

Prevalence of Transfusions Transmitted Infections among Blood Donors of Kosti Teaching Hospital Blood Bank

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Abstract

Background: Transfusions transmitted infections (TTIs) are global health challenges. They are including Human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and *T.pallidum* infections. Interventions to reduce the transmission of TTIs by transfusion include questioning donors about a history of infection and blood tests. The study was intended to determine the prevalence of transfusion transmitted infections among blood donors of Kosti teaching hospital blood bank.

Methods: This was a retrospective study done at Kosti Teaching Hospital blood bank and included data of 601 blood donors. Venous blood sample was collected from each subject divided into plain and EDTA containers. Serum was obtained by centrifugation of Plain samples and screened for HBV, HCV, HIV 1/2, and syphilis by using Rapid tests (ICT). ABO Blood grouping was done by using fortress antisera. The data was analyze by the statistical package for social sciences (SPSS) software, version 21.0 and presented as number and percentages.

Results: In this study, 68.2% of donors were required from urban area. The majority of donors was free business workers 77.9% and carries 57.7% O+ve blood group. The overall rate of transfusion transmitted infections was 14.8%. The frequency of HIV, HBV, HCV, *T.pallidum*, HBV+*T.pallidum* co-infections were 0.1%, 5.8%, 1.5%, 6.6%, and 0.6%, respectively. Comparatively, free business worker and those carry A+ve blood group showed higher rate of HIV, *T.pallidum*, HBV+*T.pallidum*, and overall rate of TTI than others.

Conclusion: This study provides evidences about TTIs in White Nile state and association of jobs and blood groups with TTIs.

Keywords: TTIs, Blood donor, HIV, *T.pallidum*, HBV, HCV

INTRODUCTION

Transfusions transmitted infections (TTIs) are global health challenges. They are including Human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and *T.pallidum* infections [1]. All donated blood, as it is processed, must undergo several measurements. These include testing for ABO groups, Rh type,

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Hepatitis B surface antigen (HBsAg), anti-HCV, Syphilis (VDRL), and HIV-1 and HIV-2 [2].

Hepatitis B Virus (HBV) is DNA virus belongs to Hepadnaviridae family. It affects hepatocytes leading to a disease range from life-threatening [3]. An unusual feature of HBV infection is the overproduction of excess viral coat material that can circulate at high concentrations, termed hepatitis B surface antigen (HBsAg) that indicative of active infection. The incubation period from exposure to HBV is from one week to six months [4].

Hepatitis C virus (HCV) is a enveloped, spherical, and single strand RNA virus belong to Hepacivirus genera of Flaviviridae family [5]. Typically, the incubation period of HCV infection ranged from 4–12 weeks. Most infections are asymptomatic [6]. Both HBV and HCV infections are ranged from asymptomatic to lifethreatening. Chronic infection may lead to cirrhosis and/or liver cancer [1].

Human immunodeficiency viruses (HIV) are enveloped, spherical positive-sense RNA virus. It is classified in family of Retroviridae, and genus Lentivirus. It include two major species (HIV-1 and HIV-2). Prevalence of HIV vary widely, with national rates range from < 1% to >20% [2].

Syphilis is a venereal disease caused by *Treponema pallidum* (*T.pallidum*) that belong to a spirochete [7]. If untreated, the disease cans progresses through three stages. Interventions to reduce the transmission of TTIs by transfusion include questioning donors about a history of infection and blood tests. The study was intended to determine the prevalence of transfusion transmitted infections among blood donors of kosti teaching hospital blood bank.

METHODOLOGY

Study design, area, and duration

This was a retrospective study done at Kosti Teaching Hospital blood bank (Kosti, While Nile state, Sudan). The study was performed to collect data of blood donors who attended the blood bank during September 2022.

In this study, the dependent variables include outcome of HBV, HIV , HCV , and Syphilis tests result. Independent variables include blood grouping, residence , and job.

Study subjects

The study involved volunteer who attended the bank during September 2022. Accordingly, 601 blood donors were included.

The study included the data of blood donors which reported in blood bank record. In blood bank the targeted donor were age over 18 years, apparently healthy and had Hb \geq 75%. Donors who did not meet these criteria were excluded.

Ethical clearance

The study approved by the ethic reviewed committee of medical laboratory sciences, University El Imam El Mahdi. The permission to perform the study was also obtained from the administration of the Kosti teaching hospital blood bank. No informed consent was gotten since it is retrospective study.

Data collection and laboratory investigations

The information regarding study participants along with laboratory outcomes were collected by using questionnaires. The collected information includes residence, job, blood group and outcome antiHIV1/2, HBsAg, anti-HCV, and *anti-T.pallidum* tests. Jobs include free-business worker (business man). All person data that contain the targeted information were obtained. Double check was done to avoid the bias.

Venous blood sample was collected from each subject divided into plain and EDTA containers. All samples will processed intermediately and analyze for blood groups AND TTIs. In blood screening, firstly the serum was obtained from each plain blood sample and screened for HBV, HCV, HIV 1/2, and syphilis by using Rapid tests (ICT). All work was done as mentioned previously [8]. ABO Blood grouping was done by using fortress antisera.[9]

Data analysis

The data was entered and analyze by the statistical package for social sciences (SPSS) software, version 21.0 and presented as number and percentages. Double check was done to avoid the bias in entering. Chi-squared was used to check the variation between the groups. P value less than 0.05 was considered significant.

RESULTS

Seropositivity rate of HIV, HBV, HCV, Syphilis, and co-infections

In this study, 601 blood donors were included. 410(68.2%) of donors were live in urban areas. The majority of donors were work as free business 468 (77.9%) and 347 (57.7%) of them had O+ve blood group (Table 1). The overall rate of transfusion transmitted infections was 14.8%. The frequency of HIV, HBV,HCV, *T.pallidum*, HBV+*T.pallidum* co-infections were 0.1%, 5.8%, 1.5%, 6.6%, and 0.6%, respectively (Table 2).

The association of TTIs with donor’s socio-demographic features

As shown in tables 3 and 4. The frequency of HIV and HCV infections are lower in rural than urban areas. In contrast HBV, *T.pallidum*, HBV+*T.pallidum*, and overall rate of TTI are higher in rural than urban areas. Comparatively, free business workers and those carry A+ve blood group showed higher rate of HIV, *T.pallidum*, HBV+*T.pallidum*, and overall rate of TTI than others (Table 3 and 4).

Table 1: Socio-demographic features of volunteer blood donors

Variable	Number	Percentage
Residence Rural	191	31.8
Urban	410	68.2
Job Free business	468	77.9
Others	133	22.1
Blood group O+ve	347	57.7
A+ve	160	26.6
B+ve	87	14.5
AB+ve	7	1.2

Table 2: Seroprevalence of Transfusion Transmitted Infections

Infection	Frequency		P value
	Number	Percentage	
HIV	1	0.1	<0.000
HBV	35	5.8	
HCV	9	1.5	
<i>T.pallidum</i>	40	6.6	
HBV+ <i>T.pallidum</i>	4	0.6	
Overall	89	14.8	

Table 3: Association of HIV, HBV, and HCV infections with donor’s socio-demographic features

Infection	HIV			HBV			HCV			
	Number	%	P value	Number	%	P value	Number	%	P value	
Residence	Rural	0	0	1.000	14	7.3	1.000	2	1.0	0.726
	Urban	1	0.2		21	5.1		7	1.7	
Job	Free business	1	0.2	1.000	27	5.7	0.915	7	1.4	1.000
	Others	0	0		8	6.0		2	1.5	
Blood group	O+ve	0	0	0.423	16	4.6		4	1.1	
	A+ve	1	0.6		17	10.6	0.031	3	1.8	0.623
	B+ve	0	0		2	2.2		2	2.2	
	AB+ve	0	0		0	0		0	0	

Table 4: Association of *T.pallidum*, HBV+*T.pallidum* co-infections and Overall TTIs frequency with donors socio-demographic features

Infection	<i>T.pallidum</i>			HBV+ <i>T.pallidum</i>			Overall			
	Number	%	P value	Number	%	P value	Number	%	P value	
Residence	Rural	15	7.8	0.421	4	2.0	0.011	35	18.3	0.098
	Urban	25	6.0		0	0		54	13.1	
Job	Free business	33	7.0	0.465	4	0.8	0.581	72	15.3	0.456
	Others	7	5.2		0	0		17	12.7	
Blood group	O+ve	24	6.9		1	0.2		45	12.9	
	A+ve	12	7.5	0.826	2	1.2	0.276	35	21.8	0.030
	B+ve	4	4.5		1	1.1		9	10.3	
	AB+ve	0	0		0	0		0	0	

DISCUSSION

In this study, the majority of donors were free business workers and carries O+ve blood group. This is similar to previous study [1]. Memon et al study [10] also reported O+ve as the most frequently blood group. Also, in the current study all donors are males which is in line with several Sudanese [1,8,11,12] and international [13] studies. This indicate the higher contribution of males in blood donation than females.

In present study, the rate of TTIs was 14.8%. This is lower than many formerly published studies in our study area [1,8] but it is higher than Bazie et al (Kosti) [11], Mandal et al (North India) [14] and Keleta et al (Eritrea) [15] studies. It also lowers than a previous study [12]. The difference between studies may result from variation in many factors such as samples size and study population.

Interestingly, we found that the frequency of HIV, HBV,HCV, *T.pallidum*, HBV+*T.pallidum* co-infections were 0.1%, 5.8%, 1.5%, 6.6%, and 0.6%, respectively. Except *T.pallidum*, these are lower than that reported by Almugadam et al study, which was done in same locality [1]. Moreover, the HIV, HBV,HCV, and *T.pallidum* frequency are comparable with the result of Ahmed et al study [8] but HBV+*T.pallidum* co-infections is lower than it. Formerly, Bazie et al [11] and Keleta et al [15] studies reported higher rate of HIV and HCV and lower rate of HBV infection in blood donors when compared to this study. Notably, the reported rate of HBsAg, HCV, and syphilis in Chandekar et al study [13] were lower and HIV is higher than these in current

studies. This variation should be attributed to difference in sample size and many other features.

In this study, the frequency of HIV and HCV infections are lower in rural than urban areas. In contrast HBV, *T.pallidum*, HBV+*T.pallidum*, and overall rate of TTI are higher in rural than urban areas. A previous study reported different result regarding HIV and HCV. [1] Regarding jobs and blood groups, free business worker and those carry A+ve blood group showed higher rate of HIV, *T.pallidum*, HBV+*T.pallidum*, and overall rate of TTI than others. This dissimilar to previous studies [1]. Similarly, Memon et al study [10] found higher rate of HIV in A+ve than other. All these findings highlight the association of TTIs with socio-demographic features. The variation between the studies could be attributed to difference in sample size, study duration, or/and study populations.

The study limitations include low sample size and no sensitive diagnostic methods.

CONCLUSIONS

This study provides evidences about the magnitude of transfusions transmitted infections in White Nile state and association of TTIs with jobs, blood groups, and residence which is potential in prediction and diagnosis of these infections and in articulating health policies and programs.

REFERENCES

1. Almugadam BS, Ibrahim OMA, Ahmed YMA. Seroprevalence of the Serological Markers of Transfusion-Transmissible Infections among Volunteer Blood Donors of Kosti Obstetrics and Gynecology Hospital. *Medicines (Basel)* 2021;8(11):64.
2. Murphy MF, Roberts DJ, Yazer MH, Dunbar NM. *Practical transfusion medicine*. 6th edition. Wiley Blackwell, USA.2022.
3. Ali RN, Rhamt Allah T, Osman TE, Almugadam BS. Serological detection of hepatitis B virus infection in patients under hemodialysis. *MOJ Biol Med* 2018;3(4):186–188.
4. Hollinger FB. Hepatitis B virus infection and transfusion medicine: science and occult. *Transfusion* 2008;48(5):1001-1026.
5. US Center for disease control and prevention. Surveillance for viral hepatitis-united states,2017. [https://www.cdc.gov/hepatitis/statsitics 2017 surveillance/index.htm](https://www.cdc.gov/hepatitis/statsitics%202017%20surveillance/index.htm).
6. Alter HG, Houghton M. Clinical Medical Research Award. Hepatitis C virus and eliminating post-transfusion hepatitis. *Nat Med* 2000;6(10):1082-1086.
7. Chessbrough M. *District Laboratory Practice in Tropical Countries Part 2*. Second Edition. Cambridge University Press, 2006.
8. Ahmed EB, Essa AA, Almugadam BS, Ahmed QM, Hussein MM. Transfusion transmitted infections among male blood donors of White Nile State, Sudan: Screening of the current seroprevalence and distribution. *BMC Res Notes* 2020;13(1):549.
9. Shah SRH, Almugadam BS, Hussain A, Ahmad T, Ahmed S, Sadiqui S. Epidemiology and risk factors of *Helicobacter pylori* infection in Timergara city of Pakistan: A cross-sectional study. *Clinical Epidemiology and Global Health* 2021; 12 : 100909.
10. Memon FA, Ujjan ID, Memon AI, Shaikh AR, Rao AR, Naz A. Seroprevalence of transfusion transmitted infections among different blood group donors at Blood Bank LUMHS, Hyderabad. *Pak J Med Sci* 2017;33(2):443-446.
11. Bazie EA, Ali MMA, Hamza HB, Magzoub OS, Salih MSM, Haroun BE. Sero-Prevalence of Viral Transfusion-transmissible Infections among Blood Donors at Kosti Teaching Hospital, White Nile State/Sudan. *Int J Curr Microbiol App Sci* 2015;4(5):1132-1138.

12. Mohammeda BAB, Badneenb MA, Gibreela MO, Othman SA. Prevalence of transfusion-transmissible infections among blood donors in Port Sudan. *Egypt J Haematol* 2019;44:72-76.
13. Chandekar SA, Amonkar GP, Desai HM, Valvi N, Puranik GV. Seroprevalence of transfusion transmitted infections in healthy blood donors: A 5-year Tertiary Care Hospital experience. *J Lab Physicians* 2017;9:283-7.
14. Mandal S, Kumar R, Parwan D, Singh N, Sharma R, Das B. Seroprevalence of transfusion-transmissible infections among blood donors and their notification: A study from North India. *Iraqi J Hematol* 2022;11:65-9.
15. Keleta YT, Achila OO, Haile AW, Gebrecherkos BH, Tesfaldet DT, Teklu KS, et al. Seroprevalence of transfusion transmitted infections among blood donors in Gash Barka Zonal Blood Transfusion Center, Barentu, Eritrea, 2014 through 2017. *BMC Hematol* 2019;19:5.