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Sero-prevalence of transfusion-transmittable infections and associated factors among blood donors in Eastern Ethiopia: an Institutional-based cross-sectional study

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Abstract

Background: Blood transfusion saves millions of lives each year globally. But, it was associated with certain risks which can lead to adverse consequences. However, there is paucity of information regarding to the sero-prevalence and risk factor of transfusion-transmittable infections among blood donors in Eastern Ethiopia.

Objective: The aim of this study was to determine the sero-prevalence of transfusion-transmittable infections and associated factors among blood donors in Eastern Ethiopia from February to March 2018.

Methods: An institutional-based cross-sectional study was conducted among 500 blood donors in Eastern Ethiopia. Data were collected using a structured questionnaire and laboratory blood screening. Data were analyzed using Statistical Package for Social Sciences version 20. Statistically significance was considered at $p < 0.05$.

Results: The overall sero-prevalence of transfusion-transmittable infections was 12.4% (95% confidence interval: 9.5, 15.3). Hepatitis B virus (6.6%) and syphilis (3.4%) were found at high magnitude. Those with family having human immunodeficiency virus or hepatitis (adjusted odd ratio = 2.91; 95% confidence interval: 1.33, 6.33), giving care for human immunodeficiency virus or hepatitis patient (adjusted odd ratio = 3.24; 95% confidence interval: 1.49, 7.07), multiple sex partner (adjusted odd ratio = 2.56; 95% confidence interval: 1.21, 5.19), unsafe sex (adjusted odd ratio = 2.99; 95% confidence interval: 1.51, 5.92), dental procedure (adjusted odd ratio = 2.75; 95% confidence interval: 1.20, 6.28), and had no formal education (adjusted odd ratio = 2.46; 95% confidence interval: 1.24, 4.86) were significantly associated with transfusion-transmittable infections.

Conclusion: The prevalence of transfusion-transmittable infections in this study was relatively high compared to studies conducted earlier in Ethiopia. Factors such as unsafe sex, multiple sex partner, dental procedure, and family with human immunodeficiency virus or hepatitis, provide health care for human immunodeficiency virus–infected or hepatitis patients, donor type, and educational level were significantly associated with transmission-transmittable infections. Thus, health promotion about prevention and control transmission-transmittable infections should be given to the community by considering the identified risk factors. Each of the blood banks and regional health bureaus in the study area should mobilize community for increasing repeated voluntary donors through promotion of blood bank activity.

Keywords

Human immunodeficiency virus, hepatitis B virus, hepatitis C virus, syphilis, blood donors, Eastern Ethiopia

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Background

Transfusion of blood and its components are the main part of the health care delivery system in many countries. The need for more blood products is rising, especially in the field of transplantation, cardiothoracic surgeries, cancer management, and in the management of many hematological conditions.[1]

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Despite the indisputable price of blood transfusion in saving millions of lives in emergencies and medical treatment, blood transfusions are associated with certain risks which can lead to adverse consequences. It may cause acute or delayed complications and carries the risk of the transfusion-transmittable infections (TTIs).[1,2]

TTIs can exist asymptomatically in donors, so donors must be screened for high-risk-behavior-related diseases.[3] Globally, there are approximately 170 million individuals chronically infected with hepatitis C virus (HCV), more than 350 million with hepatitis B virus (HBV), and 38 million human immunodeficiency virus (HIV)-infected people. According to World Health Organization (WHO) reports, the prevalence of HBV, HCV, and HIV infections among blood donors in different parts of the world varies from 0.008% to 6.08%, 0.004% to 1.96%, and 0.0004% to 2.0%, respectively.[4,5]

In Africa, 5%–10% of HIV transmission is as a result of contaminated blood transfusions. Infection by HBV and HCV causes serious mortality, morbidity, and financial burden and thus is a major global health problem.[6] In Sub-Saharan Africa, 12.5% of patients who receive blood transfusion are at risk of post-transfusion hepatitis. Prevalence of active syphilis infection among African countries showed 12.8% in Tanzania and 3.8% in Kenya.[7] Even so, syphilis is less readily transmitted by blood, and the prevalence among blood donor is low in most studies reported.[6]

The Ethiopian Red Cross Society (ERCS) provided blood services for the last 30 years in its 12 regional blood banks with replacement and directed donations. Testing of the blood for the presence of major infectious pathogens such as HBV, HCV, and syphilis was not universal in most of the transfusion centers in the country.[3]

Continuous monitoring of the magnitude of transfusion-transmissible infections in blood donors is important for determining the risk of transmissible infections and optimizing donor recruitment strategies to minimize infectious diseases transmission. However, there is paucity of information on the sero-prevalence and risk factors in Eastern Ethiopia. Therefore, this study was aimed to determine sero-prevalence of HIV, HBV, HCV, syphilis, and associated factors among blood donors in Eastern Ethiopia.

Materials and methods

Study setting and period

This study was conducted in Dire Dawa, Harari, and Jigjiga blood banks in Eastern Ethiopia from February to March 2018. These blood banks are the centers where an effective blood banking system has been established to cater for all the blood needs of patients in the hospitals of their region and referral units. They are situated in the Dire Dawa city, the Harar town, and the Jigjiga town.[8,9] Annually, on average 3200, 2220, and 1440 blood units have been collected at Dire Dawa, Harari, and Jigjiga blood banks, respectively (source: unpublished Dire Dawa, Harari, and Jigjiga blood bank office report of 2017).

Study design and population

An institutional-based cross-sectional study was conducted among 500 blood donors who visit Dire Dawa, Harari, and Jigjiga blood banks during the study period. Study participants who fulfilled the national and regional donation criteria including age >18 years and <65 years, body weight greater than 45 kg and hemoglobin level >12.5 g/dL were included. Full history, physical examination, and screening of donors were performed and recorded for all blood donors and checked to see their eligibility for donation. Blood donors who were not willing to consent to participate in the study were excluded.

Sample size determination and sampling techniques

The sample size for sero-prevalence of TTIs among blood donors was determined by considering the sero-prevalence of major blood-borne infections (12%) among blood donors from the study conducted in Jigjiga blood bank.[10] The final sample size including 10% non-respondent rate was 500. The final sample size was proportionately allocated to the three selected blood banks based on their blood donors flow in the service. All blood donors who were donated the blood at Dire Dawa (220), Harari (150), and Jigjiga (130) blood banks were selected consecutively until the required sample size reached.

Data collection and data collection procedures

Medical laboratory and nurse health professionals were selected as data collectors. Pre-test of the instrument was done before the actual data collection, and corrective measure was made. Data on socio-demographic, behavioral, and clinical factors were collected using closed ended structured questionnaire adapted from different literature.[4,5,8–10]

Specimen collection and processing

About 5 mL of blood sample was collected from each collection bag using a sterile syringe. The serum was separated by centrifuging the blood at 1500 r/min for 10 min. All collected specimens were processed immediately and stored at refrigeration temperature of 2°C–8°C. The tests were run within 24 h of collection.[11]

Serological analysis

Blood sample were tested for HBV, HCV, HIV, and syphilis using Wantai AiD™ HBsAg Enzyme Linked Immuno

Table 1. Socio-demographic characteristics of blood donors in Eastern Ethiopia, 2018 (n = 500).

	Characteristics	Frequency	Percentage
Gender	Male	406	81.2
	Female	94	18.8
Age category (years)	18–30	302	60.4
	31–45	175	35.0
	46–65	23	4.6
Marital status	Married	230	46.0
	Single	254	50.8
	Divorced	16	3.2
Educational level	No formal	100	20
	Primary	163	32.6
	Secondary and above	237	47.4
Occupation	Employed	147	29.4
	Driver	50	10.0
	Private	90	18.0
	Military	85	17.0
	Student	86	17.2
	Farmer	42	8.4
Residence	Urban	431	86.2
	Rural	69	13.8
Donation type	Replacement	154	30.8
	Voluntary	346	69.2
Number of donation	First time	426	85.2
	Repeated	74	14.8

Sorbant Assay (ELISA), Wantai AiD™ anti-HCV ELISA, WANTAI HIV 1 + 2 Ag/Ab ELISA, and DIALAB ELISA test kits (Beijing Wantai Biological Pharmacy Enterprise Co., Ltd. China Laboratory Diagnosis), respectively. Syphilis testing kits were developed by Nora Kampitsch, MSc, India. The anti-syphilis Ab ELISA test is a one-step enzyme immunoassay for the qualitative detection of antibodies to *Treponema pallidum* in human serum or plasma. All the positive blood samples were tested repeatedly before reporting positive by the same tests.

Method of data analysis

Data were checked, cleaned, coded, and entered in EPI-Data version 3.5. The data were exported to Statistical Package for Social Sciences (SPSS) version 20 for analysis. Descriptive statistics were used to summarize different variables and presented in the form of texts and tables. The prevalence of TTIs and each TTI were determined as the proportion of those individuals to at least one TTIs. Bivariate and multivariate logistic regression analyses were carried out to identify factors associated with outcome variable. A variable with $p < 0.05$ at 95% confidence interval (CI) in the multivariate logistic model was considered as statistically significant. Multi-collinearity was checked using the variance inflation factor.

Quality assurance

Training was given for data collectors on the objective, benefit of the study, individual's right, informed consent and techniques of the interview, laboratory personals, and supervisor to ensure the quality of data. Supervisors checked the collected data on daily basis in order to maintain its accuracy and completeness. Manufacturer's instructions and standard operational procedures were strictly followed during laboratory tests. Positive and negative controls were used to check the quality of reagents.

Results

Socio-demographic characteristics

A total of 500 blood donors were enrolled in this study. In total, 406 (81.2%) of the study participants were male and 302 (60.4%) of the donors belonged to the age group of 18–30 years. The mean (±standard deviation) age of participants was 29.73 (±8.02) years. Of the total, 431 (86.2%) donors were urban residents, 346 (69.2%) belonged to voluntary donors, and 426 (85.2%) were those who donated blood for first time (Table 1).

Behavioral, clinical history, and history of injury characteristics of the participants

Out of the total participants, 142 (28.4%), 139 (27.8%), and 92 (18.4%) were chat chewers, alcohol users, and use drug by injection without prescription, respectively. Of the participants, 71 (14.2%) and 59 (11.8%) were cigarette smokers and had a practice of unprotected sex, respectively. Of the total participants, 112 (22.4%) knew their sexually transmitted infection (STI) status, 76 (15.2%) had a history of sharp injury, 52 (10.4%) had a history of tooth extraction, and 44 (8.8%) had contact with the family of people who had HIV or hepatitis (Table 2).

Sero-prevalence of HIV, HBV, HCV, and syphilis

The overall sero-prevalence of TTI was 12.4% (62/500) (95% CI: 9.5, 15.3). The magnitudes of TTIs were 6.6%, 3.4%, 1.4%, and 1% for HBV, syphilis, HIV, and HCV, respectively.

Factors associated with TTIs

In the bivariate analysis, variables such as age group, occupational status, educational level, multiple sex partner, unsafe sex, previous blood transfusion, family with HIV or hepatitis, giving care of HIV or hepatitis patients, dental procedure/tooth extraction, and donor type were significantly associated with TTIs (Tables 3–5).

Multivariable analysis was conducted to control the potential confounders. In this regard, those who give care to HIV or hepatitis patient were 3.24 times more likely to be infected with TTIs than those who did not give care for HIV or hepatitis patients (adjusted odd ratio (AOR) = 3.24; 95% CI: 1.49, 7.07). Individuals who had the exposure of practicing unsafe sex were 2.99 times more likely associated with TTIs compared to their counterparts (AOR = 2.99; 95% CI: 1.51, 5.92). Families with HIV or hepatitis were 2.91 times more likely to be infected by TTIs than those who had no family with HIV or hepatitis (AOR = 2.91; 95% CI: 1.33, 6.33). The exposure of having multiple sex partners was 2.56 times more likely to infect by TTIs than those had no multiple sex partners (AOR = 2.56; 95% CI: 1.21, 5.19). The odds of TTIs were 2.75 times higher for blood donors with dental procedure compared to those who had no dental procedure (AOR = 2.75; 95% CI: 1.20, 6.28). Those who had no formal education were 2.46 times more likely to be at risk of infection with TTIs than secondary and above level (AOR = 2.46; 95% CI: 1.24, 4.86) (Table 6).

Table 2. Behavioral, clinical history, and history of injury characteristics of blood donors in Eastern Ethiopia, 2018 (n = 500).

Characteristics	Frequency	Percentage
Multiple sex partner	52	10.2
Practicing Unprotected sex	59	11.8
Inject drug without prescription	92	18.4
Sex with commercial sex worker	44	8.8
Had tattoo	34	6.8
Chewing chat	142	28.4
Smoking cigarette	71	14.2
Drinking alcohol	139	27.8
Know STD status	112	22.4
Family had HIV or hepatitis	44	8.8
Received blood/transfused	25	5.0
Chronic illness	31	6.2
Dental procedure/tooth extraction	52	10.4
Surgery	20	4.0
Care HIV or hepatitis patients	46	9.2
Sharp injury	76	15.2
Blood splash on face	27	5.4
Car accident	25	5.0
Sexual abuse	13	2.6

STD: sexually transmitted disease; HIV: human immunodeficiency virus.

Discussion

In this study, the overall sero-prevalence of TTIs was 12.4%. This was similar to studies conducted in Addis Ababa national blood bank of Ethiopia (9.5%),[3] Kenya (12.0%),[12] Cameroon (13.7%),[13] Nigeria (13.0%),[14] and Rawalpindi, Pakistan (9.6%),[15] but lower compared with other studies done in Wolaita Sodo, Ethiopia (29.5%)[16] and Bahir Dar, Ethiopia (43.2%),[17] Mozambique (18.7%),[18] Cameroon (21.2),[19] Equatorial Guinea (37.4%),[20] and Saudi Arabia (21.3%).[21] However, this study finding was slightly higher

Table 3. Bivariate analysis of socio-demographic factors associated with TTIs among blood donors in Eastern Ethiopia blood bank service, 2018 (n = 500).

Variables		Overall sero-prevalence of TTIs			
		Positive (%)	Negative (%)	COR (CI)	p-value
Age group (years)	18–30	19 (6.3)	283 (93.7)	0.242 (0.08–0.72)	0.011
	31–45	37 (21.1)	138 (78.9)	0.965 (0.34–2.77)	0.948
	46–65	5 (21.7)	18 (78.3)	1	
Gender	Male	53 (13.1)	353 (86.9)	1.614 (0.74–3.52)	0.229
	Female	8 (8.5)	86 (91.5)	1	
Occupation	Employed	6 (4.1)	141 (95.9)	0.156 (0.05–0.469)	0.021
	Driver	10 (20)	40 (80)	0.917 (0.33–2.52)	0.866
	Private	18 (20)	72 (80)	0.917 (0.37–2.26)	0.850
	Military	13 (15.3)	72 (84.7)	0.662 (0.257–1.702)	0.392
	Student	5 (5.8)	81 (94.2)	0.226 (0.071–0.726)	0.012
	Farmer	9 (21.4)	33 (78.6)	1	
Marital status	Married	34 (14.8)	196 (85.2)	0.751 (0.203–2.78)	0.669
	Single	24 (9.5)	230 (90.5)	0.452 (0.12–1.69)	0.240
	Divorced	3 (18.7)	13 (81.3)	1	
Education	No formal	23 (23)	77 (77)	2.92 (1.54–5.54)	0.001
	Primary	16 (9.8)	147 (90.2)	1.064 (0.54–2.09)	0.858
	Secondary and above	22 (9.3)	215 (90.7)	1	
Place of residence	Urban	50 (11.6)	381 (88.4)	0.692 (0.34–1.41)	0.309
	Rural	11 (15.9)	58 (84.1)	1	

TTI: transmission-transmittable infection; CI: confidence interval.

Table 4. Bivariate analysis of behavioral factors associated with TTIs among blood donors in Eastern Ethiopia, 2018 (n = 500).

Variables		Positive (%)	Negative (%)	COR (CI)	p-value
Multiple sex partner	Yes	13 (25.5)	38 (74.5)	2.86 (1.42–5.75)	0.003
	No	48 (10.7)	401 (89.3)		
Unsafe sex	Yes	16 (27.1)	43 (72.9)	3.28 (1.71–6.28)	0.000
	No	45 (10.2)	396 (89.8)		
Had tattoo	Yes	5	29	1.24 (0.46–3.33)	0.673
	No	57	409		
Drug injection	Yes	16 (17.4)	76 (82.6)	1.69 (0.91–3.16)	0.095
	No	45 (11)	363 (89)		
Sex with commercial sex worker	Yes	6 (13.6)	38 (86.4)	1.15 (0.46–2.85)	0.761
	No	55 (12.1)	401 (87.9)		
Chewing chat	Yes	19 (13.4)	123 (86.6)	1.16 (0.65–2.08)	0.612
	No	42 (11.7)	316 (88.3)		
Smoking cigarette	Yes	11 (15.5)	60 (84.5)	1.39 (0.68–2.82)	0.362
	No	50 (11.7)	379 (88.3)		
Drink alcohol	Yes	20 (14.4)	119 (85.6)	1.31 (0.74–2.33)	0.355
	No	41 (11.4)	320 (88.6)		

TTI: transmission-transmittable infection; CI: confidence interval.

Table 5. Bivariate analysis of clinical history, history of injury, and type of donor factors associated with TTIs among blood donors in Eastern Ethiopia, 2018 (n = 500).

Variables		Positive (%)	Negative (%)	COR (95% CI)	p-value
Know STDs status	Yes	11 (9.8)	101 (90.2)	0.74 (0.37–1.47)	0.384
	No	50 (12.9)	338 (87.1)		
Family with HIV or hepatitis	Yes	12 (23.7)	32 (76.3)	3.12 (1.51–6.44)	0.002
	No	49 (10.7)	407 (89.3)		
Care of HIV or hepatitis patients	Yes	12 (26.1)	34 (73.9)	2.92 (1.42–6.00)	0.004
	No	49 (12.1)	405 (87.9)		
Blood transfusion	Yes	7 (28)	18 (72)	3.03 (1.21–7.59)	0.018
	No	54 (12.8)	421 (87.2)		
Surgery	Yes	5 (25)	15 (75)	2.52 (0.88–7.21)	0.084
	No	54 (11.3)	426 (88.7)		
Dental procedure	Yes	11 (21.2)	41 (78.8)	2.14 (1.032–4.421)	0.041
	No	50 (11.2)	398 (88.8)		
Car accident	Yes	6 (24)	19 (76)	2.41 (0.923–6.29)	0.072
	No	55 (11.6)	420 (88.4)		
Sharp injury	Yes	13 (17.1)	63 (82.9)	1.62 (0.828–3.154)	0.159
	No	48 (11.3)	376 (88.7)		
Blood splash	Yes	5 (18.5)	22 (81.5)	1.69 (0.616–4.65)	0.307
	No	56 (11.8)	417 (88.2)		
Donor type	Replacement	29 (18.8)	125 (81.2)	2.28 (1.32–3.92)	0.003
	Voluntary	32 (9.2)	314 (90.8)		

TTI: transmission-transmittable infection; CI: confidence interval; STD: sexually transmitted disease.

compared with studies conducted in Hawasa (7.29%),[22] Yirgalem (7.0%)[23] and Gondar (6.55%)[24] in Ethiopia, Andaman and Nicobar Islands (2.2%),[5] Iraq (0.98%),[25] India (1.9%),[26] Democratic Republic of Congo (3.9%),[27] Uganda (5.7%),[28] Yemen (3.7%),[29] and Eretria (3.8%).[30] The discrepancies might be due to the inclusion of difference in blood donors' types, differences in population risks or effectiveness, and stringent procedures of donor screening.

In this study, the sero-prevalence of HIV was 1.4%. The finding was similar to study conducted in Hawasa blood bank (1.6%)[21] and Yirgalem Hospital (1.6%)[22] in Ethiopia. This was higher than other reports from studies conducted in Jigjiga, Ethiopia (0.1%)[9], Eretria (0.18%),[30] Yemen (0.14%),[29] Rawalpindi Pakistan (0%),[15] and India (0.09%),[26] but lower compared with the study conducted in Nigeria (5.6%),[14] Mozambique (8.5%),[18] Kenya (5.2%),[12] and

Table 6. Multivariable analysis of factors associated with TTIs among blood donors in Eastern Ethiopia, 2018 (n = 500).

Variables		Overall sero-prevalence of TTIs			
		Positive (%)	Negative (%)	AOR (95% CI)	p-value
Age group (years)	18–30	19 (6.3)	283 (93.7)	0.35 (0.11–1.15)	0.085
	31–45	37 (21.1)	138 (78.9)	1.37 (0.45–4.19)	0.585
	46–65	5 (21.7)	18 (78.3)	1	
Occupation	Employed	6 (4.1)	141 (95.9)	0.136 (0.03–1.61)	0.09
	Driver	10 (20)	40 (80)	1.23 (0.39–3.92)	0.726
	Private	18 (20)	72 (80)	1.29 (0.47–3.62)	0.619
	Military	13 (15.3)	72 (84.7)	0.76 (0.21–2.69)	0.665
	Student	5 (5.8)	81 (94.2)	0.603 (0.13–2.79)	0.518
	Farmer	9 (21.4)	33 (78.6)		
Education	No formal	23 (23)	77 (77)	2.46 (1.24–4.86)	0.010
	Primary	16 (9.8)	147 (90.2)	1.05 (0.52–2.13)	0.883
	Secondary and above	22 (9.3)	215 (90.7)		
Multiple sex partner	Yes	13 (25.5)	38 (74.5)	2.56 (1.21–5.19)	0.014
	No	48 (10.7)	401 (89.3)		
Unsafe sex	Yes	16 (27.1)	43 (72.9)	2.99 (1.51–5.92)	0.001
	No	45 (10.2)	396 (89.8)		
Blood transfusion	Yes	7 (28)	18 (72)	2.58 (0.86–7.78)	0.092
	No	54 (12.8)	421 (87.2)		
Family with HIV or hepatitis	Yes	12 (23.7)	32 (76.3)	2.91 (1.33–6.33)	0.007
	No	49 (10.7)	407 (89.3)		
Care of HIV or hepatitis patients	Yes	12 (26.1)	34 (73.9)	3.24 (1.49–7.07)	0.003
	No	49 (12.1)	405 (87.9)		
Dental procedure	Yes	11 (21.2)	41 (78.8)	2.75 (1.20–6.28)	0.016
	No	50 (11.2)	398 (88.8)		
Donor type	Replacement	29 (18.8)	125 (81.2)	2.29 (1.29–3.99)	0.004
	Voluntary	32 (9.2)	314 (90.8)		

TTI: transmission-transmittable infection; CI: confidence interval; HIV: human immunodeficiency virus.

Cameroon (4.1%).[19] The possible reason of discrepancy could be due to behavioral characteristics of the study participant. In this study, most of the study participants have multiple sexual partners, practicing unsafe sex, and dental extraction which increase the risk acquiring HIV.

Most countries in Africa, including Ethiopia, have high endemicity for HBV.[8] The sero-prevalence of HBV in our study was 6.6%. This was similar to other studies conducted in Hawasa (4.8%)[22] and Gondar (4.7%)[31] in Ethiopia, but lower compared with previous reports from Jigjiga Eastern Ethiopia (10.9%),[10] Nigeria (10.9%),[14] Mozambique (10.6%),[18] and Equatorial Guinea (10.1%).[20] However, this finding was higher than the previous reports from Gondar (3.6%),[24] Bahir Dar (4.11%),[17] and Dire Dawa (3.7%)[8] in Ethiopia. The socio-cultural difference might be again the possible factor for these differences.

In this study, the donors sero-prevalence of HCV was 1% (95% CI: 0.2, 2.2), which was comparable with the previous studies conducted in Gondar (0.8%),[24] Hawasa (0.6%)[22] and Jigjiga (0.7%)[9] in Ethiopia, Cameroon (1.3%),[13] and Yemen (0.8%),[29] but the result was considerably lower compared to reports from Saudi (4.7%),[21] Rawalpindi (4.3%),[15] Nigeria (2.8%),[14] Kenya (3.2%),[12] and Equatorial Guinea (3.7%).[20] The reason for this difference could be majority of the donors were volunteers in this study.

The sero-prevalence of syphilis in this study was 3.4% (95% CI: 1.8, 5.0), which was lower compared to the study conducted in Cameroon (8.1%)[13] and Equatorial Guinea (21.5%).[20] However, it was higher compared with other studies: from national blood bank (1.3%),[3] Jigjiga (0.7%)[9] and Hawasa blood bank (0.8%)[22] in Ethiopia, Eretria (0.5%),[30] and Kenya (1.2%).[12] The possible reason of discrepancy could be due to duration of the study, and cultural and behavioral characteristics of the study participant.

This study showed that TTIs were 2.46 times higher among blood donors with no formal education compared to their counterpart. This finding is comparable with the study done in Kenya.[12] This might be attributed to the fact that as the level of education increases, there is high probability of being aware of preventive measures against TTIs. In addition, it is likely that those with high education understand criteria for self-deferral better. Some studies suggest that better educational attainment may correlate with a lower risk of infection among blood donors.

In this study, multiple sexual partner and unsafe sex were significantly associated with TTIs. This finding is consistent

with studies conducted in Kenya,[12] Ethiopia,[17] and Ghana.[32] The key mode of acquiring sexual transmitted infection in Africa is sexual activity, multiple partners being one of the main risk factors.[33]

This finding indicated that family with HIV or hepatitis and caring HIV or hepatitis patients were significantly associated with TTIs. This was comparable with the previous study finding from Ethiopia.[17] This indicates that the main root for transmission of HIV and hepatitis are cross-contamination of body fluids, due to such reason a person who has chance to contact with the infected person is at risk to be infected.

In this study, participant who had a history of dental procedure was significantly associated with TTIs. These findings supported with the previous study in Wolaita, Ethiopia which showed participants who had a history of teeth extraction were found statistically significant to HBV,[16] and Debretabor hospital admissions in Ethiopia reported that dental procedure had significantly associated with HBV and HCV seropositivity.[34] This might be because of the commonly used dental procedure instruments.

In this study, replacement donors were significantly associated with TTIs than volunteers. This is supported with the study conducted in Ghana[33] and Addis Ababa national blood bank in Ethiopia.[23] Sero-prevalence among voluntary donors is low, due to the fact that people who donate blood voluntarily might get all the available information openly and they might be deferred.

This study has some limitations. Behavioral factors were self-reported and may introduce social desirability bias. All test results did not give positive serological result during the window period. But, detailed preliminary risk factors assessment was made by trained health professionals in the blood bank unit before donation based on blood donors screening guideline. The method laboratory analysis does not include molecular analysis, which is more confirmatory test. However, the study was mostly reported TTIs such as HIV, HBV, HCV, and syphilis were included with their potential risk factors.

Conclusion

The magnitude TTIs is relatively higher than the previous studies conducted in Ethiopia. The most dominant sero-prevalent TTI was HBV (6.6%), followed by syphilis (3.4%). Unsafe sex, multiple sex partner, dental procedure, and family with HIV or hepatitis, giving care of HIV or hepatitis patients, donor type, and educational level were significantly associated with TTIs.

Special emphasis need to be given to HBV and syphilis infections in Eastern Ethiopia. Each of the blood banks and regional health bureaus in the study area should mobilize community for increasing repeated voluntary donors through promotion of blood bank activity. They should work on the prevention and control of TTIs in the study area through provision of health information dissemination to the community on the identified risk factors. There is also need for further study to identify the gaps in the failure of preliminary blood donors screening criteria, which is used currently to defer donors before blood donation. In addition, further assessment should be conducted at community level for taking measures on the potential risk factors of major TTIs in each study area.

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Availability of data and materials

The authors declare that all important data are fully described within the manuscript

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

The study was ethically approved by Institutional Health Research Ethics Review Committee of the College of Health and Medical Sciences, Haramaya University. Official permissions were also sought from Dire Dawa, Harari and Jigjiga blood bank service to conduct this study in their institutions.

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Informed consent

The objectives of the study was explained each study participants. And all the study participants were enrolled after written informed consent was obtained. All participants were informed that their blood sample were to be tested for TTIs, and that the test results and all the information about them would be kept strictly confidential.

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