



Transfusion-Transmissible Infections among Blood Donors at Hawassa Regional Blood Bank Center, South Ethiopia

Elshaday Azerefe¹, Mesfin Worku², Mengistu Hailemariam^{2*}

¹Hawassa University, College of Medicine and Health Sciences Comprehensive and Specialized Hospital, Medical Laboratory Unit

²Hawassa University, College of Medicine and Health Sciences Department of Medical Laboratory Sciences

***Corresponding Author:** Mengistu Hailemariam, Hawassa University, College of Medicine and Health Sciences Department of Medical Laboratory Sciences

Abstract:

Background: Though Blood transfusion remedy is well known it is not without risks and may lead to the transmissions of infectious agents from donor to recipient. Screening of the common transfusion-transmissible infections (TTI) of donors blood is mandatory to regulate the safety of blood transfusion. So the aim of this study is to detect the prevalence of TTI from donated blood at a Hawassa regional blood banks center.

Methods: This was a retrospective, descriptive study. All blood donors' records from January 2014 to December 2015 were included; we analyzed 6849 blood donors document and the differences in prevalence of TTI, gender, age, occupation and type of donation the collected data were entered into SPSS version 20.0 Logistic regression analyses was performed to identify the influencing factors.

Results: The overall prevalence of TTIs is 5.78% of which HIV, HBV, HCV, and syphilis account for 1.3%, 3.4%, 0.7%, and 0.4% respectively. Syphilis and HIV increased with age also showed higher prevalence among family donation (1.7% and 1.2% respectively). The rate of HBV was higher among donors with the age groups 35-44 ($P < 0.001$), and age group 45-54 ($P = 0.001$). On the same way HCV increased across age groups 35-44 ($P = 0.001$), age group 45-55 ($P = 0.025$). Again higher among Volunteer donors ($P < 0.007$)

Conclusion: lower rate of TTI was reported compared with most of previously conducted studies as well as to the general population of Ethiopia. To accomplish more the responsible body should teach the community about the blood-borne transmittable infection and voluntary donation should be encouraged by vigorous lessons in order to diminish transfusion-related infections. Simultaneously the country should work hard in introduction of more sensitive screening methods to detect TTIs earlier and thus reduce the risks associated with window periods.

Keywords: Transfusion transmittable infection; Blood donors; Seroprevalence

1. BACKGROUND

Blood transfusion remedy is well known and integral part medical practices. Though, are not without risks and may lead to the transmissions of infectious agents from donor to recipient [1]. Transfusion-transmissible infectious agent mainly human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and syphilis are among the greatest threats for the receiver if not appropriately screened [2, 3]. Globally, transfusion of contaminated blood causes millions of new infections with HBV, HCV and other transfusion transmitted infections (TTI) [3]. Because of this World Health Organization (WHO) recommends that all blood donations should be screened for evidence of infection prior to donation [1, 4].

In Ethiopia, to provide safe, adequate and consistent donation nationally that was mainly a fragmented, hospital based system the Federal Ministry of Health (FMOH) of Ethiopia reverted the blood transfusion responsibility to the National Blood Transfusion Service (NBTS) from the Ethiopian Red Cross. Since 2010 blood transfusion service managed under FMOH and the regional health bureaus to addressee donation to all than be only accessed by hospitals in the regional capitals,

heavily reliant on family replacement donors, with neither universal nor quality assured testing of blood and inappropriate use of blood at the hospitals [5].

Assessment of records on the occurrence of the common transfusion-transmissible infections in donated blood is mandatory to regulate the safety of the collected donations. As the prevalence of TTIs in blood donations can be used as important indicator to evaluate the safety of blood supply and the potential risk of TTIs [4, 6]. In Southern Ethiopia, replacement donors from patient's family or friends appear to shift to formal Volunteer donors which probably decrease the TTIs. So in this study, we investigate the screened blood donors document at a Hawassa regional blood banks center.

2. MATERIALS AND METHODS

2.1. Study Area and Study Design

This cross-sectional study was performed in the Hawassa regional blood bank service center (HRBBSC) in southern Ethiopia. Hawassa is the capital city of the region and located 275 km from Addis Ababa, the capital city of Ethiopia. The blood bank was established in May 2013 and provides services for the surrounding hospitals. A retrospective document review of donor's record at the HRBBSC was conducted to assess the prevalence of TTIs on study area.

2.2. Study Population and Data Collection

The study population included all donors who registered from January 2014 to December 2015 at study area. Here at HRBBSC donors were screened Based on national as well as the criteria set by WHO [4, 6] and then apparently healthy individuals were meet the requirements for donation. The medical and socio demographic history of the donors in addition to serological results of HCV, HBs Ag, HIV, and syphilis records from blood donor registry was reviewed. For this study purpose incomplete record of donors were excluded.

2.3. Laboratory Testing

Blood samples were tested by using serological test; for HIV infection by using 4th generation ELISA, Vironostika HIV Uni-Form II Ag/Ab (Bio-Merieux, Boxtel, The Netherlands), Hepatitis B virus were screened by using an immunoassay ELISA Hapanostika HBSAg UNi-Form II (Murex Biotech Ltd, Dartford, UK), Hepatitis C virus using the Human anti-HCV ELISA techniques and presence of treponemal antibodies detected using rapid plasma reagin test (RPR) (RPR, Wampole Laboratories, Princeton, N.J., USA) following the manufacturer's instructions.

2.4. Ethical Consideration

The study was approved by the Department of Medical Laboratory Sciences ethics committee, College of Medicine and Health Sciences, Hawassa University. Donors recorded information was anonymized and de identified prior to analysis. Permission to collect the information from blood bank centers register was obtained from the blood bank centers administration.

2.5. Data Analysis

Data were entered, cleaned and analyzed using IBM SPSS version 20 (IBM, USA). Logistic regression model was used to determine the variation in prevalence of HIV, HBV, HCV and syphilis for selected variables. P-value less than 0.05 was considered statistically significant in addition OR with 95% CIs calculated from the logistic regression is used to determine the presence as well strength of a statistically significant association.

3. RESULTS

In this study, among the reviewed 6849 blood donors document 70.8 % (4852) were male and majority of donors were student which account 3985(58.2%). The maximum age of donation reported was 56 years old and the majority of donors 4724 (69%) were in the age group between 18 to 24 years. From the total donors, 5759 (84.1%) were voluntary donors and the rest 1090(15.9%) were family replacement donors. Regarding the ABO and Rhesus (RH) group description of the donors, 2744 (40.1%) were **O**, 2295 (33.5%) **A**, 1268 (18.5%) **B**, 542 (7.9%) **AB**, 5599 (81.7%) were RH positive and 1250(18.3%) were RH negative (Table 1).

Table1. Demographic characteristics of study population at Southern Ethiopia

characteristic		Number (%)
Gender	male	4852(70.8)
	female	1997(29.2)
Age group (years)	18-24	1628(23.8)
	25-34	4724(69.0)
	35-44	368(5.4)
	45-54	124(1.8)
	≥55	5(0.1)
occupation	student	3985(58.2)
	teachers	1207(17.6)
	Non-governmental employee	180(2.6)
	farmers	304(4.4)
	police	55(0.8)
	merchant	123(1.8)
	Governmental employee	490(7.2)
	driver	154(2.2)
	Daily laborer	142(2.1)
	House wife	173(2.5)
	others	36(0.5)
Type of donation	volunteer	5759(84.1)
	Family donation/ replacement	1090(15.9)
ABO blood group	A	2295(33.5)
	B	1268(18.5)
	AB	542(7.9)
	O	2744(40.1)
Rhesus (RH) type	Positive	5599(81.7)
	Negative	1250(18.3)

4. SEROPREVALENCE OF HIV, HBV, HCV AND SYPHILIS

The overall prevalence of TTI was 396(5.78 %). The rate of HIV, HBV, HCV and syphilis was 1.3%, 3.4%, 0.7% and 0.4% respectively and 11 (0.16%) had multiple infections. The highest combinations of multiple infections was HIV with syphilis which account 5 (0.07%) (Table2).

Table2. Prevalence of HIV, HBsAg, HCV, Syphilis and co-infections among blood donors at Southern Ethiopia

Type of TTI	Frequency (%)
HIV	86(1.3)
HBV	235(3.4)
HCV	47(0.7)
Syphilis	28 (0.4)
Total	396(5.78)
Co-infections	
HIV - HCV	2(0.02)
HIV - Syphilis	5(0.07)
HBV – Syphilis	4(0.04)
Total	11(0.16)

As shown in Table3, the prevalence of HIV was higher among driver (P = 0.001) compared to student blood donors. Whereas the prevalence of syphilis was considerably increased among Non-governmental employee (P = 0.01), farmers (P<0.001), merchant (0.01), Daily laborer (0.02) and teachers (P = 0.03) compared to those of students donors. The family donors also showed higher prevalence of syphilis (P=0.04) compared those of volunteer donors.

Table3. Socio-demographic characteristics of blood donors by HIV and Syphilis sero positivity at Southern Ethiopia

characteristic	HIV positive No (%)	OR(95% CI)	P-value	syphilis No (%)	OR (95% CI)	P-value
Gender						
male	63/4852 (1.3)	1.00	-	13/4789(0.3)	1.3(0.48-3.4)	0.06
Female	23/1997 (1.2)	1.69(0.9- 3.16)	0.10	15/1974(0.8)	1.00	-
Age group (years)						
18-24	18/1628(1.1)	1.00	-	5/1628(0.3)	1.00	-
25-34	59/4724(1.2)	0.93(0.5- 1.72)	0.82	9/4724(0.2)	.06(0.14-0.26)	0.00
35-44	8/368(2.2)	1.52(0.5-4.4)	0.44	10/368(2.7)	.905(0.17-4.7)	0.91
45-54	1/124(0.8)	0.45(0.55- 3.7)	0.46	4/124(3.2)	2.599(0.48-14)	0.27
≥55	0/5(0)	-	-	0/5(0)	.000	0.99
Occupation						
student	37/3985(0.9)	1.00		4/3985(0.1)		
teachers	12/1207(1.0)	1.1(0.46-2.51)	0.87	4/1207(0.3)	7.57 (1.2-48)	0.03
Non-governmental employee	2/180(1.1)	3.54(1.1-11.5)	0.04	3/180(1.7)	13.7(1.8-104)	0.01
farmers	6/304(2.0)	1.6(0.5-4.79)	0.41	4/304(1.3)	26(4.2-161)	.000
police	0/55(0)	-	-	0/55(0)	-	-
merchant	3/123(2.5)	3.2(0.94- 10.8)	0.06	2/123(1.6)	15(1.73-138)	0.01
Governmental employee	12/490(2.4)	2.7(1.2-6.38)	0.02	6/490(1.2)	28(5.4-149)	0.00
driver	6/154(3.7)	5.3(2- 13.84)	0.00	1/154(0.6)	4.24(0.3-53)	0.26
Daily laborer	4/142(2.8)	3(0.9- 9.6)	0.09	2/142(1.4)	13(1.55-119)	0.02
House wife	4/173(2.3)	-	0.88	2/173(1.2)	44(5.6-361)	0.00
others	0/36(0)	-	0.99	0/36(0)	.000	0.99
Type of donation						
volunteer	67/5759(1.2)	1.00		19/5759(0.3)	2.8(1.1-7.6)	0.04
Family donation/ replacement	19/1090(1.7)	1.1(0.5-2.2)	0.85	9/1090(0.8)	1	

Likewise as displayed in Table 4, the seropositivity of HBV was much higher among donors with the age groups 35-44 (P<0.001), and age group 45-54 (P=0.001) compared to age group 18-24. Volunteer donors (P < 0.001) showed higher seroprevalence of HBV compared to replacement donors. On the same way seroprevalence of HCV increased across age groups 35-44 (P=0.001), age group 45-55 (P= 0.025). Again on occupational status prevalence of HCV increased among Non-governmental employee (P = 0.002), Governmental employee (0.001), driver (0.01) compared to students and Volunteer donors (P < 0.007) compared to replacement donors (Table 4).

Table4. Socio-demographic characteristics of blood donors by HBV and HCV sero positivity at Southern Ethiopia

characteristic	HBV positive N (%)	OR(95% CI)	P-value	HCV positive N (%)	OR(95% CI)	P-value
Gender						
male	163/4852 (3.4)	0.36(0.23-0.5)	0.001	34/4789 (0.7)	0.28(0.1-0.7)	
Female	72/1997 (3.6)	1	-	13/1974(0.7)	1	
Age group (years)						
18-24	48/1628(2.9)	1	-	3/1628(0.2)	1	
25-34	110/4724(2.3)	0.81(0.6-1.1)	0.283	29/4724(0.6)	1.54(0.4-5.9)	0.52
35-44	69/368(18.8)	28.55(16-50)	0.00	12/368(3.3)	13.28(2.8-63)	0.00
45-54	8/124(6.5)	4.29(1.8-10)	0.00	3/124(2.4)	8.09(1.3-50)	0.03
≥55	0/5(0)	-	-	0/5(0)	-	-
Occupation						
student	113/3985(2.8)	1	-	9/3985(0.2)	1.00	-
teachers	48/1207(4)	0.83(0.5-1.3)	0.45	3/1207(0.2)	.918(0.2-4)	0.91
Non-governmental employee	9/180(5)	0.37(0.16-0.8)	0.02	6/180(3.3)	9.189(2.2-38)	0.00

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farmers	15/304(4.9)	0.84(0.4-1.7)	0.63	3/304(1)	3.520(0.8-15)	0.09
police	4/55(7.3)	0.27(0.09-0.85)	0.03	1/55(1.8)	2.858(0.3-28)	0.37
merchant	10/123(8.1)	0.44(0.2-0.9)	0.04	1/123(0.8)	1.043(0.1-9.7)	0.97
Governmental employee	14/490(2.9)	0.36(0.2-0.7)	0.00	14/490(2.9)	6.904(2.2-21)	0.00
driver	10/154(6.5)	0.90(0.4-2)	0.80	4/154(2.6)	6.23(2.2-21)	0.01
Daily laborer	9/142(6.3)	0.46(0.2-1)	0.06	3/142(2.1)	2.77(0.59-12)	0.19
House wife	2/173(1.2)	0.17(0.04-0.7)	0.02	2/173(1.2)	2.49(0.47-13)	0.28
others	1/36(2.8)	0.34(0.04-2.6)	0.30	1/36(2.8)	5.310(0.6-48)	0.14
Type of donation						
volunteer	167/5759(2.9)	5.9 (3.8-9)	0.00	26/5759(0.5)	3.168	0.01
Family donation	68/1090(6.2)	1	-	21/1090(1.9)	1	-

5. DISCUSSION

This study revealed that 5.78% of the donors were positive at least for one of the screened TTIs. This number is comparatively low from studies done in different part of Ethiopia; Tessema et al. 9.5 % [7], Baye et al. 6.2 % [8], Azene et al. 43.2% reported in Bahir Dar, Ethiopia [9] , 11.5% yesufe Eastern Ethiopia [10] and Fithamlak et al. 29.5% in southern Ethiopia [11]. our finding also lower than study done in part of the world like, Nwankwo E *et al* in Nigeria 54 (19.3%) [12], Nada et al. 9.3% in Egypt [13], Waheed U *et al* in Islamabad, Pakistan out of 1,454 donations (14.34%) [14]. On the contrary, the overall seropositivity rate is considered very high compared to others finding; Shrestha AC *et al* Nepal which showed 1.7% [15], Fessehaye *et al* Eritrea 3.8% [16], Song Y et al China 2.67% [17] Bommanahalli BP *et.al* in India study was showed the overall TTI was 2.22% [18]. This might be due to gap in the study period carry out in case of Ethiopia, as TTIs nationally going to decrease from time to time furthermore it is expected that prevalence variation from place to place.

When we see the rate of HIV, 1.3% in this study is smaller than other studies conducted in different part of Ethiopia Tessema et al. 3.8 % northern Ethiopia [7], Azene et al. 11.7% in Bahir Dar, Ethiopia [9] , Fithamlak et al. 6.4% in southern Ethiopia [11]. Though, the rate of HIV was much higher than the study form Eastern Ethiopia 0.1% [10], China 0.31% [17]. But we can say it was comparable with national prevalence rates of Ethiopia (1.5%) [19].

Hepatitis B is one of hyper endemic disease with prevalence estimate of $\geq 8\%$ in sub-Saharan Africa including Ethiopia [20]. However in our study the rate of HBs Ag was much lower 3.4 % than the general population estimates of WHO. This figure is also lower compared with some of similar studies in Ethiopia like, Tessema et al. Northern Ethiopia 4.7 % [7], Baye et al. 6.2 % [8], Azene et al. 25% in North Ethiopia [9] , Fithamlak et al. 9.5% in southern Ethiopia [11] and 10.9% Eastern Ethiopia [10].

Compared to worldwide findings, Prevalence of HBV in our study was higher than study done in Egypt which is 2.3% [13], 0.87% in China [17], 0.63% in India [18], and 0.09% [21] in Canada. These variations could be due to difference in the overall prevalence among the total population of the indicated countries also difference in donors type. In addition provision of HBV vaccination among countries for their population also has positive effect since the prevalence of HBV infection in the given population will drop significantly through vaccination so that it is a highly effective measure to minimize HBV in donated blood.

The prevalence rate of HCV was 0.7 % , this is comparable with Tessema et al. 0.7 % [7], and lower than 13.3% the other northern Ethiopia study [9], 8.5% in southern Ethiopia [11], Nada et al. 7.2 % in Egypt [13]. Similarly the prevalence of syphilis among blood donors in our study was 0.4%. This is consistent with the study done in Eastern Ethiopia 0.15% [10], 0% in Egypt [13]. But lower than Azene et al. 1.2% reported in Bahir Dar, Ethiopia [9], 1.3 % Gonder Ethiopia [7], 7.5% in southern Ethiopia [11]. The variations might be due to geographical distribution as well as population differences in terms of occupation, age their exposure and lifestyle in general.

In general our findings shows that age and type of donation have certain association for TTIs more positive donations were found in the older age group and more positive results of TTIs were also found in the family donors group which is sported by most literature [22].

6. CONCLUSION

Lower rate of TTI was reported compare previously conducted studies as well as to the general population of Ethiopia. To accomplish more, the responsible body should teach the community about the blood-borne transmittable infection and voluntary donation should be encouraged by vigorous lessons in order to diminish transfusion-related infections. As to this finding TTI seems declining time to time when we compare with similar previous studies else warein Ethiopia. However, the indicated prevalence of TTIs is not guarantee safe transfusion for recipient. Simultaneously the country should work hard in introduction of more sensitive screening methods to detect TTIs earlier and thus reduce the risks associated with window periods.

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AUTHORS CONTRIBUTION

EA; contributed to conception and design, acquisition of data, analysis of data; MW contributed in revising the paper critically and final approval of the version to be published; MH contributed in interpretation of data, Analysis and interpretation of data also revising the paper critically and final approval of the version to be published during contributions.

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