



Hepatitis B and C Virus: Current status among health professional students in Mwanza, Tanzania - A cross-sectional study

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Abstract

BACKGROUND

Hepatitis B and C viruses are recognized as major public health concerns, particularly among high-risk groups such as healthcare workers and students in related medical fields. Hepatitis infection can progress to serious liver diseases such as hepatocellular carcinoma and cirrhosis. However, there is a paucity of data on the magnitude of Hepatitis B and C among undergraduate students in clinical years in Mwanza hindering its control interventions. This study aimed to assess the current status of Hepatitis B and C infections and their associated factors among clinical students in Mwanza, Tanzania.

METHODOLOGY

This cross-sectional study involving 300 medical students was conducted between June and August 2023 in Mwanza city. Socio-demographic information and other relevant information of the study participants were collected using a structured pretested data collection tool. About 5 ml of blood for serum analysis was collected from each participant. Detection of HbsAg was by a one-step HbsAg rapid Test kit, and HCV SD Bio line was used for detection of HCV Antibodies finally data analysis was done using STATA version 15 software.

RESULTS

The median age for the study participants was 23 [interquartile range 18-46] years. The prevalence of HBV and HCV in this study was 2.7% (8/300) 95%CI [1.16 -5.19] and 1% (3/300)95%CI [0.21 -2.89], respectively and unprotected sex was significantly associated with HBV positivity with a p-value of 0.004.

CONCLUSION

In this study, we report a low intermediate prevalence of HBsAg (HBV infection) and moderate endemicity of HCV among clinical students in Mwanza, Tanzania. Moreover, unprotected sex was found to be significantly associated with HBV infection, while no factors showed a significant association with HCV infection.

Keywords: Hepatitis B and C, Clinical Students, Mwanza

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Introduction

Viral Hepatitis is a growing global public health concern that significantly impacts liver health leading to a range of complications from acute inflammation to chronic liver diseases, cirrhosis and liver cancer (1). Hepatitis B virus (HBV) and hepatitis C virus (HCV), usually lead to acute and chronic liver infections which are associated with liver cirrhosis or hepatocellular carcinoma if un-intervened (2). Globally; about 350–400 million people are living with chronic hepatitis B (CHB) and 71 million people with hepatitis C (2, 3). In sub-Saharan Africa (SSA) and Asia, around 5–10% are estimated to have Chronic Hepatitis B and 10 million more to have chronic hepatitis C infection (3).

In Tanzania, the overall prevalence of hepatitis B surface antigen (HBsAg) and hepatitis C antibody (anti-HCV) in the general population was reported to be 4.1% and 2.0% respectively (2). A previous study done at Catholic University among health professional students reported a prevalence of HBV surface antigen of 3.1% signifying that there is a need for testing for HBV antibodies (3). Another study among healthcare workers at Bugando Medical Centre documented the prevalence of HBV natural antibodies at 36.5%, indicating high transmission of HBV infections (1). However, there is limited data on the seroprevalence of HBV and HCV among undergraduate clinical students putting them at an increased risk of acquiring hepatitis infection during clinical practices.

Several studies have reported the seroprevalence of HBV and HCV infection among college and university students, for example, studies in Africa reported HBV prevalence ranges of 4.2% to 11% and that HCV prevalence range of 0% to 2% respectively (4-7). This shows that university clinical students are at increased risk of infection due to exposure to body fluids. Furthermore, a study in Ethiopia reported a prevalence of 4.2% for HBV and 0.7% for HCV among medical students where the risk

of exposure to needle prick injuries was high and associated with infection(5). Another study done at Taibah University in the Kingdom of Saudi Arabia among medical students showed a low prevalence of 0.95% for natural Antibodies against HBV (8). This study therefore aimed to determine the prevalence and associated factors of hepatitis B and C infection among clinical students in Mwanza city.

Material and Methods

Study design and study area

A cross-sectional study was carried out between February to July 2023 in Mwanza city. The study was carried out at the Catholic University of Health and Allied Sciences (CUHAS) which enrolls approximately 750 students annually, Tandabui College of Health Sciences, which enrolls about 200 students annually and Mkolani Foundation College of Health Sciences, which enrolls about 35 students annually.

Study population

The study population comprised all medical students in their clinical years at CUHAS-Bugando, Tandabui College of Health Sciences (TIHEST) and Mkolani Foundation College of Health Sciences. However, only students who consented to participate were included in the study.

Sample size estimation

In this study, we used the Taro Yamane formula to calculate the sample size ($n = N / (1 + N * e^2)$) where n is the sample size, N is the study population (985) students and e is the standard error (0.05). The minimum required sample size was 284. However, the study enrolled a total of 300 students, an increase of 5% to account for potential non-response and ensure that enough complete responses were available for robust analysis (9, 10). The distribution of participants among training institutions was determined based on the annual student enrollment at each institution. The intended proportion of

participants from each institution was as follows: CUHAS (261), Tandabui (133) and Mkolani Foundation College (32). However, the actual number of participants enrolled was 127 from CUHAS, 49 from Tandabui, and 24 from Mkolani Foundation College.

Sampling method

The convenience sampling method was used to recruit study participants and a modified self-administered pretested structured data collection tool was used to capture sociodemographic information that is, age, sex, residence, marital status as well as data on knowledge of HBV and HCV infections along with potential risk factors such as needle stick injuries, blood splash, intravenous drug use, intramuscular injections, blood transfusion, organ transplant and history of multiple sex partners. Other factors such as unprotected sex, mouth-to-mouth kissing, manicure/pedicure cuts, scarification and similar exposures were also documented. Each participant was assigned a unique study number for tracking as previously described (3).

Specimen collection

A 5mls of blood was collected from the medial cubital vein using a sterile syringe after applying a tourniquet and cleaning the venipuncture site with a sterile alcohol swab. The sample was transferred into a properly labelled plain tube with a unique laboratory number to ensure accurate identification. The blood was centrifuged at 3000 rpm for 10 minutes to separate its components and obtain the serum. The extracted serum was transferred into cryovial tubes labelled with the participant's study identification number and stored at -20°C in a designated laboratory freezer to maintain sample viability and integrity.

Laboratory procedures

During sample processing, all safety protocols were strictly observed. Serum samples were tested using the One Step HBsAg Rapid

Test (SD Bioline HBsAg WB)(Korea) for detecting hepatitis B surface antigen (HBsAg), with a sensitivity of 99.8% and specificity of 100%. For HCV, the One Step Anti-HCV SD Bioline WB (Korea) was used, with sensitivity and specificity of 99.3% and 98.1%, respectively. All testing procedures and result interpretations followed the manufacturer's instructions with the inclusion of positive controls for HBV and HCV samples ensuring test kit validity and results. Results were independently verified by two experienced senior scientists to ensure accuracy and reliability.

Data management and analysis

Data were entered into Microsoft Excel 2013, cleaned, coded, and analyzed using STATA version 15.0. Categorical data were presented as percentages, continuous data as mean (SD) or median (IQR). Chi-square analysis established associations between HBV and independent variables, with $p < 0.05$ considered statistically significant.

Ethical considerations

The study received ethical clearance from CUHAS-BMC Joint Research Ethics and Review Committee (CREC), clearance reference number No.2505/2023. Participants were informed of the study's importance and written informed consent was obtained before enrollment. Data privacy was maintained and participants tested positive for HBV were referred for further diagnosis and management.

Results

Socio-demographic characteristics and clinical characteristics

The study enrolled 300 participants with a median age of 23 years (IQR: 18-46). Most participants were female (58.3%, $n=175$), single (97.3%, $n=292$), pursuing diploma programs (54.7%, $n=164$), three-quarters were from CUHAS (75.6%, $n=227$), with 43.7% ($n=131$) in their second year and (16.3%, $n=49$) from Mkolani college and (8.0%, $n=24$) (Table 1).



Prevalence of Hepatitis B and C among clinical students

The prevalence of HBV and HCV was 2.7% (8/300) [95% CI 1.16-5.19] and 1% (3/300) [95% CI 0.21-2.89], respectively (Figure 1). The majority of positive cases were from CUHAS followed by TIHEST and Mkolani with 6/227

(2.6%), 2/49 (4.0%) and 0/24 (0.0%), respectively.

Factors associated with Hepatitis B and C positivity among clinical students

Unprotected sex was significantly associated with HBsAg positivity ($p = 0.006$) (Table 2). None of the factors were significantly associated with HCV positivity.

Table 1:

Socio-demographic Characteristics of Study Participants (n=300)

Characteristics	Category	Frequency(n)	Percentage (%)
Sex (N=300)	Female	175	58.3
	Male	125	41.7
Median [IQR] age in years		23 [18-46]	
Marital status	Single	292	97.3
	Married	8	2.7
Level of education	Degree	136	45.0
	Diploma	164	55.0
University	CUHAS	227	75.7
	Mkolani	24	8.0
	TIHEST	49	16.3
Have you heard of HCV?	No	5	1.7
	Yes	295	98.3
Year of Study	1 st and 2 nd Year	150	50.0
	3 rd to 5 th year	150	50.0

Key: CUHAS: Catholic University of Health and Allied Sciences; TIHEST: Tandabui College of Health Sciences; Mkolani: Mkolani Foundation College of Health Sciences

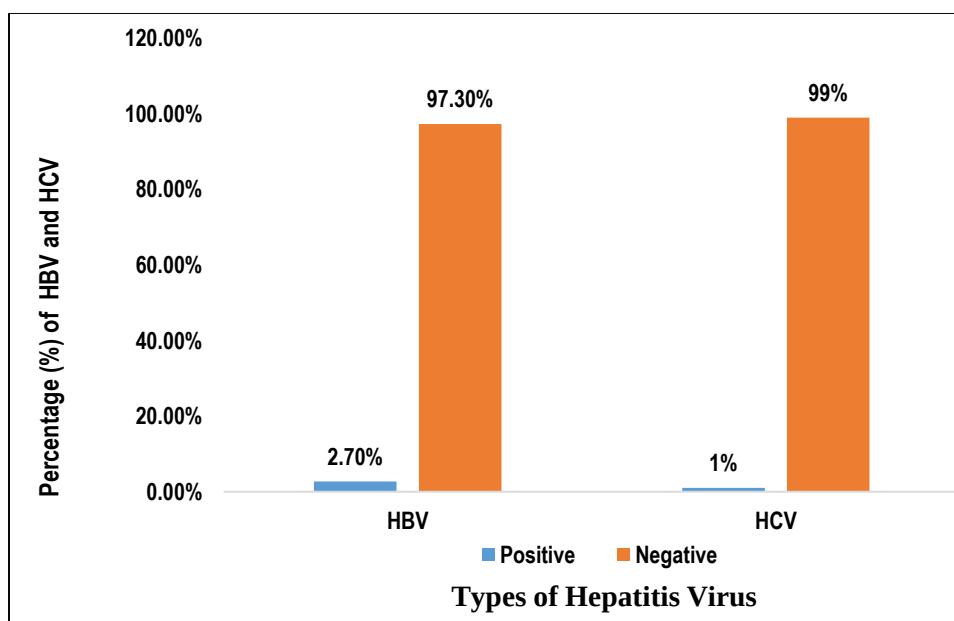


Figure 1:

Prevalence of HBsAg and HCV antibodies among clinical students in Mwanza city

Discussion

Hepatitis B and C virus infections are the foremost global public health concern causing chronic infection putting people at increased risk of death from liver cirrhosis and hepatocellular carcinoma. Clinical students in clinical practices are at increasing risk of HBV and HCV infection, during their training owing to the high rate of accidental exposure to body fluids.

Findings from the present study indicate a prevalence of 2.7% for HBV among clinical medical students, similar to 3.1% from a study that assessed Hepatitis B virus infections among health professional students in Mwanza City, Tanzania(3). However, these proportions are significantly lower compared to the previous findings out of Uganda and Kenya, which reported prevalences of 18% and 11% among medical students, respectively (4, 11).

Table 2:

Factors Associated with HbsAg and HCV Positivity among Clinical Students

Characteristic	Variable	Negative	Positive	Fisher's Exact	P-Value
Sex	Female	172 (98.3)	3 (1.7)	1.4677	0.226
	Male	120 (96.0)	5 (4.0)		
Marital status	Cohabitation	1(100)	0 (0.0)	0.2542	0.881
	Married	8(100)	0 (0)		
	Single	283 (97.3)	8 (2.7)		
Education level	Degree	131 (97.3)	4 (2.7)	0.0830	0.773
	Diploma	161 (97.6)	4 (2.4)		
University/College	CUHAS	221 (97.4)	6 (2.6)	1.0360	0.596
	MKOLANI	24 (100)	0 (0.00)		
	TIHEST	47 (95.9)	2 (4.1)		
Heard of HBV	No	4 (100)	0 (0.00)	0.1111	0.739
	Yes	288 (97.3)	8 (2.7)		
Needle stick injury	No	231 (97.1)	7 (2.9)	0.3343	0.563
	Yes	61 (98.4)	1 (1.6)		
Blood splash	No	238 (97.9)	5 (2.1)	1.8278	0.176
	Yes	54 (94.7)	3 (5.3)		
Intravenous drug use	No	259 (97.0)	8 (3.0)	1.0198	0.313
	Yes	33 (100)	0 (0.00)		
Intramuscular injection	No	228 (97.0)	7 (3.0)	0.4069	0.524
	Yes	64 (98.5)	1 (1.5)		
Blood transfusion	No	263 (97.7)	6 (2.3)	1.9082	0.167
	Yes	29 (93.5)	2 (6.5)		
Never exposed	No	238 (97.1)	7 (2.9)	0.1868	0.666
	Yes	54 (98.2)	1 (1.8)		
Surgery	No	168 (97.1)	5 (2.9)	0.0787	0.779
	Yes	124 (97.6)	3 (2.4)		
Unprotected sex	No	184 (99.5)	1 (0.5)	8.4051	0.004
	Yes	108 (93.9)	7 (6.1)		
Mouth kissing	No	148 (98.7)	2 (1.3)	2.0548	0.152
	Yes	144 (96.0)	6 (4.0)		
Manicure/pedicure	No	226 (97.8)	5 (2.2)	0.9758	0.323
	Yes	66 (95.6)	3 (4.4)		
Scarification	No	262 (97.4)	7 (2.6)	0.0416	0.838
	Yes	30 (96.77)	1 (3.23)		

The decline in the prevalence of HBV among clinical medical students could be attributed to the widespread HBV vaccine coverage across the country (12). Also, the prevalence of hepatitis B surface antigen in the current study is lower compared to a study report from Nigeria 31.5% whereas it is higher than Saudi Arabia 0.41% (13).

The prevalence of HCV among clinical students in this study was 1.0%, this is lower compared to the 6.3% reported in the previous study in Mwanza, Tanzania (2). The difference in these findings may be attributed to differences in the study groups as HIV-positive individuals have an increased risk of acquiring HCV infections compared to HIV-negative individuals (14). The prevalence of 1% HCV in this study is similar to the previous study conducted in Nigeria which reported a prevalence of 0.8%, this could be due to similar diagnostic methods used in both studies (15). Also, the study had a comparable prevalence to a study conducted in Ethiopia (0.7%), this may be due to a similar prevalence of HCV in the general population in Tanzania and Ethiopia (16). These findings indicate that the prevalence of HCV among clinical students in Mwanza urban is moderate endemicity according to WHO criteria (17).

Unprotected sex was the only factor that was statistically associated with HBV positivity among clinical students in this study, these findings are supported by a study conducted in Uganda among university medical students which established having unprotected sex as a risk factor for the acquisition of HBV infections (4, 18). However; this study did not establish any factor associated with the risk of HCV seropositivity among clinical students due low prevalence observed (19). This observation is different from previous studies which found that needle stick injury was found to be the major risk factor associated with Hepatitis B virus infection in clinical students (18-20). Further, a study in

Ghana reported that sharp objects, torn gloves and splashes from body fluids were associated with Hepatitis B and C infection contrary to the findings in our study (21). In this study, the number of participants varied among the three institutions due to differences in the annual student enrollment which directly impacted the number of students in clinical years. However, this variation in participant numbers was not statistically significantly associated with hepatitis positivity.

Study limitations

There was a possibility of recall bias on exposure to risk of infection during clinical practices mostly for final year students. Generalizability of the results from this study may be limited because the study was done in one setting and included only three training institutions which are based in the city of Mwanza.

Conclusion

In this study, we report a low intermediate prevalence of HBsAg (HBV infection) and moderate endemicity of HCV among clinical students in Mwanza, Tanzania. Moreover, unprotected sex was significantly associated with HBV infection and none of the factors were significantly associated with HCV.

Recommendations

We recommend that a thorough screening and implementation of vaccination programs to medical student be emphasized. Health education should be provided to students in clinical years on the route of transmission and prevention of the disease and vaccine performance evaluation should be done in these settings. Lastly, a large sample size from different institutions can provide different image but similar findings.

List of Abbreviations

CUHAS - Catholic University of Health
and Allied Sciences
HBV - Hepatitis B virus



HBcAg -	Hepatitis B core antigen
HBeAg -	Hepatitis B envelope antigen
HBsAg -	Hepatitis B surface antigen
HBsAb -	Hepatitis B surface antibody
DNA -	deoxyribonucleic Acid
Ig -	Immunoglobulin
WHO -	World Health Organization

Author's contribution

Authors in this study played different roles as BM, MJ and MMM developed the idea, BM, MJ, MM, MK, MZ and SO participated in data collection, specimen transportation and laboratory analysis of the samples. BM, MJ and JJ did data interpretation and analysis. BM, MJ, JJ and MMM wrote the first draft of the manuscript. SEM, HN and MMM did a critical review of the manuscript. All authors approved the final version of the manuscript.

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Competing interest: The author declares that there is no competing interest.

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