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Prevalence and associated risk factors of Hepatitis B and Hepatitis C virus among volunteer blood donors in Arba Minch Blood Bank SNNPR, Ethiopia

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Hepatitis B virus (HBV) and Hepatitis C virus (HCV) is major public health problems that affect million people worldwide and people who are infected assumed to develop liver cirrhosis or hepatocelular carcinoma. Screening of blood donors is essential for healthy and safe donation. A cross sectional study design was conducted among volunteer blood donors in Arba Minch blood bank from March 2015 to April 2015. A total of 359 volunteer blood donors who came to Arba Minch blood Bank were interviewed face to face, then data was collected by using structured and pre-tested questionnaire, and finally blood sample drown and tested for HBV and HCV by using ELISA (enzyme linked immunosorbent assay) technique. Descriptive statistics was calculated for most variables in the study. OR and 95% CI was used to assess the association. Prevalence of HBV and HCV among study participant was 4.7 and 0%, respectively. From 17 participants tested positive for HBV, 8 (47%) were males. The test positivity among male was 8/197 (4.1%) while among females was 9/162 (5.6%) and more than three forth participants tested positive were age less than 25. After multivariate analysis, when positivity was compared among study participants grouped based on average monthly income, participants earning 581-1,300 birr were 32.2% less likely to have infection than participants earning below 580 birr per month. (AOR = 0.322, 95%CI =0.108-0.961). Volunteer donors who exposed to unsafe therapeutic drug injection was 8(2.2%) and from those 3(37.5%) was positive for HBV. When compare to volunteers who did not exposed 14(4%), exposed donors 11 times increased risk of HBV infection. This was statistically significant (AOR = 11.090, p = 2.258-54.475). Prevalence HBV of among volunteer blood donors in Arbaminch Blood Bank was 4.7%. Low monthly income and using unsafe therapeutic injection were related to HBV infection.

Key words: Hepatitis B virus, hepatitis C virus, volunteer blood donor.

INTRODUCTION

Worldwide, two billion people have been infected with hepatitis B virus (HBV), 360 million have chronic infection, and 600,000 die each year from HBV related liver disease or hepatocellular carcinoma (Shepard et al., 2006). On the other hand HCV (hepatitis C virus) affects 130 to 210 million people worldwide and one of the major risk factors for hepatocellular carcinoma. Globally, at least one third of hepatocellular carcinoma cases are attributed to HCV infection and 350,000 people died from HCV related diseases per year (Lee et al., 2014). Approximately 1 000,000 people die each year (~2.7% of all deaths) from causes related to viral hepatit is most

commonly liver disease including liver cancer (WHO, 2009). An estimated 57% of cases of liver cirrhosis and 78% of cases of primary liver cancer result from HBV or HCV infection (Perz et al., 2006).

The prevalence of HBV is estimated at 8% in West Africa and 5 to 7% in Central, Eastern and Southern Africa (WHO, 2012). HCV prevalence pattern across age is similar in East, Central, and Southern sub-Saharan Africa, with the latter two having considerably lower prevalence compared to other sub-Saharan African regions. Differences in prevalence across age and total prevalence between 1990 and 2005 for sub-Saharan Africa are not significant, except in the West region, where total prevalence decreased from 4.0% in 1990 to 2.8% in 2005 (Hanafiah et al., 2013).

The World Health Organization (WHO) estimated that transfusion of unsafe blood accounted for 8 to 16 million hepatitis B virus infections and 2.3 to 4.7 million hepatitis C infections each year (WHO, 2001). It is estimated that in sub-Saharan Africa, more than 45,000 hepatitis B viruses or hepatitis C virus infections are transmitted through contaminated transfusions annually (CDC, 2014). From 2000 to 2011, countries in Sub-Saharan Africa increased screening of donated blood units for HBV and HCV from 76 to 94% and 34 to 86%, respectively. During the same period, the median percentage of HBV marker-reactive units decreased from 7.1 to 4.4%, and the median percentage of HCV marker-reactive units decreased from 1.4 to 0.9%. In Ethiopian blood donors Marker-reactive rates in 2000/2004 from 24,000 donors was 4% for Hepatitis B and 2% for hepatitis C and 2010/2011 from 92,218 donors was 3.42% for Hepatitis B and 0.47% for hepatitis C and 2000/2004 to 2010/2011 ratio was 0.86% for Hepatitis B and 0.23% for hepatitis C (CDC, 2014).. Beside this prevalence of HBV and HCV reported from different parts in Ethiopia 4.11% HBV and 0.63% HCV in Bahir Dar (Assefa et al., 2013), 2.1% HBV and 0.2% HCV in Jimma (Yami et al., 2011), 6.2% HBV and 1.7% HCV in Amhara and Tigray Regional states (Gelaw and Mengistu, 2007).

MATERIALS AND METHODS

Study area

Study was conducted at Arba Minch blood bank which is located in Arba Minch city administration, SNNPR (South Nation Nationalities and People Region), Ethiopia. Arba Minch is 500 km south of Addis Ababa the capital city of Ethiopia. It was named from forty springs that flow around the town. It is surrounded by Lake Chamo and Abaya in the East and south east, Chencha woreda in the west and Segen area zone in the south east and Arba Minch zuria woreda in the North. According to 2014/2015 SNNPR statistics bureau report Arba Minch city has total an estimated population of 108,955. It is sub divided into four sub cities, namely Secha, Seqela, Abaya and Nech Sar. The blood bank was established in October 2013.On average the blood donor was ten, three hundred, four thousand per day, per month, per years respectively. It collects blood within 100 km square area and collection site include Arba Minch, Wolaita Sodo, Jinka and sawula town.

Study design and period

A cross sectional study design was used among volunteer blood donors from March 2015 to April 2015.

Study population and sample size

359 volunteer blood donors between 18 and 65 years of age who come to Arba Minch blood bank and Arba Minch blood bank collection site during the study period were included in this study.

Inclusion criteria

All age group from 18 to 65 years who were healthy and able to donate blood.

Exclusion criteria

People whose hemoglobin level below 12 mg/dl, current history of medication, recent history of operation, serious illness, weight < 45 kg, people who refuse to give informed consent.

Sampling procedure

Mobilization of different parts of community (secondary school student, university community, religious organization, youth center) in Arba Minch, Wolaita Sodo, Jinka and sawula town were conducted though the system that blood bank establish, beside those volunteer who come to blood bank without mobilization also included in this study. All volunteer blood donors who donate blood at Arba Minch during March 15, 2015 to April 24, 2015 were included in the study and the total sample number of volunteer blood donors donating blood only once during the study period. Full history, physical examination and screening of donors were performed and recorded for all volunteer blood donors to see their eligibility for donation.

Volunteer blood donors who did not meet the criteria for blood donation stated in the inclusion criteria were excluded from the study.

Enrollment and data collection procedures

Data on socio-demographic and socioeconomic variable, route associate variable, behavioral associated variables and for laboratory investigation were collected by structured questionnaire and questioners was numbered to identify those who have

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respond and or not. After donors agree to take part in the study, he or she sign a consent form, baseline information was collected. After fill all the questioners from volunteers, blood were drown by collecting bag.

Specimen collection and processing

From individual blood donor about 5 ml of blood sample was collected from the collection bag using a sterile capped tube. The blood was centrifuged and plasma was separated and stored at 2 to 8°C until it was tested. Samples were brought to room temperature prior to testing.

Laboratory test

Each plasma sample was tested for hepatitis B surface Antigen (HBsAg) and anti-HCV antibodies using enzyme linked immunosorbent assay (ELISA) kits.

Laboratory testing methods

Laboratory sample for HBV and HCV were analyzed by Human HBsAg and anti-HCV by 3rd generation ELISA. For this study dialab ELISA kit was used which was manufactured by dialab chemical-technologies production and laboratory Instrument Company.

Quality assurance

The questionnaire as component of the training was pre-tested in the study area to see the validity and completeness. The data collectors were regularly monitored to make sure for the reliability of data and for laboratory sample which was analyzed by ELISA, positive and negative controls were used for each reagent lot.

Data entry, storage and management

After ensuring the completeness of the questionnaire the data were checked, were entered into Epi info version 3.5.1 cleaned and after all completed then transported and analyzed by SPSS 16 analysis.

Data analysis

A descriptive statistics were calculated to determine socio-demographic and socio-economic factors for any major differences in the study groups with regard to baseline information. The primary analysis was the outcome of laboratory test result as well as associated risk factors for HBV and HCV on volunteer donors. The differences in proportions of risk factors associated with the prevalence of HBV and HCV were analyzed by the Odd Ratio and 95% confidence interval. Significance levels were chosen at 0.05 levels with a two-tailed test.

Ethical approval

Ethical approvals for the study were obtained from the Addis Ababa university college of health science, school of allied health science department of laboratory sciences. In addition Ethical approvals were also obtained from SNNPR Health Bureau. Written informed consent, risk and benefit of the study were informed for donors, when donors were ready to participate in the study. To prevent the risk of back retrieval of confidential information like names of the donors, during data collection assigned code numbers was given by the investigators. Donors who were positive for HBV and HCV during study period, was counseled and linked to Arba Minch general hospital.

RESULTS

Socio-demographic and socio-economic characteristics

A total of 359 volunteer blood donors were included in this study, from those 179(54.9%) were male and 162(45.1%) were female. Their mean age was 22.57 years with SD 5.35 more than three forth (80.2%) were less than 25 years old while majority, 85.8, 89.4 and 88.6%, were unmarried, urban and had degree and above respectively (Table 1).

Route associated characteristics

From study participants, 253 (70.5%) donated for the first time and 106(29.5%) donated for more than one times. Majority of participants, 353(98.3%) has no history of transfusion while 6 (1.7%) had history of transfusion and rest of route associated factors were presented (Table 2).

Behavioral characteristics of study participants

From 359 study participants, 177(32.6%) had unprotected multiple heterosexual activities while 242(67.4%) had no such behavioral characteristics (Table 3).

ELISA test result

The test result of HBV and HCV infection as indication with positive serological test for HBsAg, anti HCV antibody was 17 (4.7%) and 0(0.0%), respectively (Table 4).

Prevalence of HBV and HCV

Prevalence of HBV among study participant was 4.7% while HCV was not detected. From 17 participants tested positive for HBV, 8 (47%) were males. The test positivity among male was 8/197 (4.1%) while among females 9/162 (5.6%) and more than three forth participants tested positive were age less than 25.

Risk factors associated with HBV and HCV

As presented in previously, the prevalence of HBV was 17 (4.7%) among study participants. Only two variables had statistically significant association during both

Table 1. socio-demographic and socioeconomic characteristics of volunteers in Arbaminch blood bank from March 2015 to April 2015.

Variable		Number	Percentage
Sex	Male	197	54.9
Female	Female	162	45.1
Age	18-20	153	42.6
	20-24	135	37.6
	>25	71	19.8
Marital status	Unmarried	308	85.8
	Married	51	14.2
Residence	Rural	38	10.6
	Urban	321	89.4
Educational status	≤ 12	14	3.9
	TVET diploma	27	7.5
	Degree and above	318	88.6
Occupation	Student	277	77.2
	Employed	58	16.2
	Merchant	14	3.9
	Others	10	2.8
Average monthly income	<580	91	25.3
	581-1,300	203	56.5
	1,301-4,000	46	12.8
	4,001-8,500	19	5.3

Table 2. Route associated characteristics of volunteers' blood donors in Arbaminch blood bank from March 2015 to April 2015.

Variable		Number	Percentage
Donor status	First	253	70.5
	Multiple	106	29.5
History of Transfusion	Yes	6	1.7
	No	353	98.3
Unsafe therapeutic drug injection	Yes	8	2.2
	No	351	97.8
Razor and sharp material sharing	Yes	29	8.1
	No	330	91.9
Exposure to surgical procedure	Yes	107	29.8
	No	252	70.2
Tattoo, body or ear piercing or permanent make-up applied	Yes	172	47.9
	No	187	52.1
Tooth extraction	Yes	56	15.6
	No	303	84.4
Circumcision condition	Yes	210	58.5
	No	149	41.5

bivariate and multivariate analysis. When positivity was compared among study

Table 3. Behavioral characteristics of volunteers' blood donors in Arbaminch blood bank from March 2015 to April 2015.

Variable			Number	Percentage
Unprotected multiple activity	Heterosexual	Yes	117	32.6
		No	242	67.4
Inject able drug user		Yes	6	1.7
		No	353	98.3

Table 4. Serological ELISA test result of volunteers' blood donors in Arbaminch blood bank from March 2015 to April 2015.

Variable	Status	No. (%)
HBsAg	Positive	17(4.7)
	Negative	342(95.3)
Anti HCV	Positive	0(0)
	Negative	359(100)

participants based on average monthly income, participants earning 581 to 1,300 were 27.7% less likely to have infection than participants earning below 580 Birr per month. (OR = 0.277, 95%CI = 0.096-0.805). From volunteer donors, 8(2.2%) were exposed to unsafe therapeutic drug injection and from these 3(37.5%) were positive for HBV. When compared to volunteers who were not exposed, exposed donors were at 14 times increased risk of HBV infection (OR = 14.443, CI = 3.134 -66.562).

The test positivity was slightly higher among female 9(5.6%) than males 8 (4.1%) but this was not statistically significant (OR = 0.720, 95%CI = 0.271-1.909). Regarding age group of study participants which tested positive for HBV, more than three forth of participants tested positive, 13 (76.5%) were age less than 25 but it was also not statistically significant (OR = 2.047, 95%CI = 0.616 - 6.805). Similarly, considering marital status of participants tested positive for HBV, test positivity was slightly higher among unmarried than married (5.9% Vs. 4.5%) but it was also not statistically significant (OR = 0.762, 95%CI = 0.211 - 2.751). About nine tenth (88.2%) of participants tested positive were from urban areas even though test positivity in relation to residence of volunteer donors tested was comparable, test positivity for rural dwellers was 2(5.3%) and urban dwellers was 15(4.7%) (OR = 1.133, 95%CI = 0.249-5.157).

In addition, there is no association between educational status, employment status, frequency of blood donation status, history of transfusion, use of inject able drug use, sharing sharp materials, exposure to surgical operations, having unprotected sex, and traditional tooth extraction. After multivariate analysis, when positivity was compared among study participants grouped based on average monthly income, participants earning 581 to 1,300 were 32.2% less likely to have infection than participants earning below 580 Birr per month (AOR = 0.322, 95%CI = 0.108-0.961). Volunteer donors exposed to unsafe therapeutic drug injection was 8(2.2%); 3(37.5%) was positive for HBV. Comparing volunteers 14(4%) not exposed to unsafe therapeutic drug injection, donors who were exposed had 11 times increased risk of HBV infection. (AOR=11.090, p=2.258-54.475) (Table 5).

DISCUSSION

In this study, prevalence of HBV and HCV among volunteer donors was 4.7 and 0% consecutively. Studies with different percentages has been reported from other areas in Ethiopia like lower prevalence in Bahir Dar (4.11%) (Assefa et al., 2013) and in Jimma (2.1%) (Yami et al., 2011) and Higher HBV prevalence reported from Northwest Ethiopia 25% (Dessie et al., 2007) and Amhara and Tigray Regional states 6.2% (Gelaw and Mengistu, 2007). This may be resulted from Blood bank's strategy to use volunteer donors so that replacement and commercial donations are not included. Both replacement donors (53.6%) and commercial donors (56.6%) have higher percentage compared to volunteer donors (Dessie et al., 2007).

When the finding of this study compare with similar study in other countries, higher study reported from south Dar fur 6.25% (Abou et al., 2009), Tete Mozambique 10.6% (Stokx et al., 2011), kano Nigeria 11.1% (Nwankwo et al., 2012), Ibadan Nigeria 5.9% (Afolabi et al., 2013), Akure Nigeria 7.4% (Shittu et al., 2014), Quảng Trị, Vietnam 11.1% (Viet et al., 2015).

Table 5. Risk factors association with Hepatitis B and C virus on volunteer Blood Donors in Arba Minch blood bank from March 2015 to April 2015.

Variable		No (%)	Pos for HBsAg N (%)	Crude OR	95% CI	Adjusted OR	95% CI
Sex	Male	197(54.9)	9(4.1)	1			
	Female	162(45.1)	8(5.6)	0.72	0.271-1.909		
Age	18-20	153(42.6)	9(5.9)	1			
	20-24	135(37.6)	4(3)	2.05	0.616-6.805		
	25-65	71(19.8)	4(5.6)	1.05	0.311-3.521		
Marital status	Unmarried	308(85.8)	14(5)	1			
	Married	51(14.2)	3(5.9)	0.76	0.211-2.751		
Residence	Rural	38(10.6)	2(5.3)	1			
	Urban	321(89.4)	15(4.7)	1.13	0.249-5.157		
Educational Status	≤ 12	14(3.9)	1(7.1)	1			
	TVET diploma	27(7.5)	1(3.7)	0.50	0.029-8.649		
	Degree & above	318(88.6)	15(4.7)	0.64	0.079-5.250		
Occupation	Student	277(77.2)	13(4.7)	1			
	Employed	58(16.2)	3(5.2)	1.11	0.305-4.018		
	Merchant	14(3.9)	0(0)	0.00			
	Others	10(2.8)	1(10)	2.26	0.266-19.173		
Income	<580	91(25.3)	9(9.8)	1			
	581-1,300	203(56.5)	6(3)	0.27	0.096-0.805	0.322	0.108-0.961
	1,301-4,000	46(12.8)	2(4.3)	0.41	0.086-2.001		
	4,001-8,500	19(5.3)	0(0)	0.00	0.000		
Donor status	First donor	253(70.5)	12(4.7)	1			
	Multiple Donor	106(29.5)	5(4.7)	1.01	0.345-2.929		
History of Transfusion	Yes	6(1.7)	1(16.7)	1			
	No	353(98.3)	16(4.5)	4.21	0.465-38.202		
Inject able drug user	Yes	6(1.7)	1(16.7)	1			
	No	353(98.3)	16(4.5)	4.21	0.465-38.202		
Unsafe therapeutic drug injection	Yes	8(2.2)	3(37.5)	14.44	3.134-66.562	11.090	2.258-54.475
	No	351(97.8)	14(4)	1			
Share razor and sharp materials	Yes	29(8.1)	2(6.9)	1			
	No	330(91.9)	15(4.5)	1.55	0.338-7.161		
Surgical procedure	Yes	107(29.8)	3(2.8)	1			
	No	252(70.2)	14(5.5)	0.49	0.138-1.743		
Circumcision condition	Yes	210(58.5)	3(1.4)	1			
	No	149(41.5)	14(9.4)	1.32	0.47-3.64		
Unsafe multiple heterosexual activity	Yes	117(32.6)	1(0.85)	1			
	No	242(67.4)	16(6.6)	0.95	0.121-7.556		
Tattoo, body or ear piercing or permanent make-up applied	Yes	172(29.8)	7(6.5)	1			

Table 5. cont'd

	No	187(70.2)	10(4.95)	0.75	0.279-2.019
Tooth extraction exposure	Yes	56 (15.6)	2(3.6)	1	
	No	303(84.4)	15(4.9)	0.71	0.16-3.19

Lower finding was also reported from Kathmandu Nepal 0.47% (Shrestha et al., 2009), Babylon Iraq 0.7% (Al-Juboury et al., 2010), Jordan 1.4% (Al-Gani, 2011), Gujarat India 0.68%, (Dhruva et al., 2014). Different geographical location, socio-cultural difference, dominant genotype, sub genotype and mutant existence may be possible factors. But the finding was comparable with study finding of Aden city Yemen 5.1 % (Al-Waleedi and Khader, 2012).

Prevalence of HCV was zero; this may be due to changing of donors' from commercial and replacement donors to only volunteers donors. Compare to this study, other HCV studies reported from Bahir Dar 0.63% (Assefa et al., 2013), Jimma University specialized hospital Blood Bank 0.2% (Yami et al., 2011), and Amhara and Tigray regional state 1.7% (Gelaw and Mengistu, 2007). These differencescould arise as there is a big difference in sampling and sample size usage in the studies.

When the finding of this study compare with similar study in other countries, higher study reported from south Dar Fur 0.65% (Abou et al., 2009), Kano Nigeria 1.8% (Nwankwo et al., 2012), Ibadan Nigeria 1.4% (Afolabi et al., 2013), Akura Nigeria 2.1% (Shittu et al., 2014), Quảng Trị, Vietnam 51.7% (Viet et al., 2015), Kathmandu Nepal 0.64% (Shrestha et al., 2009), Babylon Iraq 0.5% (Al-Juboury et al., 2010), Jordan 0.9% (Al-Gani, 2011),Gujarat India 0.074% (Dhruva et al., 2014), and Aden city Yemen1.3% (Al-Waleedi and Khader, 2012). Genetic diversity, socio-cultural condition may be possible factors. But this finding is incomparable with study in Tete Mozambique 0% (Stokx et al., 2011).

Since in this study HCV infection was 0% and there was no co-infection between HBV and HCV. As the result HCV infection was infrequent in HBsAg positive volunteer donors. This finding was also similar with the study done in Amhara and Tigray Regional state (Gelaw and Mengistu, 2007).

In this study, significant association was found between income status and HBV. Compared among study participants grouped based on average monthly income, participants earning 581 to 1,300 Birr were 32.2% less likely to have infection than participants earning below 580 Birr per month (AOR = 0.322, 95%CI = 0.108-0.961). This may indicate that as income status increase peoples may easily take care from HBV associated factors. This was similar but higher by percentage to the finding in Jimma, Southwest Ethiopia on seroprevalence of HBsAg and its risk factors among pregnant women whose income is <500 Birr/month was 88.9% ($p<0.05$) but in those study rapid chromatographic immunoassay test used for detection of HBsAg (Awole and Gebre-Selassie, 2005).

Another significantly associated factor was use of unsafe therapeutic injection (AOR = 11.09, CI = 2.258-54.475) and the finding was in line with the study done among pregnant women in Bahir Dar City, North west Ethiopia, that showed significant association with unsafe therapeutic injection 15.9% (AOR = 5.65, 95% CI, 1.44-22.19) (Zenebe et al., 2014). There was another agreement that in developing countries, exposures to contaminated therapeutic injection equipment are common in many settings. Contaminated injections caused an estimated 21 million HBV infections worldwide in 2000, accounting for 32% of all new infections (WHO, 2012).

Most factors tested for association with hepatitis infection were not found significant at 95% CI which could be due to homogeneity by age of study participants and this study was limited to investigate associated factors among heterogeneous population.

Conclusion

This study showed that the prevalence of HBV infections confirmed with positive test for HBsAg among volunteers' blood donors in Arbaminch Blood Bank and the prevalence was 4.7%. Low monthly income and using unsafe therapeutic injection were related to HBV infection.

Conflict of Interests

The authors have not declared any conflict of interests.

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