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Seroprevalence of Human T-Cell Lymphoma/Leukemia Virus Type-1 (HTLV-1) Antibodies among Blood Donors at Ibadan, Nigeria

Abstract

Background: Blood transfusion is an efficient mode of transmission of viruses and other infectious agents. Although human T-lymphotropic virus type 1 (HTLV-1) screening of blood donors is already routinely performed in developed countries, there is no routine screening of blood donors in our environment. As HTLV I and II are human retroviruses and are endemic in sub-Saharan African, including Nigeria, there is need to evaluate the burden of HTLV among blood donors in developing countries.

Objective: The current study was carried out to determine the prevalence of HTLV I/II among apparently healthy blood donors at the University College Hospital, Ibadan, Nigeria.

Material and Methods: A total of 1,000 consented, apparently healthy blood donors were recruited into a hospital-based cross-sectional study conducted at the Blood bank. 5mL of sera was obtained from each participant and analyzed for antibodies to HTLV-1 using a one-step incubation double-antigen sandwich ELISA (enzyme-linked immunosorbent assay) kit. Participants' sociodemographic characteristics and possible risk factors associated with HTLV-1 infection were assessed using a questionnaire. Statistical analysis of results was done using SPSS version 17.

Results: Of the 1000 blood donors, 942 (94.2%) were male, while the average age of the blood donors was 32.26 (±8.96) years. Thirty-two (3.2%) of the blood donors tested positive for HTLV I/II antibodies. All the positive cases were males. The major risk factors for HTLV I/II seropositivity among participants include; age less than 30 years, single status and previous history of blood transfusion. Other significant risk factors include; first time commercial blood donors and drug addiction. .

Conclusion: This study documents the Seroprevalence of HTLV I/II infection in our environment, thus highlighting the need for large scale multi-centered studies and routine screening of blood donors for HTLV-1 infection.

Keywords: Seroprevalence; HTLV I/II; Blood donors

Research Article

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Introduction

The Human T-cell Lymphotropic Viruses types I and II (HTLV-I and II) are closely related human retroviruses and were the first two retroviruses to be identified in humans in 1980 and 1982, respectively [1]. These viruses are typically lymph proliferative and are able to induce cellular transformation. HTLV-I has been associated with adult T cell lymphoma/leukaemia (ATL) which is a malignancy of CD4 T lymphocytes, and a chronic neurological disorder termed HTLV-I-associated myelopathy/tropical spastic par paresis (HAM/TSP). HTLV-II disease association is less clear as only a few cases of variant hairy cell leukemia (CD8 T-cell origin) have been reported. About 10-20 million people are infected with HTLV-I worldwide with the infection being endemic in some parts of the world including Sub-Saharan Africa [2]. The major modes of HTLV transmission are prenatally (predominantly through breast feeding), parenteral (through blood transfusions or exposure to needles and syringes contaminated with blood), and sexually. Blood transfusion is an efficient mode of transmission of HTLV. Transmission of HTLV-I infection by transfusion of cellular components of infected blood units (whole blood, red blood cells or platelets) has been confirmed in Japan with a seroconversion rate of 63% [3]. Hence screening of blood donors for HTLV-I/II infection is currently mandatory in several countries [4-7]. In Nigeria, hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infections are important causes of concern among blood donors and the Nigerian policy on blood transfusion emphasizes screening for the three viral infections as well as syphilis. The Seroprevalence rates of Hepatitis B and C among blood donors range from about 10–20% and 0.5-6%, respectively [8-10]. Currently, routine screening of blood donors for HTLV I/II is not practiced in Nigeria. Different studies carried out in Nigeria showed varied prevalence rates for HTLV I among blood donors in Nigeria [11-16]. Prevalence rates among blood donors in in Lagos ranged from 0.7% in Lagos [17]. to 11% in Ibadan [18].

Materials and Methods

Study Design: The study was a descriptive, hospital-based cross-sectional study carried out at the Blood Bank of the Department of Haematology, University College Hospital (UCH), and Ibadan.

Study population: The study population consisted of 1,000 consecutive blood donors recruited at the blood bank of the University College Hospital, Ibadan, over a 3-month period.

Data collection: A pre-validated investigator-administered questionnaire was used to assess participant's eligibility and to record their biodata.

Sample collection: Five milliliters (5mL) of venous blood was aseptically collected from the antecubital area and transferred into a plain specimen bottle after obtaining a written informed consent from each participant. The blood collected was separated immediately by centrifugation at 3000 rpm for 15 minutes using laboratory bench centrifuge (Universal 32, Hectic Centrifuge, and Germany). The sera were stored at -30^{0}C for HTLV I/II screening. The HTLV I& II screening was carried out using HTLV I & II Ab Micro-ELISA assay kit by DIAPRO (Milan, Italy). The ELISA test detects HTLV I/II antibody from polystyrene micro well strips pre-coated with recombinant HTLV antigen. Criteria for reactive, nonreactive, and intermediate results were clearly stated in the manufacturer's quality control ranges for the validation of results. The ELISA tests were repeated to ensure reproducibility of results.

Ethical consideration: Approval was obtained from the joint Ethical Committee of the University of Ibadan/University College Hospital Institution Review Board before the commencement of the study.

Data analysis: The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 17.0. Quantitative variables were summarized using mean, median, standard deviation and range while qualitative variables were summarized in frequencies and proportions. Level of significance was set at 5%. Subgroup analysis was done and the difference compared using chi-square. Bivariate analysis was performed to identify independent predictor from the explanatory variables considered (demographic and biologic variables).

Results

A total number of one thousand (1000) blood donors were recruited into the study. The age range of participants ranged from 18 to 69 years with an average of 32.26 (±8.96) years. Majority were males, 942 (94.2%) as shown in table 1 and were less than 30 years of age, constituting 424 (42.4%) of the study population. The socio-demographic characteristics of the donors are presented in (Table 1). Family replacement donors constituted 847 (84.7%) followed by voluntary donations, 140 (14%). Donations for commercial purposes were least frequent at 13 (1.3%). The prevalence of HTLV I and II in the study was 32 (3.2%). Sixteen (1.6%) respondents had indeterminate result while the remaining tested negative for HTLV I and II; 952 (95.2%) (Table 2 & 3) shows the association between HTLV I/II status and socio-demographic characteristics of the blood donors. There were no significant associations between HTLV I and II status and socio-demographic characteristics of respondents. However, there was a decrease in the prevalence of HTLV I and II with age. A higher proportion of HTLV I and II positive respondents (3.5%) were below the age of 30 years, followed by those aged 30-39 years (3.3%) and those 40 years and above (2.4%). All respondents that tested positive for the HTLV I and II virus were males, although majority of donors were also males. There was a slightly higher proportion of HTLV I and II positive respondents that were single (3.9%) compared with those that were married/divorced (2.7%), (p=0.485) (Table 4). shows the association between HTLV I and II status and behavioral characteristics of the blood donors. There were no statistically significant associations between HTLV I and II status and behavioral characteristics of blood donors (P>0.05) except for the drug abuse group (P<0.05). Interestingly, there was a higher proportion of HTLV I and II positivity among those that did not have multiple sexual partners when compared with those that have multiple sexual partners (3.4 vs. 1.6%). Additionally, Blood donors that had never had blood transfusion before had a higher frequency of HTLV I and II when compared with those who had blood transfusion before (3.2 vs. 4.8%). First time blood donors had higher HTLV I and II than return donors (3.6 vs. 2.7%). There was also a higher proportion of respondents with HTLV I and II that made donations for commercial purposes (15.4%) compared with those that did so voluntarily (4.3%) and those that did so for family replacement (2.8%), (p=0.107).

Table 1: Socio-demographic characteristics of the blood donors

Variable	Number	Frequency %
Sex		
Male	942	94.2
Female	58	5.8
Marital Status		
Single	436	43.6
Married	562	56.2
Divorced	2	0.2
Level of Education		
No Formal Education	17	1.7
Primary	88	8.8
Secondary	383	38.3
Tertiary	512	51.2
Multiple Sexual Partners		
Yes	128	12.8
No	872	87.2
Ever had a blood Transfusion?		
Yes	21	2.1
No	979	97.9
Previous Blood Donation		
Yes	442	44.2
No	558	55.8
Number of Previous Blood Donations		
0	580	58
1	243	24.3

≥2	177	17.7
Type of Donation		
Voluntary	140	14
Family replacement	847	84.7
Commercial	13	1.3
Drug Abuse		
Yes	3	0.3
No	997	99.7
Total	1000	100

Table 2: Prevalence of HTLV I/II among the blood donors.

Variable	Number	Frequency %
HTLV I/II		
Positive	32	3.2
Indeterminate	16	1.6
Negative	952	95.2
Total	1000	100

Table 3: Bivariate analysis of HTLV I/II status and socio-demographic characteristics of the blood donors.

Characteristics	HTLV I/II Status			Total	P-value
	Positive (%)	Indeterminate (%)	Negative (%)		
Age					
Below 30	15 (3.5)	6 (1.4)	403 (95.0)	424 (100)	>0.05
30-39	12 (3.3)	7 (1.9)	349 (94.8)	368 (100)	
40+	5 (2.4)	13 (1.4)	200 (96.2)	208 (100)	
Sex					
Male	32 (3.4)	16 (1.7)	894 (94.9)	942 (100)	>0.05
Female	0 (0)	0 (0.0)	58 (100.0)	58 (100)	
Marital Status					
Single	17 (3.9)	8 (1.8)	413 (94.3)	438 (100)	>0.05
Married/ Divorced	15 (2.7)	8 (1.4)	539 (95.9)	562 (100)	
Education					
Primary/None	3 (2.9)	2 (1.9)	100 (95.2)	105 (100)	>0.05
Secondary	14 (3.7)	9 (2.3)	360 (94.0)	383 (100)	
Tertiary	15 (2.9)	5 (1.0)	492 (96.1)	512 (100)	

<0.05 – significant

Table 4: Bivariate analysis of HTLV I/II status and behavioral characteristics of the blood donors.

Characteristics	HTLV I/II Status			Total	P-value
	Positive (%)	Indeterminate (%)	Negative (%)		
Multiple sexual partners					
Yes	2 (1.6)	2 (1.6)	124 (96.9)	128 (100)	>0.05
No	30 (3.4)	14 (1.6)	828 (95.0)	872 (100)	
Ever had a Blood Transfusion					
Yes	1 (4.8)	0 (0)	20 (95.2)	21 (100)	>0.05
No	31 (3.2)	16 (1.6)	932 (95.2)	979 (100)	
Previous Blood Donation					
					>0.05
Yes	12 (2.7)	8 (1.8)	422 (95.5)	442 (100)	
No	20 (3.6)	8 (1.4)	530 (95.0)	558 (100)	

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Number of Previous Donations					
0	20 (3.4)	8 (1.4)	552 (95.2)	580 (100)	>0.05
1	8 (3.3)	6 (2.5)	229 (94.2)	243 (100)	
≥2	4 (2.3)	2 (1.1)	171 (96.6)	177 (100)	
Type of Donation					
Voluntary	6 (4.3)	3 (2.1)	131 (93.6)	140 (100)	>0.05
Family	24 (2.8)	13 (1.5)	810 (95.6)	847 (100)	
Replacement					
Commercial	2 (15.4)	0(0)	11 (84.6)	13 (100)	
Drug Abuse					
Yes	1 (33.3)	0 (0)	2 (66.7)	3 (100)	<0.05
No	31 (3.1)	16 (1.6)	950 (95.3)	997 (100)	

Discussion

Blood transfusion is an essential therapy in the management of a significant proportion of patients in developing countries. The main aim of an effective blood transfusion policy is to achieve a zero risk of transmission of infectious agents. Human T-cell lymphotropic viruses I and II are closely related human retroviruses that are associated with diseases and have previously been documented to be endemic in many parts of the world including Nigeria [2]. This study is among the few that attempted to screen healthy blood donors in this environment. The first similar study in this environment was carried out in 1993 by CKO Williams et al. [12] and the study showed a HTLV1-I prevalence rate of 11% among blood donors in the same blood bank [12]. The higher prevalence obtained in that study was probably due to the lower number of participants screened, theirs was 123 blood donors as against our 1000 blood donors. The observed sero-prevalence rate of HTLV I and II from our study was 3.2%. This result is lower than the 5.6% previously reported by Olaleye et al. [13] involving over four thousand participants recruited from different parts of the country [13]. Our finding is however similar to that of Terry et al. [18] who reported a prevalence rate of 3.6% among 372 blood donors in another Southwestern State, Osun State, Nigeria [18]. Contrastingly, a much lower Seroprevalence of 0.7% was reported in a study carried out in Lagos among 406 blood donors [11]. Probably due to the lower number of the participants in that study. The result of the current study is also slightly higher than those obtained from other West African countries; 1.5% in one study in Benin Republic [19] and 2.1% in Ghana [20]. This study shows that the majority of the blood donors are below the age of 30 years (42.4%) when compared with those between the ages of 30 and 40 years (36.8%) and those above 40 years of age (20.8%). It is not surprising that majority of the infected persons are HTLV I/II positive considering that the blood donors at the blood bank of the University College Hospital, Ibadan, are predominantly males (94.2%). Majority is married (56.2%) and had tertiary education (51.2%) followed by those with secondary education (38.3%). The majority of the donors are first time donors. Among the return donors, less than half (40%) donated more than two times. Only 14% are voluntary blood donors. This observation falls short of the WHO recommendation of at least 99.9% of donors being voluntary unpaid blood donors. There was no significant association between age of participants and HTLV I/II even though our study shows a decline in the prevalence of the infection with age group, from 3.4% in those less than 30 years to 2.4% among those that are above 40 years of age. This was probably due to the higher number of the participants that are less 30 years of age. This agrees with the previous finding by Olaleye et al. [13] who also reported a higher prevalence of HTLV I/II among individuals in their third decade of life [10]. There was also no significant association between the sero-prevalence of HTLV I/II and the level of education of the participants, but a higher percentage of positivity was found among those with secondary school education (3.7% vs. 2.9%). Sexual transmission of HTLV I and II appears to be relatively inefficient when compared with the transmission of HIV with a risk of HTLV I and II transmission from husband to wife to be 60.8% and from wife to husband to be 0.4% over a 10-year period [18-23]. This study did not show any significant association between sexual behaviours of the participants and the sero-prevalence of HTLV I and II.

In contrast, the study demonstrated a higher prevalence rate among singles when compared with those that are married or divorced (3.9% vs. 2.7%). It also showed a higher prevalence rate among those with no multiple sexual partners (3.4% vs. 1.6%). These findings contrast a previous study which showed a higher prevalence rate among commercial sex workers, who have multiple sexual partners than married pregnant women[19]. We also report a higher prevalence rate of HTLV I and II among first time blood donors when compared with the return blood donors (3.6% vs. 2.7%) thus suggesting that regular blood donors are more likely to be safe. This is further confirmed by the observation that those who donated more than twice have a further lower prevalence rate than those who donated only once in the past (2.3% for those who donated ≥ 2 times vs. 3.3% for one donation in the past). Family replacement donors have the lowest prevalence rate (2.8%) followed by voluntary donors (4.3%) and then commercial donors (15.4%). This is in contrast with published data that voluntary donors carry the lowest risk of transfusion-transmissible infections (TTIs), probably due to the lower number of the voluntary blood donors when compared with the family replacement donors (140 ~Authors declare no conflict of interest.

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