Transfusion Transmitted Syphilis Among Potential Male Blood Donors in Some Hospitals in Port Harcourt Town, Rivers State, Nigeria

Adewuyi SA, Frank-Peterside N, Otokunefor K, Abeni BA, Cookey TI, Okonko IO

Virus Research Unit, Department of Microbiology, University of Port Harcourt, East-West Road, P.M.B. 5323, Choba, Port Harcourt, Rivers State, Nigeria;
E-mail: iheanyi.okonko@uniport.edu.ng; Tel: +2348035380891

Abstract: Blood transfusion is associated with a high risk of exposure to transfusion-transmissible infections (TTIs) including syphilis among others. This study aimed at determining the prevalence of syphilis among intending male blood donors in two hospitals (private and government-owned) in Port Harcourt, Rivers State, Nigeria and the effect of some demographic factors on the prevalence. A total of 182 sera samples from male donors were screened for the presence of antibodies to *Treponema pallidum* using Syphilis Ab version ULTRA enzyme immunoassay technique respectively. Chi-square test was used to determine the relationship of some demographic factors with syphilis prevalence. The overall seroprevalence of syphilis was 6.6% with seronegativity of 94.5%. There was a significant relationship ($p<0.05$) between the seroprevalence of Syphilis with respect to age. Total of 83.4% of syphilis positive was found in the age group of 31-40 years old. Donors with Primary school level made up 33.3% of Syphilis positive cases. The lowest of 8.3% was seen in undergraduates. A percentage of 83.4% positive cases were seen among donors with low skill occupation as compared to 8.3% each of unemployed and high skill donors. There was relatively low number of voluntary donors (3.8%) as compared to family donors (48.9%) and paid donors (47.3%). The seroprevalence of syphilis, remain a threat to safe blood transfusion and public health in Nigeria. Strict enforcement of mandatory screening and aggressive public enlightenment are recommended as preventive measures against TTIs.

[Adewuyi SA, Frank-Peterside N, Otokunefor K, Abeni BA, Cookey TI, Okonko IO. **Transfusion Transmitted Syphilis Among Potential Male Blood Donors in Some Hospitals in Port Harcourt Town, Rivers State, Nigeria.** *Biomedicine and Nursing* 2019;5(3): 90-96]. ISSN 2379-8211 (print); ISSN 2379-8203 (online). http://www.nbmedicine.org. 12. doi:10.7537/marsbnj050319.12.

Keywords: Transfusion, Transmitted Syphilis, Blood Donors, Nigeria

1.0 Introduction

Blood transfusion is means of receiving blood and its products into one's circulatory system intravenously. During the course of transfusion, infections can be transmitted, such infection is called a Transfusion Transmitted Infection (TTI). These pathogenic microorganisms are dived into three categories: Bacteria, Virus and Parasites. Bacteria such as *Treponema pallidum, Staphylococcus epidermidis*. Viruses including Hepatitis B and C virus, Human Immunodeficiency Virus (HIV), Cytomegalovirus, and parasites such as Malaria and Leishmania are all examples of TTIs (Su *et al.,* 2003; Mollison *et al.,* 2005; Sheppard *et al.,* 2005; Shang *et al.,* 2007; WHO, 2011).

Blood transfusion is a life-saving intervention used in varieties of medical conditions such as malignancies, sickle cell anaemia, Thalassemia, post-traumatic and operative bleeding. Those who donate blood are categorized into three groups; those who donate for incentive purpose (paid donors); those who donate of free will (voluntary donors and; those who donate to family and friends (family donors) (WHO, 2017). Majority of donors in Sub-Saharan Africa falls into the paid donors and family donors, these categories are highly associated with the risk of TTIs (Okoroiwu*et al*., 2018; Siraj *et al*., 2018). The World Health Organization plans to have a target of 100% voluntary donor by the year 2020 (WHO, 2017).

The causative agent of syphilis is Treponema pallidum subspp*pallidum*. The bacterium is a gram-negative, thin spirochete that has endoflagella. Transmission is either via sexual, parenteral (blood transfusion, contaminated needles among drug users), transplacental or vertical route (Gardella *et al., 2002; Workowski* and Berman, 2006). It is an obligate pathogen cannot survive for more than 4days, pathogenesis depends on either of the fourstages: primary - chancre of the skin; secondary- genito-inguinal rashes (condyloma lata), ocular syphilis; latent- early latent, late latent and; tertiary- CNS is affected and cardiovascular infection (Kent and Romanelli, 2008). Syphilis can also occur as a congenital disease (Stamm, 2009).

Syphilis is still a serious public health concern in Sub-Saharan Africa owing to the reported high

prevalence of this infection associated with High prevalence of HIV in this region (Okoroiwu *et al*, 2018; Siraj 2018; Shiferaw *et al*., 2019). Diagnosis of this TTI is performed using commercially available rapid immunochromatographic kits commonly known as VDRL. For syphilis, WHO suggests *Treponema pallidum* Haemagglutination Assay (TPHA) and the Enzyme Immunoassay (EIA) as specific test looking for anti-treponema antibodies or Rapid Plasma Reagin (RPR) and Venereal Disease Research Laboratory test (VDRL) as a non-specific test looking for anti-cardiolipin antibodies for syphilis screening (WHO, 2010).

The World Health Organization estimated that approximately 12 million new cases are reported each year in the world with more than 90 per cent from developing countries (World Health Organization [WHO], 2011). Moreover, the mortality and morbidity potential of syphilishas become high owing to increasing prevalence of HIV infection. The infection is commonly found in developing countries where prevalence can reach 25% amongst blood donors and rare in developed countries (Tagny et al., 2009).

Safe blood transfusion is still a challenge in Nigeria due to poor blood transfusion policies, inexperienced laboratory personnel, lack of political will and mass poverty among others. To minimize these TTI Donors have to be selected using donor selection criteria such as age, weight, blood pressure and questionnaire; blood donors also have to be screened for TTI; avoiding contamination risk during collection, processing, storage and Transportation.

2 Materials And Methods

The design of this study aimed at investigating the prevalence of syphilis among intending male donors in two hospitals in Port Harcourt Town by detecting the presence of antibodies to *Treponema pallidum* using ELISA test.

2.1. Study Population

A sum of 182 potential males blood donors at Meridian Hospitals and Rivers State University Teaching Hospital, in Port Harcourt Town, Nigeria were enrolled in this survey. For the scheme of this survey, these Hospitals were labelled Hospital 1 and Hospital 2 respectively. 100 samples were collected from Hospital 1 and 82 samples from Hospital 2. The demographic details relevant to this study were gathered as shown in Table 1.

2.2. Sample Collection

One hundred and eighty-two intravenous blood samples were obtained aseptically using a 5-ml syringe and allowed to clot at room temperature in plain tubes. Serum specimens were separated by centrifugation at 3000rpm (resolution per minute) for 5 min. The Sera were stored at -20°C and used for the serological analyses.

2.3. Syphilis analysis

Syphilis was screened using Syphilis Ab version ULTRA ELISA kit for the evaluation of antiserum to *Treponema pallidum* in serum. Assay Procedure was achieved using the Long Incubation method (1st incubation 60 minutes, 2nd and 3rd incubations 30 minutes) by the manufacturer's specification.

2.4 Data Analysis

Microsoft Excel spreadsheet (Microsoft Corporation) was used for analyzing the result. The seroprevalence was calculated. Pearson's Chi-square test used to find relations between demographic factors and seropositivity of syphilis and HBV. Thelevel of significance was set at $P \leq 0.05$.

3 Results

3.1 Overall demographic factors of the male blood donors in both Hospitals

The total number of male donors in this study was 182 from both hospitals. Donors with Secondary School qualifications constituted the largest population making up 49 (26.9%) overall followed by graduates n= 43 (23.6%) with undergraduates n=8 (4.4%) as the least. On the basis of occupational skills n= 25(13.7%), 147 (80.8%), and 10 (5.5%) of the donors were found to be unemployed, have a low skill or high skill occupations respectively. The voluntary donors were the least among the donor population n=7 (3.8%). Family and paid donors made up the majority of the donor populace in this study, 49 (48.9%) and 46 (47.3%) respectively.

The mean age group 31 – 40 years were the majority overall, while ages 21- 30 and 41-0 years constituted 27.5% (n=50) and 13.2 (n=24) (Table 1).

Table 1: **The overall demographic information of the male blood donors in some Hospitals in Port Harcourt**

Demographic factors	**Groups**	**No. tested**
Gender		
	Males	182 (100%)
Educational Level	Primary School	40(22%)
	Secondary School	49 (26.9%)
	Diploma	42 (23.1%)
	Undergraduate	8 (4.4%)
	Graduate	43 (23.6%)
Occupational Skills	Unemployed	25 (13.7%)
	Low Skill	147 (80.8%)
	High Skill	10 (5.5%)
Donor Types	Family Donor	89 (48.9%)
	Voluntary Donor	7 (3.8%)
	Paid Donor	86 (47.3%)
Age Group	21-30 years	50 (27.5%)
	31-40 years	108 (59.3%)
	41-50 years	24 (13.2%)
Total		**182**

3.2. The overall seroprevalence of syphilis in the study

Fig 1 shows the overall seroprevalence of syphilis among the intending male blood donors of two Hospitals in Port Harcourt, Rivers State with a syphilis seroprevalence of 12 (6.6%).

3.3. The overall seroprevalence of syphilis according to age group

The 31- 40 years age group distribution of 10 (83.4%), 1 (8.3%) of 41- 50 years, and 1 (8.3%) of 21-30 years age group were positive for syphilis, as shown in Fig. 2. A significant relationship with p value 0.001 < 0.05 and X^2 9.955 higher than 7.815 at df 3 was found.

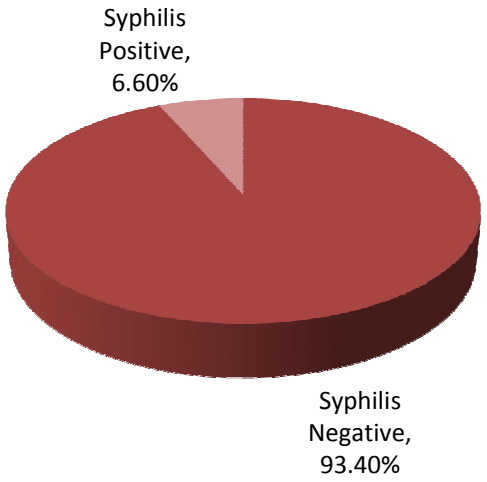

Fig 1: Overall seroprevalence of syphilis in two Hospitals in Port Harcourt Town, Rivers State, Nigeria.

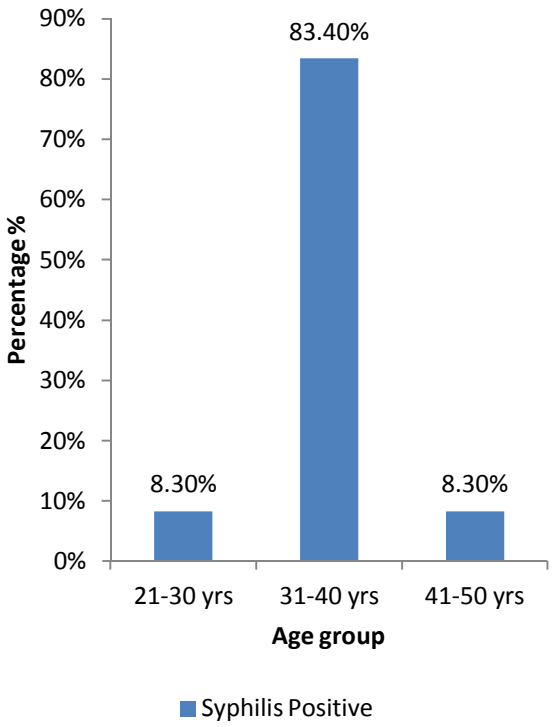

Fig 2: Overall seroprevalence of syphilis with respect to age group

3.4 Overall seroprevalence of syphilis according to educational level

Figure 3.3 shows the distribution of syphilis prevalence according to the educational qualifications of the blood donors. Those with Primary school level qualification had the highest prevalence of 4(33.3%) among other educational qualifications. There was no statistical significance with a p value= 0.540.

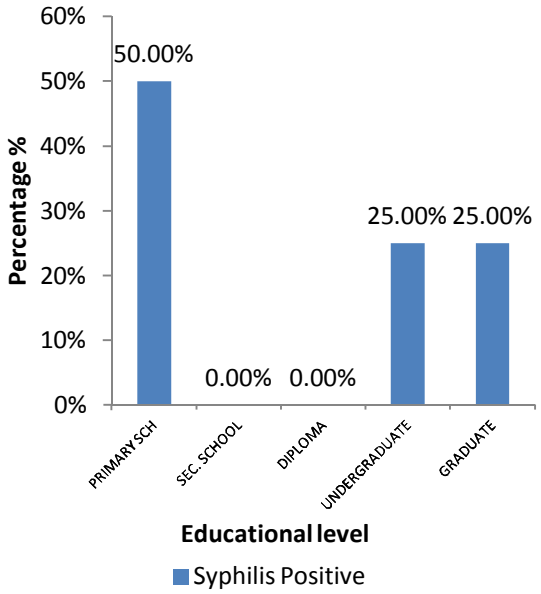

Fig. 3: Overall seroprevalence of syphilis with respect to educational level

3.5 Overall seroprevalence of syphilis according to occupational skills

Blood donors with low skill occupation were the majority 10 (83.4%) with syphilis positivity while the unemployed and high skill occupations had the least prevalence of 1 (8.3%) each, as shown in Fig. 4. A p value of 0.888 >0.05 means there is no relationship between syphilis status and occupational skills.

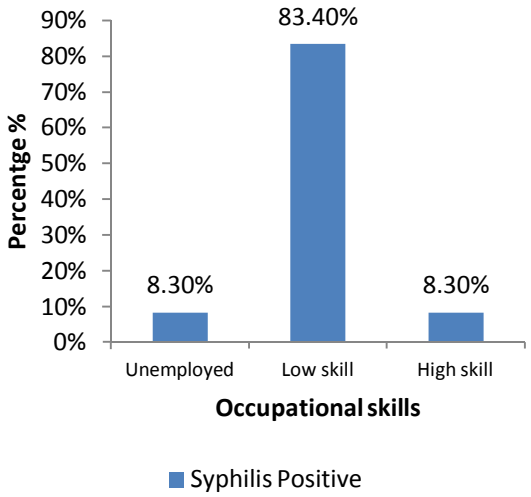

Fig. 4: Overall seroprevalence of syphilis with respect to occupational skills

3.6. The overall seroprevalence of syphilis according to donor types

As shown in Fig. 5 below, the distribution of syphilis seropositive donors for both Hospitals in relation to donor type shows 6 (50%) family donors, 5 (41.7%) paid donors and 1 (8.3%) voluntary donors. A non-significant p value of 0.698 was found.

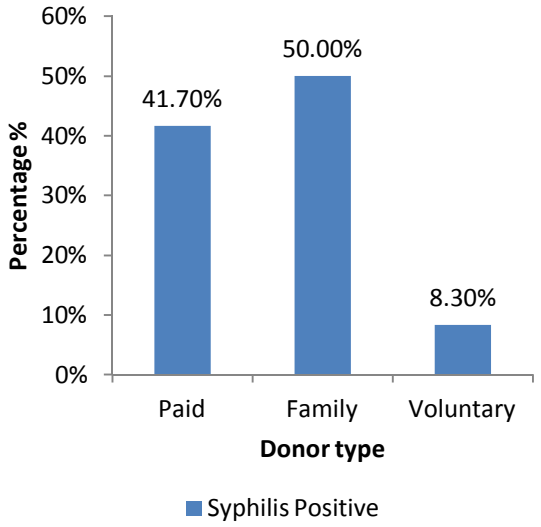

Fig. 5: Overall seroprevalence of syphilis with respect to donor type

3.7 Seroprevalence of syphilis in Hospital 1 of this study

Low seropositivity of Syphilis 4 (4%) was found in Hospital 1 against a high seronegativity of 96% as seen in Fig. 6.

3.8 Seroprevalence of syphilis in Hospital 2 of this study

Figure 7 shows the seroprevalence of Syphilis in Hospital 2 with n= 8 (9.8%) seropositivity.

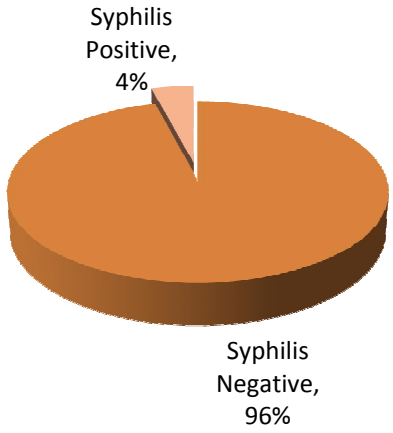

Fig. 6: Seroprevalence of syphilis in Hospital 1 in Port Harcourt Town, Rivers State, Nigeria

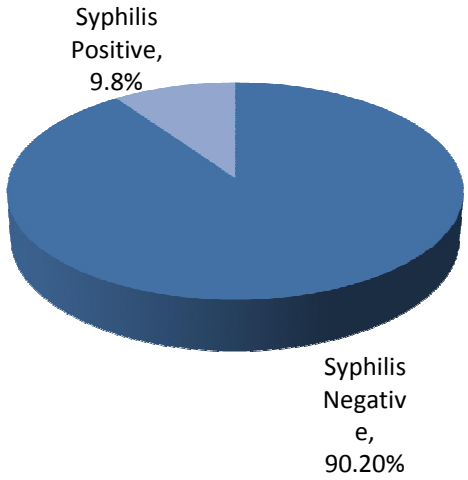

Fig. 7: Seroprevalence of syphilis in hospital 2 in Port Harcourt, Rivers State, Nigeria.

4. Discussion

There was a high prevalence of transfusion-transmissible syphilis (6.6%) in this district of Port Harcourt. This prevalence was found to be higher than 0.1%, 1.7%, 2.61% and 3.1% reported in studies conducted in Port Harcourt (Ejele *et al.,* 2005), Enugu (Chukwurah and Nneli, 2005), Ile-Ife (Salawu *et al.,* 2010) and Calabar respectively, however it was lower than 7.5% reported in Ghana (Adjei *et al.,* 2003) but higher than 0.3% reported in Eritrea (Siraj *et al.*, 2018). The difference in the prevalence may be due to differences in the health care system, the test method used in the study and risk factors in the different study locations. It is true that individual risk of contracting syphilis depends on their lifestyle choices. Syphilis being a nosocomial infection can be spread by unscreened blood (Nwabuisi *et al.,* 2005). Confirmatory screening method like direct microscopy

using darkfield or immunofluorescence microscope can reduce the risk of syphilis transmission via blood transfusion (Ekeleme *et al.,* 2016). The only significant association between prevalence of syphilis and demographic facts was found between syphilis and the age group of the donors with a p value of 0.025 ($p<0.05$), but the association between syphilis and the other demographic factors were found insignificant.

This study showed that the seroprevalence of syphilis among 100 intending male donors in Hospital 1 was 4% and seroprevalence of 9.8% syphilis in Hospital 2. These values are higher than the seroprevalence of 3.1% for syphilis reported by Okoroiwu *et al* (2018) among prospecting donors in a tertiary health care facility in Calabar. The differences may be due to varying magnitude of risk factors for contracting TTIs in the various locations.

The 31 – 40 years age bracket represents the group with the highest number of blood donors and had the highest seropositivity of 75% for syphilis in Hospital 1. Likewise, in Hospital 2, the 31 – 40 years age bracket, which was the largest group, having the highest seropositivity of 87.5% for syphilis. These findings agree with that of Nwankwo *et al*. (2012) who reported a similar age range (27-38 years) as having the highest prevalence of syphilis. The 21 – 30 years age group had the lowest prevalence of syphilis, though with youth exuberance one would expect this value to be high. However, the low turnout of blood donation within this group (only 15 blood donors) could explain the low level recorded.

Intending blood donators with low skill occupation made up the largest group of the donor populace which accounted for 50% Syphilis seropositivity in Hospital 1. However, donators with low skill occupation who made up the largest donor population accounted for the 100% seropositivity of syphilis from the donors in Hospital 2. Considering the nature of their job, low skilled workers are usually sweaty, are usually lowly paid and hence most are paid donors, and some promiscuous (e.g., commercial drivers, farmers, artisans). The low frequency of syphilis among the high skill donors might be because most of them are enlightened and probably well informed of the risk and mode of transmission of syphilis as they are mostly educated. This group consists of medical practitioners, lecturers, bankers, and most of the white-collar jobs.

Family replacement donors were the majority (62%) among the intending male donors in Hospital 1, 35% were paid donors while voluntary donors were meagrely 3 persons at 3%. None of the voluntary donors had Syphilis but 50% of family donors and paid donors had Syphilis. Paid donors were the majority of 52 (63.4%) among the intending male donors in Hospital 2. Paid donors accounted for 37.5% of syphilis seropositivity, while family donors accounted for 50% syphilis positive, leaving voluntary donors accounting for 12.5% syphilis seropositivity. In both Hospitals, there was no significant association between syphilis prevalence and the demographic factors.

In conclusion, the high prevalence of transfusion-transmissible syphilis (6.6%) in this district of Port Harcourt could be explained for by the high number of low skill donors that make up the majority of paid donors, as this group are more likely to donate for commercial purposes. The need for public sensitization on encouragement of voluntary blood donations is recommended as the voluntary donors were very low in number almost insignificant. Syphilis still constitutes a public health problem as it's also a common co-infection of HIV, considering the high request for blood transfusion, support enforcement of mandatory screening and aggressive public enlightenment and prevention measures for TTIs is needed.

References

1. Adjei, A.A., Kudzi, W., Armah, H., and Adiku, T. (2003). Prevalence of antibodies to syphilis among blood donors in Accra, Ghana. *Japanese Journal of Infectious Diseases*. 56(4):165-7.
2. Chukwura, E.F., and Nneli, R.O. (2005). Prevalence of transfusion transmissible infectious disease markers among blood donors in a south Eastern state of Nigeria. *Nigeria Biomedical Science Journal*. 1: 114-7.
3. Ejele, O.A., Erhabor, O., and Nwauche, C.A. (2005). Trends in the prevalence of some transfusion-transmissible infections among blood donors in Port Harcourt, Nigeria. *Haematology. 8*: 273-7.
4. Ekeleme, U., Kama, H. U., Elijah, O. A., Kelechi, A., Ndimele, E. C., Ndubuisi, O., and Martin, O. C. (2016). Studies on the infections of Malaria and Hepatitis B virus among Secondary School Students in Enugu West. *International Journal of Scientific Research Publication.* 6(2):36-43.
5. Gardella, C., Marfin, A., Kahn, R., Swint, E., and Markowitz, L. (2002). Persons with Early Syphilis Identified through Blood or Plasma Donation Screening in the United States. *The Journal of Infectious Diseases*. 185(4): 545-549.
6. Kent, M. E., and Romanelli, F. (2008). Reexamining Syphilis: An Update on Epidemiology, *Clinical Manifestations, and Management. Annals of Pharmacotherapy*, 42(2), 226-236.

7. Mollison, P. L., Engelfriet, C. P., and Contreras, M. (2005). Infectious agents transmitted by transfusion. In *Mollison's Blood Transfusion in Clinical Medicine (*11th ed., pp. 701-702). Pubishing, Massachusets: Blackwell.
8. Nwabuisi, C., Aderinola, C.I., and Ibegbulam, O.G. (2005). The seroprevalence of syphilis in unscreened and unstored blood transfused in Ilorin, Nigeria. *Medipharm Medical Journal*, 2: 7-9.
9. Nwankwo, E., Mamodu, I., Umar, I., Musa, B., and Adeleke, S. (2012). Seroprevalence of major blood-borne infections among blood donors in Kano, Nigeria. *Turkish Journal of Medical Sciences*, 42(2):337–341.
10. Okoroiwu, H.U., Okafor, I.M., Asemota, E.A. and Okpokam, D.C. (2018). Seroprevalence of transfusion-transmissible infections (HBV, HCV, syphilis and HIV) among prospective blood donors in a tertiary health care facility in Calabar, Nigeria; an eleven years evaluation. *Bio-Medical Clinic of Public Health.* 18:645.
11. Salawu, L., Bolarinwa, R.A., Adegunloye, A.B. and Muraina, H.A. (2010). HBsAg, anti-HCV, anti-HIV and VDRL in blood donors: Prevalence and trends in the last three and a half year in a tertiary health care facility in Ile-Ife, Nigeria. *International Journal of Medicine and Medical Science.* 2(11): 335-341.
12. Shang, G., Seed, C., Wang, F., Nie, D., and Farrugia, A. (2007). Residual risk of transfusion-transmitted viral infections in Shenzhen, China, 2001 through 2004. *Transfusion,47*(3): 529-539.
13. Shepard, C. W., Finelli, L., and Alter, M. J. (2005). Global epidemiology of hepatitis C virus infection. *Lancet Infectious Diseases. 5*(9): 558-567.
14. Shiferaw, E., Tadilo, W., Melkie, I., Shiferaw, M. (2019). Sero-prevalence and trends of transfusion-transmissible infections among blood donors at Bahir Dar district blood bank, northwest Ethiopia: A four-year retrospective study. PLoS ONE. 14(4): e0214755.
15. Siraj, N., Achila O.O., Isaac, J., Menghisteab, E., Hagos, S., Gebremeskel, Y. And Tesfamichael, D. (2018). Seroprevalence of transfusion-transmissible infections among blood donors at National Blood Transfusion Service, Eritrea: a seven-year retrospective study. *Bio-Medical Clinic of Infectious Diseases*. 18: 264.
16. Stamm, L. V. (2009). Global Challenge of Antibiotic-Resistant Treponema pallidum. *Antimicrobial Agents and Chemotherapy*. 54(2): 583-589.
17. Su, B., Liu, L., Wang, F., Gui, X., Zhao, M., Tien, P., and Chen, Z. (2003). HIV-1 subtype B' dictates the AIDS epidemic among paid blood donors in the Henan and Hubei provinces of China. *AIDS, 17*(17): 2515-2520.
18. Tagny, C. T., Diarra, A., Yahaya, R., Hakizimana, M., Nguessan, A., Mbensa, G., Nebie, Y., Dahuru, H., Mbanya, D., Shiboski, C., Murphy, E. and Lefrère, J. J. (2009). Characteristics of blood donors and donated blood in sub-Saharan Francophone Africa. *Transfusion.49*(8): 1592-1599.
19. Workowski, K. A. and Berman, S.M. (2006). Sexually transmitted diseases treatment guidelines. *MMWR Recommend,* Rep. 55(RR-11), pp. 1-94.
20. World Health Organization. [internet] (2010) Screening donated blood for transfusion transmissible infections. Geneva: WHO. ISBN 978 92 4 154788 8.
21. World Health Organization. Internet] (2011). Global Database on Blood Safety Summary report 2011.Available from. https://www.who.int/bloodsafety/global_database/GDBS_Summary_Report_2011.pdf?ua=1 Retrieved February 10, 2018.
22. World Health Organization. [Internet] (2017). Blood safety and availability. Available from https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability Retrieved February 10, 2018.

9/25/2019