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Awareness and Prevalence of Hepatitis B Infection Among Secondary School Students Blood Donors at Lake Zone Blood Transfusion Services Mwanza, Tanzania

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ABSTRACT

Background: In sub-Saharan Africa, the hepatitis B virus (HBV) continues to be a major public health concern. Students in secondary schools who donate blood are among the vulnerable groups most at risk of contracting HBV. In order to inform targeted actions to slow the spread of the virus and enhance community blood transfusion safety protocols, this research conducted a thorough assessment of students' knowledge levels, awareness of transmission risks, and prevalence of HBV infection.

Objective: To determine the awareness and prevalence of hepatitis B virus infection among secondary school students blood donors at Lake Zone Blood Transfusion Services (LZBTS) Mwanza, Tanzania.

Methods: From May to August 2024, this descriptive, cross-sectional study enrolled a total number of 450 participants who were secondary school students' voluntary donors. Information was gathered through the use of structured survey questions and serological testing for the hepatitis B surface antigen (HBsAg) was done using Atlas Medical Hepatitis B Surface Antigen (Elisa) For in-vitro diagnostic kit. Data analysis involving descriptive statistics to summarize knowledge levels, awareness, and prevalence were entered in Microsoft excel and analyzed by using SPSS version 26.

Results: Out of 450 secondary school students recruited in the study, 30 (6.7%) tested reactive for HBV infection. 395 (87.8%) never heard of hepatitis B infection, 427 (94.9%) were unaware of the symptoms of Hepatitis B and majority of the participants 447 (99.3%) didn't know the transmission of HBV. Majority of the participants in the study were male 330 (73.3%). Among all participants recruited none had hepatitis B vaccine.

Conclusion: Results shows that there is a need for disseminating knowledge to secondary school students regarding HBV. The results support evidence-based tactics meaning to lower the hepatitis B virus's spread and enhance secondary school blood donors' transfusion practices.

Keywords: Elisa kit; vaccine; Hepatitis B Virus; Blood donor; awareness; lake zone Blood Transfusion services.

1.0 INTRODUCTION

1.1 Background

Viral hepatitis constitutes an enormous health burden, and is a major cause of morbidity and mortality globally. The magnitude of the problem can be highlighted by the fact that 1 in 12 people globally are living with chronic infections of either hepatitis B virus (HBV) or hepatitis C virus (HCV). HBV can cause chronic infection, imposing increased long-term health risk to the carriers themselves, and representing a significant reservoir of infection to non-infected person (1)

Hepatitis B has been documented as a global public health problem. Is an infectious illness caused by hepatitis B virus (2) . Is a member of the Hepadnaviridae family, enveloped with double stranded circular DNA. It is the only DNA virus among the agents which commonly cause viral hepatitis. Previously, was called serum hepatitis, post-transfusion hepatitis and inoculation hepatitis. The virus is found in blood and bodily secretions and is commonly spread by sexual contact. Mother to child transmission at birth, through contaminated needles and transfusion are extremely rare (3).

The virus is a major cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma (HCC). The disease is highly endemic in developing nations with large population such as South East Asia, China, Sub-Saharan Africa and the Amazon basin (4), where at least 8.0% of the population were HBV chronic carrier (5).

Safe blood transfusions remain a challenge in resource-limited settings where blood-transmitted diseases are endemic. The transmission risk of hepatitis B virus (HBV) infection depends on the actual disease prevalence rate; where the prevalence is low the transmission risk is estimated at approximately 1:60,000 where HBV infection is endemic, the transmission rate is probably much higher (6). Testing for hepatitis surface antigen (HBsAg) is in place in most low-income countries.

The demand for blood transfusion services in Tanzania is high due to endemicity of infections causing anemia, malnutrition, surgical and obstetrical emergencies associated with blood loss (7). It is evident that HBV and HCV infections are both major global health problems, and they are rapidly spreading in developing countries due to the lack of health education, poverty, illiteracy and lack of hepatitis B vaccination (8). Safety assessment of the blood supply, the quality of screening procedures and the risk of transfusion transmitted infectious diseases (TTIs) in any country can be estimated by reviewing and analyzing records of blood donors for markers of infectious diseases (9). This study is thought to be a helpful tool for understanding the burden and risk factors associated with HBV, HCV and other TTI diseases in the lake zone.

METHODS

Ethical consideration

Ethical clearance was received from the Catholic University of Health and Allied Sciences and BMC joint research committee (ethical clearance number, 3021/2024). Permission to work in the LZBTS was sought from the zonal Manager and Director. Written informed consent were given to Participants before including them in the study.

Study design

This was a cross-sectional study conducted from May 2024 to August 2024 at the LZBTS, Mwanza City, Tanzania. Participants were secondary school voluntary blood donors who donated blood during the study period and consented to participate. Donors were recruited until the estimated minimum sample size of 99 were reached and exceeded to 450; the sample size was estimated using the Kishi Lisle Formula. The study included all Secondary school students who were willing to donate blood and complete the survey questionnaires within the study period but excluded all who did not meet the national guideline for transfusion practices in our country. A well-structured questionnaire with relevant questions regarding age, sex, domicile, marital status, knowledge of HBV infection, and other topics was filled out by qualified participants.

Sample collection

A tourniquet was applied, and the venipuncture site was cleaned with a sterile alcoholic swab before a blood sample was drawn into a plain tube from the arm's medial cubital vein using a sterile syringe. After attaching a unique lab number to the tubes, the samples were separated and centrifuged to extract serum for analysis.

Laboratory procedure

By use of Atlas Medical Hepatitis B Surface Antigen (Elisa) For in-vitro diagnostic kit. This assay is based on the one-step sandwich method. Sample, An- ti-HBs are coated microplate and enzyme-labeled Anti-HBs are combined. During the incubation, HBsAg present in the sample was allowed to react simultaneously with the two antibodies, resulting in the HBsAg being sandwiched between the solid phase and enzyme-linked antibodies. After washing, a complex is generated between the solid phase, the HBsAg within the sample and antibody in enzyme conjugate by immunological reactions. Substrate A and substrate B are then added and catalyzed by this complex, resulting in a chromogenic reaction.

The resulting chromo- genic reaction is measured as absorbance. The color intensity is proportional to the amount of HBsAg in the sample.

The result was valid if the following criteria for the controls are both met:

Negative Control:

Mean negative control is lower than 0.10 O.D.

Positive Control:

Mean positive control is equal to or higher than 0.6 O.D.

Cut-off Value

The cut-off value is 2.1 times the mean of the negative control replicates (in case the mean absorbance of negative control replicates < 0.05, use 0.05 instead of the actual mean)

Example

Negative Control absorbance: well 1 = 0.011, well 2 = 0.009, well 3= 0.013.

Mean Negative Control = (0.011 + 0.009+ 0.013)/3 = 0.011

Cut-off Value =2.1 × 0.05= 0.105.

Interpretation of results

1. Nonreactive

Samples giving an absorbance less than the cut-off value were considered nonreactive.

2. Reactive

Samples giving an absorbance equal to or greater than the cut-off value considered reactive.

Such samples should be retested in duplicate using the original sample source. Samples that are reactive in at least one, re-tests are presumed to contain HBAg and confirmed by confirmatory kit and tests for other HBV markers. Samples that nonreactive in both wells on retest considered nonreactive.

Data management and statistical analysis

Data were transferred to Statistical Package for Social Sciences software version 26 from excel sheet after cross-checking them. Then cleaning will be done. Continuous variables will be analysed using means and medians. Categorical variables will be analysed using proportions. Associations will be analysed using chi square tests, $P < 0.05$ was considered statistically significant.

RESULTS

Social - demographic characteristics of the participants

In a sample size of 450 health blood donors, 330(73.3%) were males and 120(26.7%) were female donors (Table. 1). Donors with age 18 years had the highest frequency of donation, 294 (65.3%) and the lowest frequency was among donors with age of 25 years, 3(0.7%). Among seven secondary schools in which blood donation practices were done, Mahina and Mapango secondary schools had the highest frequency of donation of 20 and 18.7 respectively

Table 1: Social – demographic characteristics

		Frequency	Percent (%)
GENDER	FEMALE	120	26.7
	MALE	330	73.3
	Total	450	100.0
AGE	18	294	65.3
	19	117	26.0
	20	36	8.0
	25	3	0.7
	Total	450	100.0
SCHOOL DISTRIBUTION	IGOGO SEC	36	8.0
	MAHINA SEC	90	20.0
	MAPANGO SEC	84	18.7
	MKUYUNI SEC	30	6.7
	MTONI SEC	75	16.7
	NYAKURU-NDUMA SEC	60	13.3
	OMEGA SEC	75	16.7
	Total	450	100.0

Prevalence of HBV infection among secondary school student blood donors

Out of 450 secondary school students recruited in the study, 30 (6.7%) were tested positive for HBV infection during the study period. Among 330 male 16(4.8%) were positive to HBV while only 14(11.6%) were positive to HBV among 120 female who donated blood. Prevalence on gender variable was statistically significant with a p value of (0.010) calculated by chi square test.

Table 2: Prevalence of HBV

		HEPATITIS B VIRUS STATUS			
		NON-REACTIVE	REACTIVE (%)	Total	p-value
GENDER	FEMALE	106	14(11.6)	120	0.01
	MALE	314	16(4.8)	330	
AGE	18	275	19(6.5)	294	
	19	108	9(7.7)	117	
	20	34	2(5.6)	36	
	25	3	0(0.0)	3	
Total		420	30(6.7)	450	

Awareness of HBV infections among secondary school student blood donors

Majority of participants were unaware of HBV infection with very high frequency of variables which were used to assess awareness. Starting with knowledge on HBV 395(87.8%) were unaware of what HBV meant. Going on with knowledge on the symptoms, 427(94.9%) did not have a clue about the symptoms of HBV. Furthermore, we assess the knowledge on transmission of HBV, 447(99.3%) knew nothing regarding transmission of HBV. And lastly, all the participants were not vaccinated.

Table 3: Awareness of HBV infections

		HEPATITIS B VIRUS STATUS		
		NON-REACTIVE	REACTIVE (%)	Total (%)
KNOWLEDGE ON HBV	NO	371	24(6.1)	395(87.8)
	YES	49	6(10.9)	55(12.2)
	Total	420	30	450
KNOWLEDGE ON SYMPTOMS	NO	398	29(6.8)	427(94.9)
	YES	22	1(4.3)	23(5.1)
	Total	420	30	450
KNOWLEDGE ON TRANSMISSION	NO	417	30(6.7)	447(99.3)
	YES	3	0(0.0)	3(0.7)
	Total	420	30	450
KNOWLEDGE ON VACCINATION	NOT VACCINATED	420	30(6.7%)	450

Risk factor associated with HBV infection.

The only risk factor that was used in this study was statistically significant with the p value of (0.012) calculated using chi square test. Among 385 participant who were not in intimacy relationship 21(5.5%) were reactive and on the other side 9(13.8%) out of 65 who were in intimacy relationship turned to be reactive for HBV infection.

Table 4: Risk factor of HBV

		HEPATITIS B VIRUS			
		NON-REACTIVE	REACTIVE	Total	P value
INTIMACY RELATIONSHIP	NO	364	21	385	0.012
	YES	56	9	65	
Total		420	30	450	

Discussion

The risk of transfusion-transmitted HBV infection can be reduced through screening of blood(10). The study that was done in western zone of Tanzania to assess the seroprevalence of HBV had the general seroprevalence of 6.9% which is almost the same with the prevalence that we obtained (11), this could be due to the same study participants who were voluntary donors. Another study which was done in northern part of Tanzania to assess seroprevalence of HBV infection on health workers had the prevalence of 5.7% (12) . This prevalence seems slightly less comparing to what we obtained despite being on the same setup as ours, this could be due to the study group that was involved. Health workers have knowledge regarding HBV infection comparing to secondary school students. From the national survey study which was done in Nigeria to assess the prevalence of HBV infection, a seroprevalence for HBV was found to be 12.2% which is almost twice the prevalence we obtained. This study in Nigeria covered six geopolitical zones namely north-west, north-central, north-east, south-west, south-east, and south-south regions. Our study only involved one zone, the increase in prevalence for the study in Nigeria might be as a result of huge coverage of participant population. In the study that was done in Morocco among general population and blood donors to assess prevalence and risk factors of HBV it was found that HBV status was statistically significant with gender p value (0.01) in which male had high prevalence comparing to female (13). On contrary, the current study shows that the relationship between gender and HBV status was statistically significant with the same p value has what was done in Morocco but difference in prevalences between gender. Female had high prevalence comparing to men 11.6% by 4.8% despite of the number of men donors be higher than female donors.

Assessing knowledge and practices of hepatitis B among seropositive and seronegative prospective blood donors in a tertiary care hospital in eastern Nigeria was a study that was done in Nigeria (14). In this study, seropositive group had the average knowledge score of 27.3% while in seronegative group, the average knowledge score was 65.7%. This shows us that, the knowledge dissemination regarding HBV is necessary so as to reduce HBV infection among blood donors as the frequency of knowledge among seronegative group seems higher comparing to seropositive group.

In the study which was done by Eltayeib et al in Sudan to assess prevalence and awareness of blood donors regarding HBV infection concluded that about 59% of donors did not know the modes of transmission of HBV infection (15) . 93.5% of donors wanted to know about the results of their screening, this shows us that they had little knowledge regarding HBV that's why they eagerly wanted to know the outcome after screening.

The study that was done at Bauchi in Nigeria to assess prevalence and knowledge of HBV infection among blood donors at Abubakar Tafawa Balewa University Teaching Hospital revealed the prevalence of 18% (16). This prevalence is more than twice higher than what we obtained, the population that was used includes university students and workers who are more exposed to dangerous environment comparing to secondary school students. Risk factors like multiple sex partner, marital status and use of sharp objects were included in this study. On contrary we only use one risk factor depending on our study population being secondary school students. High prevalence of 11% out of 18% was seen among secondary school students and this increase credibility of our study participant population

Limitations of the study

Risk factors are limited due to the study population. Also because of resource constraints, the study only detected the presence of HBsAg as a marker of HBV infection and failed to identify other important indicators, such as anti-HBc and HBeAg.

Conclusion

In the current study, HBV infection has been found prevalent among health blood donors who were secondary school students at Lake Zone blood transfusion services in Mwanza, Tanzania. Gender was found to be statistically significant in which female were more prevalent comparing to males whereby male donated more comparing to women. Of all the four variables that were used to assess awareness and knowledge regarding HBV infection have sum up giving the conclusion that there is very minimal awareness to secondary school students regarding this infection which leads to increase risk in infection among donors. Despite the availability of HBV vaccine, almost all the donors were not vaccinated. The only risk factor that was used in this study concluded to be statistically significant with p value of 0.01.

Recommendations

Due to high seroprevalence and lacking awareness of transfusion-transmissible infection (HBV) among secondary school blood donors at Lake Zone blood bank transfusion services in Mwanza, we do recommend the following;

- The government should add more efforts on increasing awareness about HBV infection, and ways of preventing transmission. Knowledge can be delivered through media, poster and brochures targeting all sectors, but focusing mainly on the young population as they in turn can act as a source of knowledge to their families.
- Blood donors found to be seronegative for HBV, should be advised to receive HBV vaccine and mass vaccination in schools should be encouraged.
- To establish guidelines for in-depth screening for risk factors and individuals before blood donation and introducing of highly sensitive screening assays for the same purpose to reduce risk of disease transmission.
- Furthermore, more and in-depth studies should be done country wide, to deduce more transfusion-transmissible infections, raise awareness among people on preventive, risk factors and to address the importance for safe transfusion medicine practices in the country.

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