spastic paraparesis (Bangham *et al.*, 2021) while HTLV-2 is transfusion-transmissible, but pathogenically less significant (Filén & Friberg,

2021). About 5–10 million of people throughout the world have been estimated to be infected with one of these viruses (Verdonck *et al.*, 2020; Marinho *et al.*, 2024) with notable geographic clustering and the highest prevalence rates observed in southwestern Japan, the Caribbean basin, parts of South America, Melanesia, and sub-Saharan Africa.

In Nigeria, the screening of blood donors for major transfusion-transmissible infections (HIV, Hepatitis B, and Hepatitis C) is routinely performed; however, there is no mandatory HTLV-1/2 screening among these tests (Adewoyin *et al.*, 2020; National Blood Transfusion Service [NBTS], 2022). In a multicenter, six-zone study, the overall seroprevalence of HTLV-1 in the Nigerian blood donors was found to be 1.8%, showing considerable differences among the zones (Oladele *et al.*, 2020). A similar prevalence rate was demonstrated among pregnant women in southwest Nigeria (Adekanle *et al.*, 2021). A systematic review and meta-analysis of the studies conducted in Nigeria during the period between 2018 and 2022 has estimated the pooled seroprevalence to be around 1.2% (Afolabi *et al.*, 2023). A recently conducted nationwide retrospective analysis of transfusion-transmissible infections among blood donors in Nigeria highlighted that the problems with blood safety are not limited only to one infection (Oreh *et al.*, 2025).

The problem with the potential transfusion-associated transmission of HTLV-1/2 is especially relevant, as the infected lymphocytes in the cellular blood components can infect the recipient in a considerably more efficient way than when using any other route of infection (Opere-Sem *et al.*, 2021). This, together with the lifelong persistence of HTLV infection and the possibility of its development into severe conditions many years after the first exposure explains why WHO recommendations for the screening of blood donors include the necessity to screen them regularly when the prevalence in the donor population exceeds certain level (of about 1%) (World Health Organization [WHO], 2025).

Despite the accumulating national and zonal data, methodologically sound facility-level seroprevalence data specifically for Ilorin, the capital of Kwara State in North Central Nigeria are lacking, and poor healthcare provider awareness of HTLV-1/2 in Nigeria has also been demonstrated (Olanrewaju *et al.*, 2022). The screening becomes cost-effective starting from the prevalence in the donor population of about 0.5-1% (Brasil *et al.*, 2023) and migration and culture have been recognized as factors of West African HTLV-1/2 burden (Oladele *et al.*, 2022). Thus,

contemporary local data are needed for evidence-based blood safety policies in Kwara State. This study aimed at estimation of the seroprevalence of HTLV-1/2 among blood donors at tertiary and secondary healthcare facilities in Ilorin, Kwara State and analysis of its distribution by the type of donor, demographic characteristics, healthcare facility tier, and co-infection with other transfusion-transmissible infections.

MATERIALS AND METHODS

Study Design and Setting

A descriptive cross-sectional study design incorporating laboratory-based serological analysis together with administration of structured questionnaires was carried out in Ilorin. Ilorin is the capital city of Kwara State in North Central Nigeria. Donors were selected from three healthcare facilities spread across two levels in the health delivery system in the State.

Study Population and Sampling

The study population involved voluntary and familial donors who presented themselves at the selected facilities for blood donation during the period of the study. Potential eligible subjects were between the ages of 18-65 years old and fulfilled other donor eligibility criteria including haemoglobin level of ≥ 12.5 g/dL and weight of ≥ 50 kg, who had complete information and did not have insufficient, or haemolyzed serum samples; those that refused consent were excluded from the study. The minimum sample size needed was estimated using Cochran's formula for determining population proportion, using expected HTLV-1/2 prevalence rate of 3.1%, with 95% confidence level and margin of error of 2%. The result gave a minimum of 288 subjects that was increased by 25% to take care of non-response, thus making a total of 360 subjects (Cochran, 1977). Out of the 360 subjects, 172 were from UITH, 98 from CSH and 90 from SSH based on their respective monthly donations volume; recruitment of subjects was done using stratified systematic random sampling technique where the sampling interval was approximately 3-4 individuals per site.

Ethical Considerations

Ethical approval was sought from the Ethical Review Committee, Kwara State Ministry of Health, Ilorin (ERC/MOH/2026/06/762) and the study conducted was guided by the Nigerian National Code of Health Research Ethics and the Helsinki Declaration. Written informed consent was obtained from all participants before participation in the study.

Collection of Data and Sample

Research assistants interviewed the respondents and collected data by means of the administration of a structured questionnaires. Blood sample (5ml) was collected from each respondent into a plain vacutainer tube and transferred within 2 hours at 4-8°C to the central laboratory where they were processed to get the serum which was aliquoted and stored in the freezer at (20°C for use within 72 hours and -80°C for future use).

Laboratory Analysis

Antibodies against HTLV-1/2 and the other transfusion-transmissible infections screened were detected by enzyme-linked immunosorbent assay (ELISA), following manufacturer's protocols. Briefly, samples and controls were incubated in duplicate for 60 minutes at 37°C, washed, incubated with anti-human IgG-horseradish peroxidase conjugate for 30 minutes, washed again, developed with 3,3',5,5'-Tetramethylbenzidine (TMB) substrate for 30 minutes in the dark, and stopped with sulfuric acid before optical density was read at 450 nm (reference 620–650 nm). The reactivity cut-off was defined as the mean negative-control optical density plus 0.250.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 27. Associations between HTLV-1/2 serostatus and categorical variables were tested using the Chi-square test (expected cell counts ≥ 5) or Fisher's exact test

(smaller expected counts); continuous variables were compared using independent-samples t-tests. Seroprevalence was calculated overall and by subgroups with 95% confidence intervals, and statistical significance was set at $p < 0.05$.

RESULTS

A total of 360 blood donors were screened across the three study sites. Table 1 shows the socio-demographic and donation-history characteristics of the participants. The mean age was 33.7 ± 8.6 years (range 18–55 years), and the modal age group was 36–45 years (33.3%). Males predominated (89.4%; male-to-female ratio $\approx 8.5:1$). Most donors were married (66.7%), Muslim (68.1%), and had attained tertiary education (76.1%). Slightly over half of donors (53.9%) were voluntary non-remunerated donors, while 46.1% were family replacement donors; occasional donors (2–5 lifetime donations) constituted the largest donor category (52.8%), followed by first-time donors (36.4%) and regular donors (10.8%).

Of the 360 donors screened, four (4) tested positive for HTLV-1/2 antibodies, giving an overall seroprevalence of 1.11% (95% CI: 0.43–2.82%). Site-specific seroprevalence was 1.16% at UITH, 0.00% at CSH, and 2.22% at SSH; this difference was not statistically significant ($\chi^2 = 2.12$, $df = 2$, $p = 0.347$) (Figure 1).

Table 1: Socio-demographic Characteristics of Blood Donors

Variable	Category	Frequency (n=360)	Percentage (%)
Age group (years)	18–25	87	24.2
	26–35	119	33.1
	36–45	120	33.3
	46–55	34	9.4
	Mean $\pm$ SD	33.7 ± 8.6	–
Sex	Male	322	89.4
	Female	38	10.6
Marital status	Married	240	66.7
	Single	120	33.3
Religion	Islam	245	68.1
	Christianity	115	31.9
Educational level	Secondary	44	12.2
	Tertiary	274	76.1
	Postgraduate	40	11.1
	No formal education	2	0.6
Type of donor	Voluntary	194	53.9
	Replacement	166	46.1
Donor category	First-time donor	131	36.4
	Occasional donor (2–5)	190	52.8
	Regular donor (>5)	39	10.8
Total		360	100.0

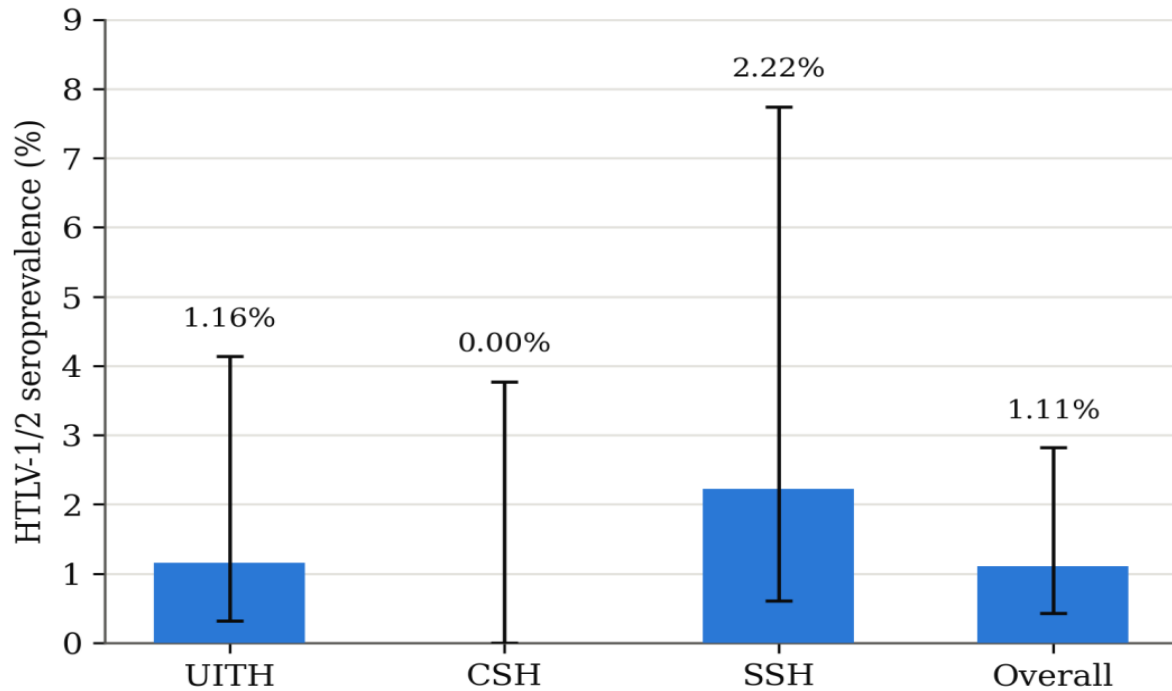


Figure 1: HTLV-1/2 seroprevalence (%) by study site

The seroprevalence of HTLV-1/2 alongside the other screened transfusion-transmissible infections by study site shows that Hepatitis B virus has the highest overall seroprevalence (9.17%), followed by HIV (1.67%) and Hepatitis C virus (1.11%). All six HIV-reactive donors were recruited at UITH (Table 2). None of the four HTLV-1/2-positive donors was reactive to HIV, HBV, or HCV, giving a co-infection prevalence of 0.0% among HTLV-positive donors.

Separately, two donors who tested HIV-reactive were also HBV-reactive; both were recruited at UITH and were non-reactive for HTLV-1/2 and HCV.

Across the demographic variables examined (Table 3), the highest seroprevalence was observed in the 46–55-year age group (2.94%) and among female donors (2.63%); none of these associations reached statistical significance.

Table 2: Seroprevalence of HTLV-1/2 and other Transfusion-Transmissible Infections by Study Site

Facility	Level	Number Tested	HTLV-1/2No. (%)	HIV No.(%)	HBV No.(%)	HCV No. (%)
UITH	Tertiary	172	2 (1.16)	6 (3.49)	23 (13.37)	3 (1.74)
CSH	Secondary	98	0 (0.00)	0 (0.00)	4 (4.08)	0 (0.00)
SSH	Secondary	90	2 (2.22)	0 (0.00)	6 (6.67)	1 (1.11)
Total		360	4 (1.11)	6 (1.67)	33 (9.17)	4 (1.11)

Key: No. = Number

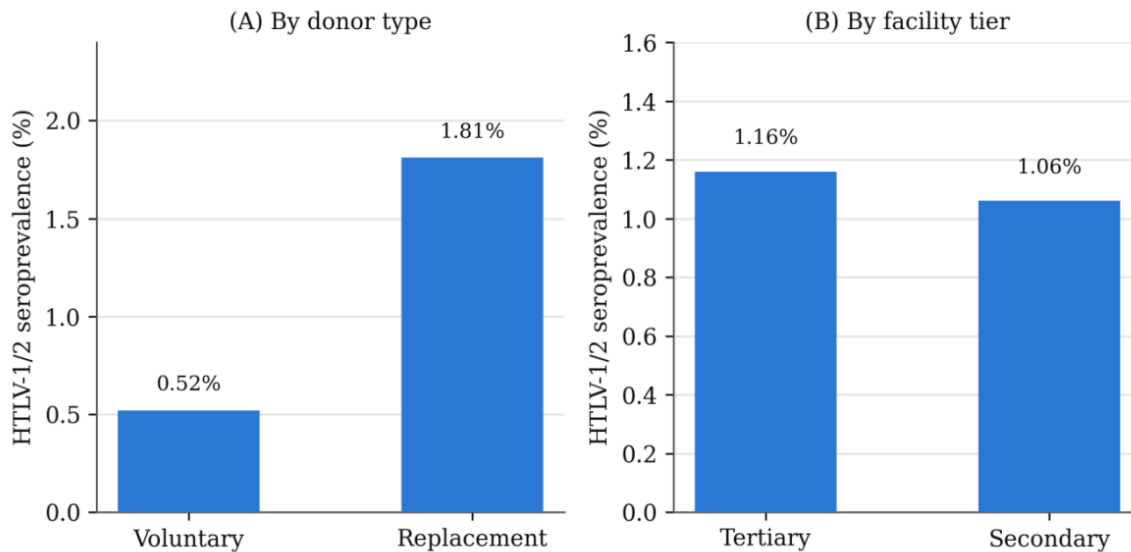


Figure 2: HTLV-1/2 seroprevalence (%) (A) by donor type and (B) by healthcare facility tier

Table 3: Socio-demographic Distribution of HTLV-1/2 Seropositivity

Variable	Category	Number tested	HTLV Reactive (n)	Seroprevalence (%)	P-value
Age group (years)	18–25	87	2	2.30	0.311†
	26–35	119	0	0.00	
	36–45	120	1	0.83	
	46–55	34	1	2.94	
Sex	Male	322	3	0.93	0.361*
	Female	38	1	2.63	
Marital status	Married	240	2	0.83	0.603*
	Single	120	2	1.67	
Religion	Islam	245	2	0.82	0.596*
	Christianity	115	2	1.74	
Educational level	Secondary	44	0	0.00	0.998†
	Tertiary	274	4	1.46	
	Postgraduate	40	0	0.00	
	No formal education	2	0	0.00	
Donor category	First-time donor	131	0	0.00	0.164†
	Occasional donor (2–5)	190	4	2.11	
	Regular donor (>5)	39	0	0.00	

*Fisher's exact test; †Chi-square test (interpreted with caution due to small expected cell counts). None significant at $p < 0.05$

DISCUSSION

Screening of 360 blood donors across three healthcare facilities in Ilorin returned an overall HTLV-1/2 seroprevalence of 1.11% (95% CI: 0.43–2.82%), a figure that sits close to the threshold at which international guidance recommends routine donor screening (WHO, 2025). This estimate is broadly consistent with previously reported Nigerian figures, including the 1.8% seroprevalence documented among blood donors in a six-zone multicentre study

(Oladele *et al.*, 2020) and the pooled estimate of approximately 1.2% from a national systematic review and meta-analysis (Afolabi *et al.*, 2023); given the wide confidence interval around the present estimate, reflecting the small number of positive cases ($n = 4$), these modest differences across studies more plausibly reflect sampling variability than genuine divergence in underlying prevalence. The continued exclusion of HTLV-1/2 from Nigeria's mandatory blood donor screening algorithm (NBTS,

2022) therefore appears to reflect a policy gap rather than negligible risk.

At the site level, no HTLV-1/2-reactive donors were identified at CSH, while UITH and SSH recorded seroprevalence of 1.16% and 2.22% respectively; this difference was not statistically significant ($\chi^2 = 2.12$, $p = 0.347$), and the wide, overlapping confidence intervals around each site-specific estimate indicate that the study was not adequately powered to detect genuine inter-facility differences of this magnitude.

Seroprevalence of HTLV-1/2 was more than three times higher among family replacement donors than voluntary non-remunerated donors, a directional finding consistent with the broader transfusion medicine literature, in which replacement donors, who often donate under family or social pressure to meet an immediate patient need, are subject to less rigorous self-deferral than altruistically motivated voluntary donors (Adewoyin *et al.*, 2020). Although this difference did not reach statistical significance ($p = 0.339$), this most plausibly reflects the small absolute number of HTLV-positive donors rather than the absence of a true difference in risk, and lends indirect support to continued promotion of voluntary non-remunerated donation as a blood safety strategy in Kwara State.

None of the demographic variables examined showed a statistically significant association with HTLV-1/2 seropositivity, which is unsurprising given that only four positive cases were identified across 360 donors. Nonetheless, the numerically higher seroprevalence observed among female donors and in the oldest age group examined (46–55 years) is directionally consistent with the sexual-transmission dynamics and cumulative lifetime exposure risk described for HTLV-1/2 in the wider literature (Verdonck *et al.*, 2020; Bangham *et al.*, 2021), and merits investigation in a larger, adequately powered sample.

None of the four HTLV-1/2-positive donors showed co-infection with HIV, HBV, or HCV. Given the very small number of HTLV-positive donors, this finding should be interpreted as inconclusive rather than as evidence that HTLV-1/2 and the other screened infections are epidemiologically independent in this population. Separately, this study identified co-infection between HIV and HBV in two donors (0.56% of the sample), underscoring that dual bloodborne viral infection remains a clinically relevant reality within Ilorin's blood donor population and reinforcing the importance of comprehensive, multiplex screening panels rather than infection-specific testing in isolation.

Lastly, seroprevalence did not differ significantly between the tertiary centre (UITH, 1.16%) and the two secondary centres together (CSH and SSH, 1.06%; Fisher's exact $p = 1.000$). There was no indication of a gradient of risk of HTLV-1/2 transmission according to facility tier in this study population. Similar to all other analyses done within this study, the low number of cases found makes it difficult to generalize about the lack of such a gradient with confidence, and the sample size needed to confirm a potential association between facility tier and HTLV-1/2 seroprevalence would have to be much larger.

CONCLUSION

This study recorded 1.11% seroprevalence of HTLV-1/2 among blood donors in Ilorin, Kwara State, which is quite close to the threshold set by the World Health Organization for recommending routine HTLV-1/2 screening. Numerical differences in HTLV-1/2 seroprevalence were found between family replacement donors and voluntary non-remunerated donors, and between the tertiary center and the two secondary centers, however, these differences were not statistically significant. None of the demographic factors examined were associated with seroprevalence, and none of the HTLV-1/2-positive donors had co-infection with HIV, HBV, or HCV. These findings support the case for routine HTLV-1/2 screening in Kwara State, promotion of voluntary non-remunerated donation, and further studies with larger samples.

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Data Availability: Data supporting the findings of this study are available from the corresponding author upon reasonable request

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