

# Human Immunodeficiency Virus and Syphilis Among Blood Donors at Western Oromia, Ethiopia

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**Background:** Blood transfusion saves lives and improves health, but many patients requiring transfusion do not have timely access to safe blood. Human immunodeficiency virus and syphilis are the commonest transfused transmitted infections and threats to blood recipients. Proper donor selection and screening of the donated blood for major transfusion-transmitted infections evidently reduced challenge in blood safety. Therefore, the objective of this study was to determine the sero-prevalence HIV and syphilis infections among blood donors at East Wollega, West Ethiopia.

**Patients and Methods:** A five-year (from January 2015 to December 2019) retrospective study was conducted by reviewing blood donor laboratory test results from Nekemte blood bank which is serving hospitals in Western Oromia. Blood donor data were analyzed by Statistical Package for Social Sciences version 20 software.

**Results:** The total of 17,810 individual's blood was screened during the study period. The overall prevalence of HIV, syphilis, and their co-infection was 222 (1.25%), 142 (0.80%), and 5 (0.03%), respectively. The prevalence of HIV was associated with unmarried (AOR: 2.4; 95% CI: 1.5, 5.2), male (AOR: 2.1; 95% CI: 1.5, 2.9), and blood donors resident in a rural area (AOR: 1.5; 95% CI: 1.5, 5.9). Besides, the prevalence of syphilis was associated with education, age, marital status and residence of study participant.

**Conclusion:** In the current study, the sero-prevalence of HIV and syphilis among blood donors was low, when it was compared to other sub-Saharan Africa country. However, to ensure the health of all recipients screening blood using standard methods is highly recommended.

**Keywords:** epidemiology, predictor, transfusion-transmitted infection, blood bank

## Introduction

Blood transfusion is a life-saving therapeutic intervention in which globally more than 81 million units of blood are donated every year. Among these 18 million are not screened for an infection that is potentially capable of being transmitted by blood transfusion due to the blood is a vector for harmful transfusion transmissible infections.<sup>1</sup> Human immunodeficiency virus and *Treponema palladium* are the common microorganisms for post-transfusion transmitted infection.<sup>2</sup>

The World Health Organization, to assure quality and safety, recommends screening of donated blood for a minimum of the major transfusion-transmitted infections (TTIs). Accordingly, screening for HIV, hepatitis B, hepatitis C, and syphilis should be mandatory.<sup>3,4</sup> Annually, the worldwide infection rate of HIV

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through blood transfusion alone ranges from 80,000 to 160,000.<sup>5</sup> Up to 500 people acquire TTIs due to contaminated blood transfusion daily in Africa<sup>5</sup> and in sub-Saharan Africa, blood transfusion accounts for 5–10% of HIV transmission.<sup>6</sup> The estimated prevalence of HIV infection among blood donors in Ethiopia ranged from 0.1% - 11.7%.<sup>7–9</sup>

There is a scarcity of comprehensive data on the prevalence and trends of major TTI among blood donors in the study area. Thus, the current study aimed to determine the prevalence and predictors of HIV and syphilis infections among blood donors in the Western Oromia, East Wollega, Ethiopia.

## Methods

### Study Area

The study was conducted in Nekemte Blood Bank, which is serving about 17 hospitals in Western Oromia. This blood bank is placed in the Nekemte town which is the capital city of the East Wollega Zone, Western Oromia, Ethiopia. Nekemte town is located 331 km west of the capital city, Addis Ababa.

### Study Design

A five-year (January 2015 to December 2019) retrospective study was conducted by retrieving data from the Nekemte Blood Bank laboratory registration book.

### Study Population

Blood donors who were registered on the laboratory registration of Nekemte Blood bank and screened for HIV and syphilis infection during the study period.

### Data Collection, Laboratory Examination, and Statistical Analysis

The data extraction sheet was used to collect data regarding socio-demographic variables and blood donors laboratory test results of HIV and syphilis from Nekemte Blood Bank registration book. To identify HIV and syphilis of blood donors ELISA serological method was applied during the study period. In case of HIV, the WANTAI HIV 1 + 2 Ag/Ab ELISA test kit (Beijing Wantai Biological Pharmacy Enterprise Co., Ltd. China) was used. Besides, the blood donor sample was tested for anti-syphilis Ab: using DIALAB ELISA (Nora Kampitsch, MSc, India). Finally, the collected data were entered and analyzed by

using a statistical package for the social science version 20 software.

## Results

From a total of 17,810 blood donors, 70.1% (12,480) of the study participants were males. Of the total, a majority of 74.4% (13,245) blood donors were single, 59.4% (10,572) were students, and 70% (12,456) donors were urban residents (Table 1).

The sero-prevalence of HIV was 1.25% (222/17,810). Of all study participants five (0.03%) of them had co-infection of HIV and syphilis. Furthermore, of the total infected participants, the majority (53.85%) of unmarried, 42.87% of males, 40.38% of age group within 18–30, 34.89% of students, 47.53% of resident in urban, and 41.48% of participants had above the secondary level of education were infected by HIV (Table 1). Besides, the sero-prevalence of HIV was 0.06% (10/17,810) in 2015 and increased to 0.29% (52) in 2016 and 0.48% (86/17,810) in 2017, then decreased to 0.26% (46/17,810) and 0.16% (28/17,810) in 2018, and 2019, respectively (Table 2).

The sero-prevalence of Syphilis was 0.8% (142/17,810). Of all study participants five (0.03%) of them had co-infection of HIV and syphilis. Moreover, of the total infected blood donors 29% of males, 34.89% of unmarried, 19.78% of age group within 35–65, 15.38% of students, and 24.45% resident in rural were infected with syphilis (Table 1). In addition, the seroprevalence of syphilis increased steadily from 0.06% (10/17,810) in 2015 to 0.02% (35/17,810) in 2019 (Table 2).

In the current study, the risk factors of HIV and syphilis were identified by multivariate logistic regression analysis. According to this study, the male blood donors were two times (AOR: 2.1; 95% CI: 1.5–2.9) more likely to be infected by HIV compared to the counterpart. Besides, the unmarried study participant was also two times (AOR: 2.4; 95% CI: 1.5–5.2) more likely to be infected by HIV when it was compared with that of married blood donor (Table 3).

Age, marital status, educational status, and residence were risk factors of syphilis in the present study. Those study participant at the age of 31–35 years (AOR = 2.8; 95% CI: 1.4, 3.9) and 45–65 years (AOR = 3.9; 95% CI: 1.5–3.7), unmarried blood donors (AOR = 2.5; 95% CI: 1.4,3.2), donors with no formal education (AOR = 3.5; 95% CI: 1.9, 4.5) and donor who were resident in rural

**Table 1** Socio-Demographics Characteristics, Prevalence of HIV and Syphilis Among Blood Donor, Western Oromia, Ethiopia from January 2015 to December 2019

Variable	HIV Positive N (%)	Syphilis Positive N (%)	Total Infected Participants N (%)
<b>Sex</b>			
Male	156 (42.85)	107 (29.40)	263 (72.25)
Female	66 (18.13)	35 (9.62)	101 (27.75)
<b>Age</b>			
18–30	147 (40.38)	27 (7.42)	174 (47.80)
31–45	52 (14.29)	43 (11.81)	95 (26.10)
46–65	23 (6.32)	72 (19.78)	95 (26.10)
<b>Marital Status</b>			
Unmarried	196 (53.85)	127 (34.89)	323 (88.74)
Married	26 (7.14)	15 (4.12)	41 (11.26)
<b>Occupational status</b>			
Student	127 (34.89)	56 (15.38)	183 (50.27)
Private worker	22 (6.04)	15 (4.12)	37 (10.16)
Government Employes	63 (17.30)	52 (14.29)	115 (31.59)
Farmer	10 (2.75)	19 (5.22)	29 (7.97)
<b>Educational status</b>			
No formal	47 (12.91)	61 (16.76)	108 (29.67)
Primary school	24 (6.59)	9 (2.47)	33 (9.06)
Secondary and college	151 (41.48)	72 (19.78)	223 (61.26)
<b>Residence</b>			
Urban	173 (47.53)	53 (14.56)	226 (62.09)
Rural	49 (13.46)	89 (24.45)	138 (37.91)

Abbreviations: N,number; %, percent.

**Table 2** Sero-Prevalence of HIV and Syphilis Infections with Respect to Donation Year Among Blood Donors, Western Oromia, Ethiopia from January 2015 to December 2019

Year of Donation	No of Donor	HIV Positive N (%)	Syphilis Positive N (%)
<b>2015</b>	2693	10 (0.06%)	10 (0.06%)
<b>2016</b>	2197	52 (0.29%)	30 (0.16%)
<b>2017</b>	4178	86 (0.48%)	25 (0.14%)
<b>2018</b>	4406	46 (0.26%)	42 (0.24%)
<b>2019</b>	4336	28 (0.16%)	35 (0.20%)
<b>Total</b>	17,810	222 (1.25%)	142 (0.80%)

Abbreviations: N,number; %,percent.

(AOR = 3.7; 95% CI: 1.9,4.6) were more likely to be infected by syphilis compared their counterpart (Table 4).

## Discussion

In the current study, the majority of the donors (70.1%) were males, which were similar to the study in Gondar,<sup>7</sup> and Nigeria.<sup>10</sup> The numbers of female blood donors were few in the current study, and this may be attributed to behavioral and sociocultural drivers in Ethiopian

society that the male is donated blood than female.<sup>11</sup> Regarding trend, seroprevalence of HIV and syphilis with respect to year has shown a trend. However, a study from Gondar, Ethiopia has shown that consistent increment in the seroprevalence from 2010 to 2012.<sup>12</sup> This might be a result of variation in the sero-prevalence of HIV and syphilis in the community since it is assumed that blood donors are a representative of the community. In addition, it might be as a result of the

**Table 3** Logistic Regression of HIV with Socio-Demographic Characteristics of Blood, Western Oromia, Ethiopia from January 2015 to December 2019

Variable	HIV Status		COR (95% CI)	AOR (95% CI)
	Negative	Positive		
<b>Sex</b>				
Female	5264	36	1.00	
Male	12,324	186	2.2 (1.6–3.2)	2.1 (1.5–2.9)*
<b>Age</b>				
18–30	11,313	147	1.00	
31–45	5840	52	0.7 (0.4–2.9)	
46–65	435	23	4.1(0.3–4.6)	
<b>Marital status</b>				
Married	4539	26	1.00	
Unmarried	13,049	196	2.6 (1.6–5.5)	2.4 (1.5–5.2)*
<b>Occupation</b>				
Student	10,445	127	1.00	
Private worker	1208	22	1.5 (0.5–3.4)	
Government Employs	5413	63	0.9 (0.3–1.8)	
Farmer	522	10	1.5 (0.8, 2.4)	
<b>Educational Status</b>				
Primary school	5419	24	1.00	
Secondary and college	8367	151	4.1 (0.4–4.1)	
No formal education	3802	47	2.8 (0.3–3.4)	
<b>Residence</b>				
Rural	5305	49	1.00	
Urban	12,283	173	1.5 (1.6–6.6)	1.5(1.5–5.9)*

**Note:** \*Statistically significance.

**Abbreviations:** COR, crude odd ratio; AOR, adjusted odd ratio; CI, confidence interval.

implementation of sensitive diagnostic test methods for screening of this infection.

The majority (64.5%) study participants' age in the present study were ranging from 18 to 30. Our result is similar to research conducted in North Gondar,<sup>12</sup> Southwest Ethiopia,<sup>13</sup> and Northwest Ethiopia.<sup>7</sup> The highest number of donations in this age group (18–30 years) is due to the fact that active age groups (18–30) of the population are actively participating in blood donations. Besides, a good awareness was created on these age groups in the current study area.

The seroprevalence of HIV in the present study was 1.25%. This result was similar to the study reported from Sudan, which was 1%<sup>14</sup> and 1.13% in South Africa.<sup>15</sup> However, it was lower than a study conducted by different scholars in Ethiopia which was 4.5% of Diro et al<sup>16</sup> and 3.8% of Tessema et al,<sup>7</sup> and 3.8% in another country.<sup>17</sup> The reason for the low prevalence of HIV seropositivity in

the present study is due to the fact that there is good voluntary counseling test coverage in the study area. On the other hand, the prevalence of HIV among blood donors in the present study was higher than a similar study conducted in Jigjiga which was 0.1%,<sup>9</sup> 0.18% in Eretria<sup>18</sup> and 0.00% in Egypt in which there were no cases reported.<sup>19</sup> The differences might be due to, differences in geographical locations, the burden of the disease in the society and difference in awareness of study participant on transmission and prevention of HIV.

In the current study, HIV infection was highest among blood donors who were male, college students, and 18–30 years of age which were similar to a report from another study area.<sup>20</sup> Besides, in the present study sex, marital status, and residence of blood donors were risk factors for HIV seroprevalence. Male blood donors were more likely to be infected with HIV compared to female which was agreed with other research reported by different

**Table 4** Logistic Regression of Syphilis with Socio-Demographic Characteristics of Blood Donor, Western Oromia, Ethiopia from January 2015 to December 2020

Variable	Syphilis Status		COR (95% CI)	AOR (95% CI)
	Negative	Positive		
<b>Sex</b>				
Female	5295	35	1.00	
Male	12,373	107	1.3(0.8, 2.9)	
<b>Age</b>				
18–30	7633	27	1.00	
31–45	5849	43	3.1(1.5, 4.5)	2.8(1.4–3.9)*
46–65	4186	72	4.8(1.8–4.7)	3.9(1.5–3.7)*
<b>Marital status</b>				
Married	4550	15	1.00	
Unmarried	13,118	127	3(1.7–3.6)	2.5(1.4–3.2)*
<b>Occupation</b>				
Student	10,516	56	1.00	
Private worker	1215	15	2.3(0.5–2.9)	
Government Employers	5424	52	1.8 (0.1–4.5)	
Farmer	513	19	6.9(0.6–5.2)	
<b>Educational Status</b>				
Primary school	5424	19	1.00	
Secondary and college	8446	72	2.4(0.8,3.4)	
No formal	37,898	51	3.8 (1.9–4.7)	3.5(1.9–4.5)*
<b>Residence</b>				
Urban	12,403	53	1.00	
Rural	5265	89	3.9(1.8–4.9)	3.7(1.9–4.6)*

**Note:** \*Statistically significance.

**Abbreviations:** COR, crude odd ratio; AOR, adjusted odd ratio; CI, confidence interval.

scholars.<sup>7,21</sup> This might be due to most females may know their HIV status at prenatal care which is mandatory for all pregnant women in our country. The present study has also shown that unmarried study participants were higher risk for HIV compared to married blood donors. The plausible explanation for this result is, married study participant might have stable sexual partners which decrease their risk of HIV infection.<sup>22</sup> Moreover, rural blood donors were more likely to be infected with HIV than the urban donors. Similar result had been reported from another study area.<sup>23</sup> The prevalence of HIV, which is high in rural study participant, is might be due to lack of awareness regarding the transmission and prevention of this virus from different electronic media.

The present study has shown that the prevalence of syphilis among study participant was 0.8%, which was similar to the research done in Hawassa, Ethiopia.<sup>24</sup> However, it was slightly higher than a similar study

conducted in Eritrea (0.49%)<sup>18</sup> and lower than a study reported by scholars in Gondar which was 1.7%, and Tanzania which was 4.7%.<sup>17</sup> These differences between different countries might be due to the quality of laboratory tests used to screen blood samples, the difference in prevention measures taken, the effectiveness of the program to choose blood donors. In this study, the prevalence of syphilis significantly associated with older blood donors within the age group 31–35 years and 45–65 years compared to the reference group. This result was similar with study conducted in different countries.<sup>1,11,17,25,26</sup> However, our result was not inconsistent with some study conducted in our country like in Gondar and Jigjiga.<sup>9</sup> Similar to study conducted in Eastern Ethiopia,<sup>27</sup> in the current study unmarried blood donors, donors with no formal education and donors who were living in rural were highly vulnerable to syphilis compared to their counterparts.

The current study has provided a good data on the prevalence and some associated predictors of HIV and syphilis due to the study tried to use long year blood donor's history with large sample size. However, some variables were missed since the study was retrospective, which was reviewed from laboratory registration book of the blood bank.

## Conclusion

The result of the current study has shown that the seroprevalence of HIV and syphilis was low compared to study from countries in sub-Saharan Africa. Though, a substantial percentage of study participants had HIV and syphilis infections. Therefore, strict selection of blood donors using standard methods is necessary to make sure the health of the recipients is protected. Besides, increasing the awareness of rural people regarding the transmission and prevention of infection required to minimize the burden of HIV and syphilis should be encouraged.

## Abbreviations

ELISA, enzyme linked immunosorbent assay; HIV, human immunodeficiency virus; SPSS, Statistical Package for Social Sciences; TTIs, transfused transmitted infections; WHO, World Health Organization.

## Data Sharing Statement

All data generated or analyzed during this study were included in this article.

## Ethics Approval and Consent to Participate

This research was conducted after obtaining ethical clearance from an ethical review committee of the Institute of Health Science, Wollega University with reference number DMLS/127/11. All data and samples obtained from them were kept confidential by using codes instead of any personal identifiers and were meant only for the purpose of the study. Besides, the study was conducted in accordance with the Declaration of Helsinki.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Disclosure

The authors declare that they have no competing interests in this work.

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