

## Sero-Prevalence of Human T-Cell Lymphotropic Virus (HTLV) Among Blood Donors Attending Federal Teaching Hospital Gombe State, Nigeria.

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### ABSTRACT

**Background:** Human T cell lymphotropic virus type 1 (HTLV-1) is a retrovirus that has been associated with adult T cell leukemia/lymphoma (ATL) and a tropical spastic paraparesis (TSP). Blood transfusion is a common transmission pathway for Human T-cell lymphotropic Viruses (HTLVs). Presently, there is no routine pre-transfusion screening for HTLV for donors in Nigeria. **Aim:** The study aimed to determine the prevalence of HTLVs among blood donors attending Federal Teaching Hospital, Gombe. The study was carried out on blood donors attending the blood transfusion unit of Federal Teaching Hospital, Gombe. **Materials and Method:** Two hundred and sixty-four (264) family replacement blood donors were recruited during the period of the study, of which all were male donors. The participant's sera were assayed for HTLV by an enzyme-linked immunoassay method for the determination of antibodies to HTLV- I and HTLV -II. **Result:** Out of the two hundred and sixty-four (264) samples tested for HTLV-I/II, 2 (0.8%) were equivocal while 10 were found to be repeatedly positive giving a prevalence of 3.8% with a 95% CI of 1.8% to 6.9%. Age groups show no significant association with the infection of HTLV-I/II ( $p=0.84$ ). Also, there was no significant association with the infection of HTLV-I/II between <24 years age group to that of > 25 years age groups ( $p=0.54$ ). **Conclusion:** This study advocates for routine screening of blood donors for HTLV because the high rate of infection in the blood bank laboratories.

**Keywords:** Human T cell lymphotropic virus type 1, leukemia/lymphoma, blood donors, enzyme-linked immunoassay, Prevalence, Federal Teaching Hospital Gombe

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## INTRODUCTION

Globally, approximately 108 million units of blood are donated annually [1]. Sub-Saharan Africa recorded about 2 million units donated which resulted due to the need for blood transfusions arising from “maternal morbidity, malnutrition, and a heavy weight of infectious diseases such as transfusion transmissible infections (TTIs)” [2]. Blood is vital to human life and across the world, millions of lives are saved through blood transfusion. However, the risk of receiving unsafe blood is increasingly high even with current efforts to screen donated blood. Patients, especially those who require transfusions regularly, are more at risk of getting infected with TTIs such as HIV, hepatitis B or hepatitis C and HTLVs if given blood that has not been adequately screened. HTLV infection has been known to be transfusion linked [3]. In fact, post-transfusion infections due to HTLV have been reported [4].

Okocha *et al.*, [5] reported positive rates between 44% and 63% among patients that were transfused with HTLV-I-infected blood products in a high prevalence region. Countries in the world have adopted the intervention strategy used to stop spread of HIV through blood transfusion to also reduce HTLV infection. Some countries where HTLV is prevalent and others with low incidence rate have taken step to screen blood donors in order to avoid infection through transfusion. This significant approach has been documented to slowdown spread of HTLV in USA [6]. The World Health Organization (WHO) encouraged that local epidemiological evidence should be a guide in decisions taken when offering routine testing of blood donors for HTLV [7]. In addition, that avoidance and control of HTLV transmission is more reliable with the

screening of blood donors. HTLV-1 spread via transfusion happens with cellular blood products such as whole blood, red blood cells, and platelets but not with the plasma fraction from HTLV-1-infected blood” [8]. The possible way of spread of HTLVs between individual drug users (intravenous) is sharing contaminated needles [9]. Screening for antibodies and discarding seropositive units is expected to strongly interrupt HTLVs transmission since they are transmitted through blood transfusion. The fear of HTLV-1 spread via blood transfusion in advanced nations has prompted the commencement of routine donor screening for HTLV-1 [10].

The aim of the study is to determine the Human T-cell Lymphotropic Virus (HTLV) sero-prevalence rate amongst blood donors attending Federal Teaching Hospital Gombe (FTHG).

## MATERIALS AND METHOD

### Study Area

The study was carried out on blood donors (Family Replacement Donors) attending the Blood Transfusion Department of the Federal Teaching Hospital, Gombe (FTHG).

### Ethical Clearance/Informed Consent:

Ethical clearance was sought and obtained from the ethical and human research committee of the Federal Teaching Hospital, Gombe. And an informed consent was obtained from all the participants.

### Sample collection, preparation and separation.

Two hundred and sixty-four (264) family replacement blood donors were recruited during the period of the study, of which all were male donors. Upon enrolment, 5ml of venous blood was collected from each

potential blood donor that volunteered to donate blood at the blood bank of FTHG into a sterile plain bottle. Serum was extracted from the clotted blood. The serum samples were stored in the freezer at -20-degree centigrade until the test for the HTLV-I/II was done.

#### Tests for HTLV-I/II Antibodies.

Participant's serum was tested for HTLVs using the Ab versions ULTRA by Diagnostic Bio-probes-Srl, Italy, an immunoassay designed for screening HTLV-I/II antibodies in serum. The assays were carried out strictly as prescribed by the manufacturer (serum samples with an "OD/cut-off  $\geq 1.1$  are considered positive,  $< 0.9$  are considered negative, while those between 0.9-1.1 are considered equivocal for HTLV-I/II antibodies). Reactive samples were all repeated in duplicate with the same kit.

This assay uses the ELISA based principle in which the wells of the Microplates embedded with specific HTLVs synthetic antigens comprises of "gp46-I, gp46-II and gp21-I". The sample and anti-HTLV-I/II antibodies were initially layered on the solid phase. Following the second incubation and washing, specific synthetic antigens derived from "gp46-I, gp46-II and gp21-I, labeled with peroxidase (HRP)" were added to detect bound anti-HTLV-I & II total antibodies.

An optical signal that is proportionate to the quantity of anti HTLV I/II antibodies present in the sample was generated due to the enzyme captured on the solid phase. After stopping the enzyme reaction, its optical density is determined by an ELISA reader. The plates were read at a wavelength of 450nm (reading) and at 630nm (background subtraction, strongly recommended). Sensitivity = 100%, specificity = 99.5%.

Results were interpreted according to manufacturer's guidelines.

**Statistical Analysis:** Data were captured on Microsoft Excel and analysed on Epi Info version 7.1.14 (2013). Descriptive statistics (frequency distribution, mean and confidence interval) were used to describe the characteristics of participants. The proportions were compared using "Chi-square test, Fisher's exact test" and draw inferences at  $p \leq 0.05$ .

#### RESULTS

Samples were collected from 264 family replacement donors. Occupation of the participants is shown in table.1. 2 (0.8%) are Clergy men, 71(26.9%) Civil Servants, 12(4.5%) Drivers, 22(8.3%) Farmers, 4(1.5%) Force, 113(42.8%) Private Businessmen, 39(14.8%) Students and 1(0.4%) are Teachers. All participants in this study were all males. The least age was 18years while the oldest was 56years old (Table 2).

The seropositivity of HTLVs was carefully studied along the age groups and later categorized them into those  $< 24$ years and  $> 25$ years. Two hundred and sixty-four (264) samples were tested for HTLV-I/II. 2(0.8%) were equivocal while 10 were found to be repeatedly positive giving a prevalence of 3.8% with a 95% CI of 1.8% to 6.9% (shown in Fig.1).

Age groups had no significant relationship with those infected with HTLV-I/II ( $p=0.84$ ) (shown in Fig 2). In addition, majority of HTLV-I/II infection were found among  $< 24$  years and 30-34 years age groups. There were no HTLV-I/II positive among individuals between the age of 40-44 years and 45-49 years of age. Also, (Fig. 3) shown that, there was no significant relationship with the rate

of infection of HTLV-I/II between <24 years age group to that of > 25 years age groups p=0.54).

The spreading of seropositive along occupations indicated that those on private

business recorded highest seroprevalence 6(60%) to HTLV-I/II. There was also no statistically significant association between occupation and HTLV infection p=0.97 (Fig 4)

**Table 1. Occupation Distribution of Participants**

OCCUPATION	FREUEQNCY	PERCENTAGE
CLERGY	2	0.8%
CIVIL SERVANT	7	26.9%
DRIVER	12	4.5%
FARMER	22	8.3%
FORCE	4	1.5%
PRIVATE BUSINES	113	42.8%
STUDENT	39	14.8%
TEACHER	1	0.4%
<b>TOTAL</b>	<b>264</b>	<b>100%</b>

**Table 2: Age Distribution of participants**

Age	FREUEQNCY	PERCENTAGE
<24	51	19.3%
25-29	71	26.9%
30-34	60	22.7%
35-39	47	17.8%
40-44	21	8.0%
45-49	6	2.3%
>50	8	3.0%
<b>TOTAL</b>		<b>100%</b>

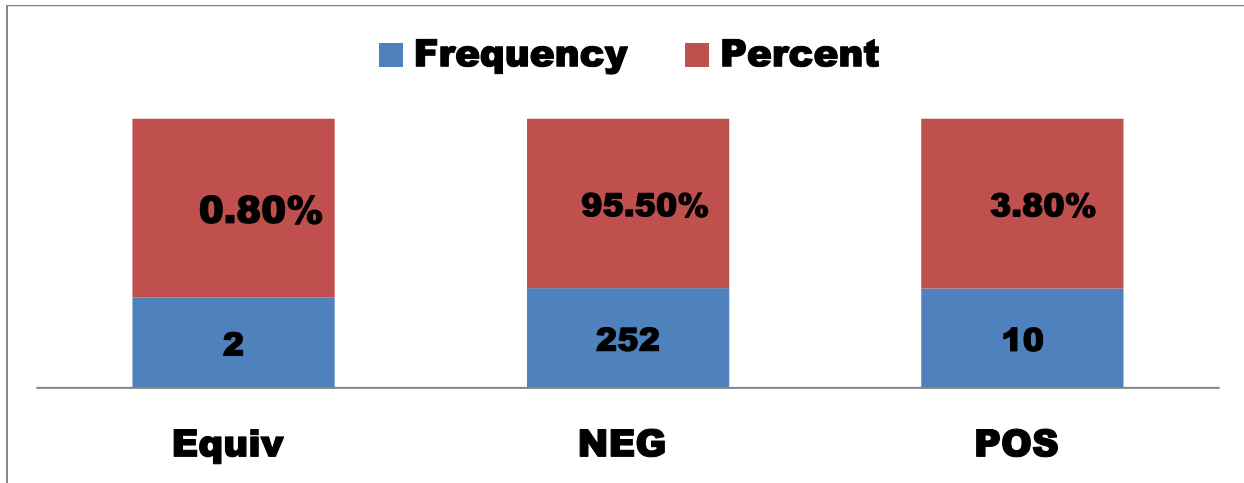
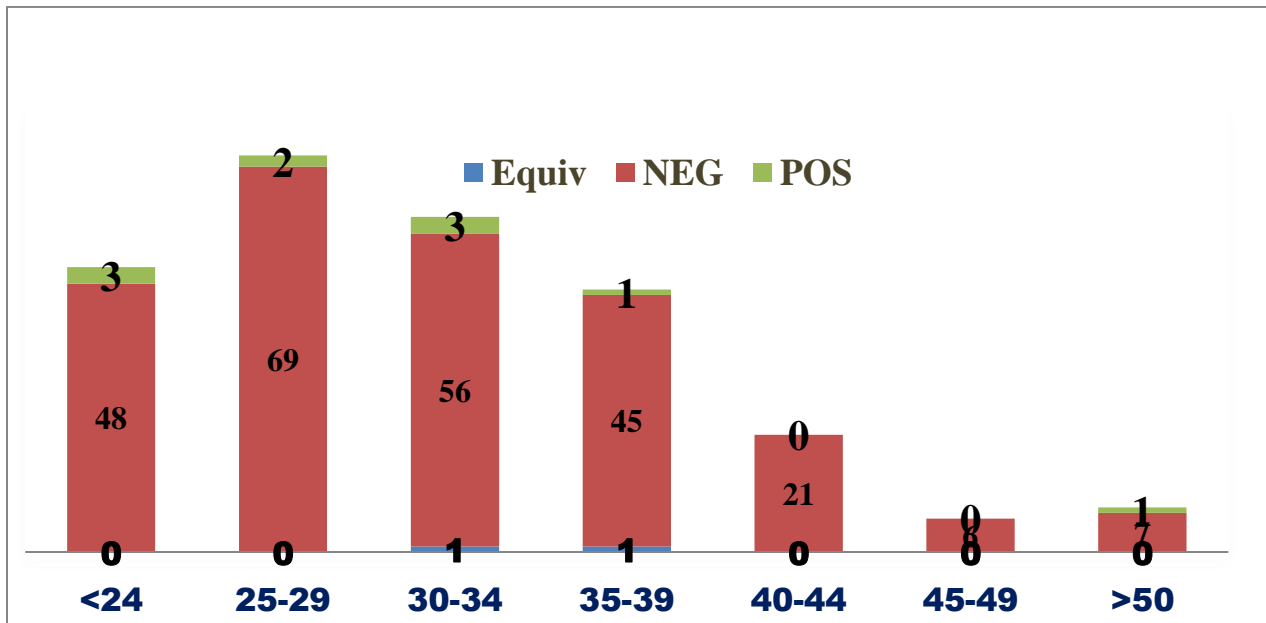
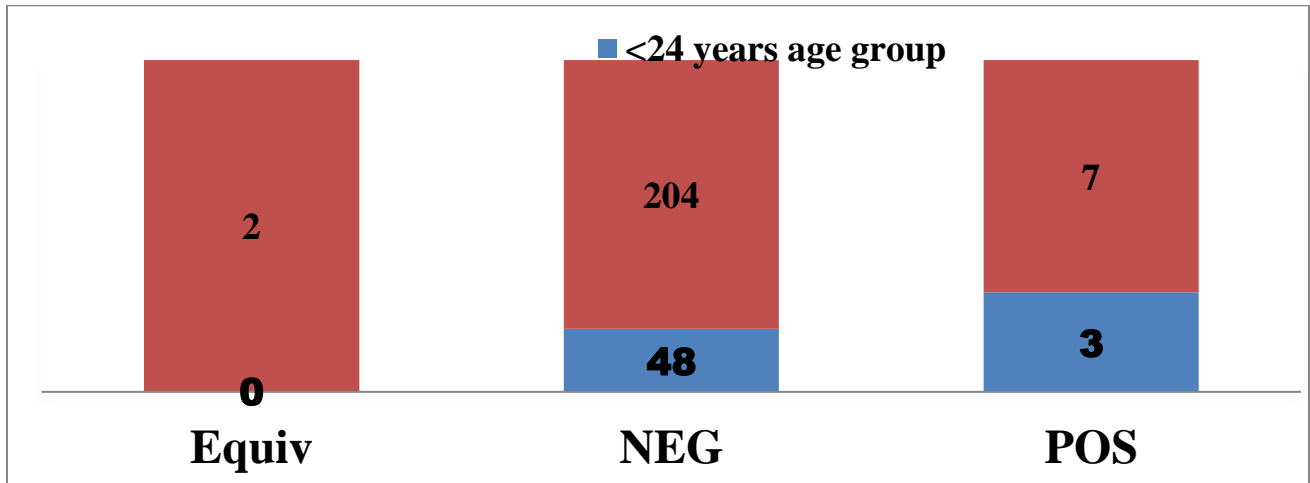


Fig. 1 Prevalence of HTLVs Among Blood Donors



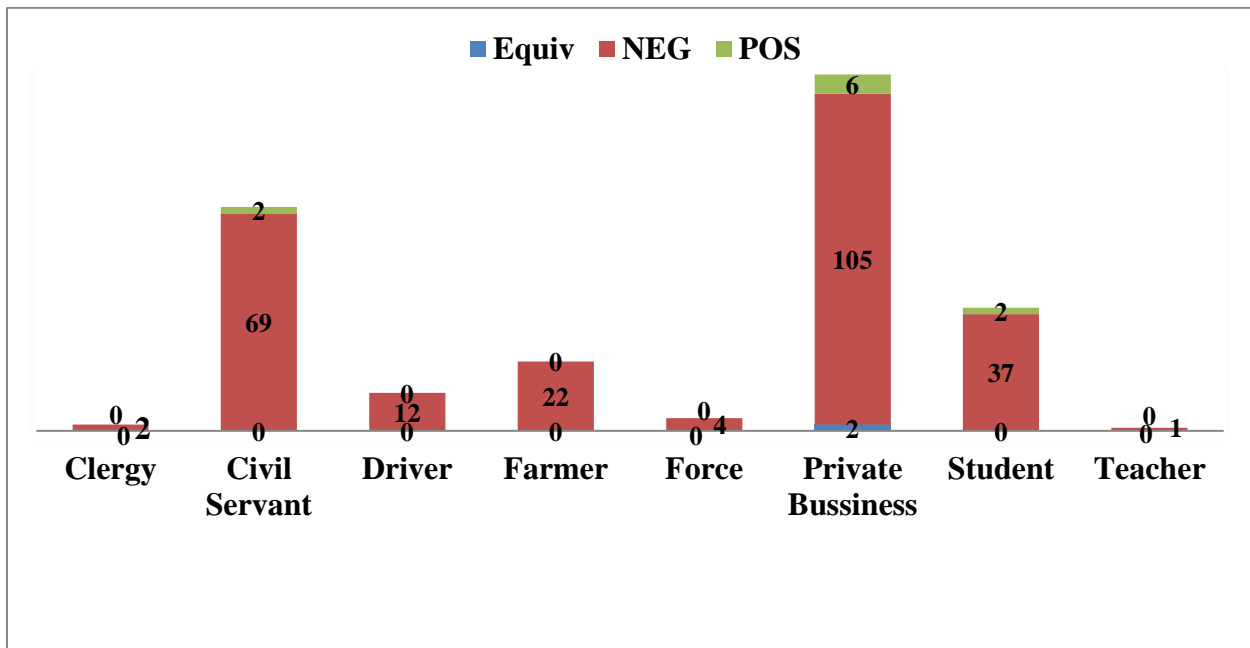
P=0.8477

Fig. 2 Relationship Between Age and HTLVs Seropositivity



P=0.5426

Fig. 3 Relationship between Age (<24 years and >25 years) and HTLVs Infection



P=0.978

Fig. 4 Occupation and HTLVs Seropositivity

## DISCUSSION

Human Lymphotropic Virus (HTLV) infection is said to be confined to specific geographical areas and sub Saharan Africa is in that endemic belt of HTLV, with a stable incidence and high prevalence [11]. The result of this study shows that the seroprevalence of HTLV-I and HTLV-II was 3.8% amongst the blood donors attending FTHG. This prevalence was relatively lower than the seroprevalence study reported by *Williem et al.*, [12] among blood donors in Ibadan which is 7.0% , but in conformity with an average national rate of donors in Nigeria which is “2% and 4.8%” as stated by *Fleming et al.*, [13], also agree with the study carried out in Oshogbo, Nigeria and Caribbean Nations where they established the prevalence as 3.0 to 6.0% [14].

Decline in this infection rate compared to what was obtained in Ibadan by Williams could be associated with the improvement in the blood donor selection criteria since the advent of HIV/AIDs and other TTIs. Although, this finding is lower compare to the prevalence obtained in general populations both in Nigeria and other part of the world. For instance, United State of America (USA) has reported 3-5% prevalence among general population [8]; Japan has prevalence rate of 27% for HTLV-I/II where the prevalence has been reported to be highly endemic [15]; while Central Africa prevalence ranges falls between “3 to 33%” [16].

HTLV-I/II prevalence has been reported among blood donors across various countries all over the globe with an average of 0.16% [17] as opposed to research done in 1986 in Nigeria that found average sero-prevalence as 2.0% to 4.8% [13]. In Nigeria, the following prevalence of HTLV I/II have been reported in separate studies among blood donors. *Analo et al.*, [18] reported prevalence

of 0.7% in a study done in Lagos, *Durojaiye et al.*, [19] in a study conducted among healthy blood donors in LUTH also reported prevalence of 0.5%. In Oshogbo 3.6% was reported by *Terry et al.*, [14], while prevalence of 0% was recorded in Enugu in 2015 as stated by *Okoye et al.*, [20].

This study was carried out to establish the need to include HTLV-I/II screening as part of the blood donor’s check.

The study appears to be the first of its kind to the best of my knowledge in North Eastern Nigeria. Prevalence research works on HTLVs have been reported and published in some of the geopolitical zones of Nigeria “North-West, South-East, South-West, South-South”, while no studies have been circulated in North-Eastern Nigeria. Virtually, most of the publications on HTLV-1 prevalence were done between 1980s and 1990s. The need for contemporary studies became evident.

The seroprevalence of 22.9% and 16.7%, respectively were recorded in a research conducted among the money-making sex workers and women that are pregnant in south west Nigeria [21].

The result of this prevalence study of 3.8% was higher than the outcome recorded in a related research done among blood donors in Senegal, which documented prevalence of “0.16%” [12]. This might be due to more stringent measure in donor selection in Senegal (Voluntary blood donor compliance) compare to what is obtainable in Nigeria where family replacement donations still dominate.

The sero-prevalence of HTLV-I/II obtained was also higher than *Analo et al* [14] who reported prevalence of 0.7% in a study done in Lagos, [15] in a study conducted among healthy blood donors in LUTH of 0.5% and prevalence of 0% recorded in Enugu in 2015 [22]. This finding was higher due to the fact that the above studies were further subjected

to molecular analysis (PCR) for better confirmation.

The prevalence rate recorded in this study was also more than rate obtained in North America and Europe on blood donors despite its very low sero-prevalence documented in those nations, for instance, “0.01-0.03% in USA and Canada [23], 0.0039 in France, 0.002% in Norway and 0.0056% in Greece” [24]. Strong adherence to donor selection rules may justify reason for the very low HTLV-1 sero-prevalence rates among this Nations [25]. This finding also shows higher prevalence than what was recorded among the general populace in African Countries; “South Africa has a prevalence of 0%, Zimbabwe 0.11%, Senegal 1, 2%, Namibia 1.0%, Mozambique 0.7%, and Congo 0.7%” [26]. This further confirmed that not all African Countries has high endemicity for HTLV-I infection. Age groups has no significant relationship with the infection of HTLV-I/II ( $p > 0.05$ ), even though previous report have indicated increases of HTLV infection with age between 20 to 40 years [27]. However, majority of those positive for HTLV-I/II fall among <34 years age groups. While there was no recorded HTLV-I/II positive individuals between the age groups of 40-44 years and 45-49 years. The findings showed no significant relationship for those infected with HTLV-I/II between <24 years age group to that of > 25 years age groups ( $p > 0.05$ )

### Conclusion:

This study has provided baseline information on the seroprevalence of HTLVs among blood donors in Gombe, North Eastern part of Nigeria.

### Recommendation

The findings advocate strong backing for routine blood donor screening for HTLVs

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base on increased rate of the prevalence recorded among blood donors studied; this outcome could form basis of including HTLVs testing as part of the blood donor routine screening.

### Limitation of the Study

This assay method was designed not to separate between HTLV-I and HTLV-II, but capable of testing for HTLV-I and HTLV-II in the same Micro-Elisa-Well, due to its specificity and sensitivity (i.e. specific to the antibody, very sensitive and highly reproducible).

### Conflict of Interest

The authors declare no conflict of interest

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### REFERENCE

1. World Health Organisation. Blood Safety and Availability Fact Sheet. 2014.
2. Hensher M and Jeffery E. Financing blood transfusion services in Sub-Saharan Africa: a role for user fees? Health policy plan. 2000; 15(3), 287-295. DOI: <https://10.1093/heapol/15.3.287>.
3. Gasmi M, D'Incan M and Desgranges C. Transfusion transmission of human T-lymphotropic virus type I (HTLV-I) from an asymptomatic



- blood donor: conservation of LTR U3, env, and tax nucleotide sequences in a recipient with HTLV-I-associated myelopathy. *Transfusion* 1997;37 (1), 60-4.  
<https://doi.org/10.1046/j.1537-2995.1997.37197176952.x>
4. Kaplan JE, Litchfield B and Rouault, C. HTLV-I associated myelopathy associated with blood transfusion in the United States: epidemiologic and molecular evidence linking donor and recipient. *Neurology*. 1991;41(2 (Pt 1)), 192-7  
DOI:10.1212/WNL.41.2\_Part\_1.192
  5. Okocha K, Sato H and Hinuma. A retrospective study on transmission of adult T cell leukaemia virus by blood transfusion: seroconversion in recipients. *Vox Sanguinis*. 1984; 46(5): 245-253  
DOI:10.1111/j.1423-410.1984.tb00083.x.
  6. Glynn SA, Murphy EL, Wright DJ, Sacher RA, Friday J and Schreiber GB. Laboratory abnormalities in formal Blood donors seropositive for Human T-lymphotropic virus types 1 and 2: a prospective analysis. 2000;12:550-555.  
DOI:10.5858/2000-124-0550-LAIFBD
  7. World Health Organization. (Accessed July 19, 2013). Screening donated blood for transfusion-transmissible infections. Geneva: WHO; 2012. Available at: <http://www.who.int/bloodsafety/ScreeningTTI.pdf>
  8. Manns A, Wilks RJ, Murphy EL, Haynes G, Figueroa JP, Barnet M, Hanchard B and Blattner WA. A prospective study of transmission by transfusion of HTLV-I and risk factors associated with seroconversion. *International Journal Cancer*.1992;30, 51(6), 886-91.  
DOI:10.1002/ijc.2910510609.
  9. Feigal E, Murphy E, Vranizan K, Bacchetti P, Chaisson R, Drummond, JE, Blattner W, McGrath M, Greenspan J and Moss A. Human T-cell lymphotropic virus types 1 and II in intravenous drug users in San Francisco: risk factors associated with seropositivity. *Journal of Infectious Disease* 1991; 164(1), 36-42. DOI: 10.1093/infdis/164.1.36.
  10. Stigum H, Magnus P, Samdal HH and Nord E. Human T -cell lymphotropic virus testing of blood donors in Norway: a cost-effect model. *International Journal of Epidemiology*.2000;29(6):1076-1084.  
<https://doi.org/10.1093/ije/29.6.1076>
  11. Van Prooyen N, Andresen V, Gold H, Bialuk L, Pise-Masison C and Fanchini G. Hijacking the T-cell communication network by the human T-cell leukaemia/lymphoma virus type 1 (HTLV-I) p12 and p8 protein. *Journal Molecular Aspects Medicine*. 2010a; 31: 333-343.  
doi.10.1016/j.mam.2010.07.001.
  12. Williams CK, Alexander SS, Bodner A. Frequency of adult T-cell leukaemia/lymphoma and HTLV-I in

- Ibadan, Nigeria. *British Journal Cancer* 1993; 67: 783–786.  
Doi:10.1038/bjc.1993.142
13. Fleming AF, Mahamjan R, Abraham M, Kulkarni AG, Bhusnurmath S.R., Okpara RA, Williams E, Akinsete I, Schneider J, Bayer U and Hunsmann G. Antibodies to HTLV-I in Nigerian blood donors, their relatives and patients with leukemias, lymphomas and other diseases. *International Journal of Cancer* 1986; 38: 809-813.  
Doi: 10.1002/ijc.2910380605.
  14. Terry OA, Olusoga Ogbolu D, Oluremi AS and Okanlawon BM Seroprevalence of HTLV/II amongst Blood Donors in Osogbo, Nigeria. *Sudan JMS* 2011; 6(3):177 – 182.
  15. Mueller N, Okayama A, Stuver S and Tachibana N. Findings from the Miyazaki Cohort Study. *Journal Acquired Immune Deficiency Syndrome*.1996;13: S2–S7.  
Doi:10.1097/000042560-199600001-00002.
  16. Hjella B. Human T-cell leukaemia/lymphoma viruses. Life cycle, pathogenicity, epidemiology, and diagnosis. *Arch Pathology Laboratory Medicine*. 1991; 115(5)440-5
  17. Analo HI, Akanmu AS, Akinsete I, Njoku OS and Okany CC. (1998). Seroprevalence of HTLV-1 and HIV infection in blood donors and patients with lymphoid malignancies. *Centre African Journal Medical*. 1998; 44(5) 130–134.
  18. Diop S, Calattini S and Abah-Dakou, J. Seroprevalence and molecular epidemiology of human T-Cell leukemia virus type 1 (HTLV-1) and HTLV-2 in blood donors from Dakar, Senegal. *Journal Clinical Microbiology* 2006; 44(4): 1550-4.  
Doi: 10.1128/JCM.44.4.1550-1554.2006.
  19. Durojaiye I, Akinsegun A, Adedoyin D, Sarah A, Adewumi A, Ebele U., Olajumoke O, Majeed O, Akinola D and Olaitan O. Sero-prevalence of human T lymphotropic virus antibodies among healthy blood donors at a tertiary centre in Lagos, Nigeria. *The Pan African Medical Journal*. 2014;17:301.4075.  
DOI:  
10.11604/pamj.2014.17.301.4075.
  20. Okoye AE, Godswill OI, Onoh CR, Ugwu NI, Anigbo SC and Nonyelu EC .Seroprevalence of human T-cell lymphoma/leukaemia virus type-1 (HTLV-I) antibodies among blood donors at Enugu, Nigeria. *Journal of Blood Medicine*.2015; 93(6): 31-36  
Doi: 10.2014/JBM.S65556.
  21. Forbi JC and Odetunde AB. HTLV in a population of pregnant women and commercial sex workers in South Western Nigeria. *African Health Science*, 2007; 7(3): 129-132.  
DOI: 10.5555/afhs.2007.7.3.129.
  22. Chiavetta JA, Escobar M, Newman AHY, Driezen P, Deeks S., Hone, D.E., O'Brien, S.F. and Sher, G. Incidence and estimated rates of residual risk for HIV, hepatitis C,

- hepatitis B and human T-cell lymphotropic viruses in blood donors in Canada, 1990-2000. *CMAJ*. 2003 Oct 14;169(8), 767-73.  
PMID:14557314;  
PMCID:PMC2032278.
23. Tseliou PM, Spanakis N, Spiliotakara A, Politis C, Legakis NJ and Tsakris A. HTLV-I and -II in southwestern Greece. *Transfusion*, 2003;43: 1641–1642.
24. Yara S, Fujita J and Date H. Transmission of human T-lymphotropic virus type I by bilateral living-donor lobar lung transplantation. *Journal of Thoracic Cardiovascular Surgery*. 2009;138(1): 255-6  
Doi: 10.1016/j.jtcvs.2008.12.050.
25. Olaleye OD, Bernstein L and Sheng Z. Type specific immune response to HTLV-1/2 infections in Nigeria. *American Journal of Tropical Medicine and hygiene*. 1994 Apr; 50(4):479-86.  
Doi:10.4269/ajtmh.1994.50.479