Original Article

HEPATITIS B AND C: AN ASSESSMENT OF RISK EXPOSURE AND PREVALENCE AMONG PRECLINICAL MEDICAL STUDENTS IN NORTHWESTERN NIGERIA.

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ABSTRACT

Background
The risk of transmission of hepatitis B and C (HBV and HCV) infection is of particular concern among medical students training in high endemic regions. In this study,we investigated the risk and prevalence of hepatitis B and C viruses among preclinical medical students in a government-owned medical school in northwestern Nigeria.
Methods
We employed a cross-sectional studytargeting the whole population of preclinical medical students of Kaduna State University, Kaduna State northwestern Nigeria. Data were collected using**a self-administered, semi-structured questionnaire and** blood testing for HBsAg and HCV antibodies using rapid screening kits.**Data were analyzed using SPSS version 22.**
Results
A total of 133 students participated, and 79.7% of them had a previous risk exposure to injuries by sharps. The seroprevalence for HBV and HCV was 0.8% for both infections. Complete HBV vaccination uptake (3 doses)before enrolment in medical school was 18.8%. The knowledge that HBV infection is preventable was a significant determinant for the previous testing for hepatitis B and C.
Conclusion
Risk exposure to injuries by sharps was high in preclinical students. But their seroprevalence for both hepatitis B and C were low.
Keywords: Hepatitis B and C viruses;prevalence; medical students;sharp injuries

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INTRODUCTION

Hepatitis B and C viruses (HBV and HCV) cause infections that affect the liver. Worldwide HBV is the most common cause of chronic liver disease,including cirrhosis and hepatocellular cancer.[1,2]Globally, there are about 2 billion people infected with HBV and an estimated 360 million with chronic infections. Annually, the disease also accounts for the death of about 1 million people.[3,4] Nigeria is one of the countries in which HBV is highly endemic with an estimated 12% of the population beingchronic carriers, although studies among selected populations report varying prevalence rates.[5,6] HBV is spread between people usually through contact with the blood or other body fluids of infected persons, among other modes of transmission.Healthcare workers and medical students are at risks of infection through occupational exposure to blood and body fluids.[7,8]
HCV remains a large healthcare burden to the world, and it has been estimated to have a worldwide prevalence of about 3% with the virus affecting about 170 million people.[9] The prevalence of HCV infection is greatest in the low-income countries of sub-Saharan Africa and south-east Asia, where about 8-10% of the population are chronic carriers. The disease is transmitted primarily through parenteral exposure (bloodborne).Sexual transmission almost certainly occurs, but its public health importance is not well quantified. HCV-infected persons can remain asymptomatic for many years following initial infection; however, the virus is a major cause of acute hepatitis and chronic liver disease; including cirrhosis, liver cancer and decompensated liver failure.

Medical students are at a high risk of acquiring blood-borne infections including HBV and HCV, as, during the course of their clinical work, they are in direct contact with patients, blood, injections and surgical instruments. They are also at risk ofworkplaceaccidents that occur during the period of their practical training. The lack of professional skillsand experience on the part of the students increases their risk exposure in the course of invasive medical procedures. Previous studies have shown that medical and para-medical studentslack adequate knowledge about hepatitis B and C.[10-13] Other studies showed prevalence ranges of between 4.2 to 12.5% for HBV and 1.5 to 3.6% for HCVand a vaccination rate of 19.2% for hepatitis B amongst medical students.[14-17]Vaccination is the best means

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by which one can arm oneself against hepatitis B infection. The transmission rate is as high as 30% in those who are not immune but rare in those who have been immunized.[18]

Medical students come into contact with patients immediately they commence the clinical phase of**medical** school. It is relevant that sufficient considerationbe given to prevention measures like vaccination and health education. These measures will be most effective if it targets the medical students prior to their first contact with patients.The vaccination against hepatitis B is recommended to minimize the risk of this occupational infection. Although the exposure to the clinical environment of the hospital will increase the risk of exposure to bloodborne viral hepatitis for medical students, the availability of information about their seroprevalence status during the preclinical phase of their training will provide evidence for the appropriate timing for the hepatitis B vaccination. Therefore, the objective of this study was to determine the prevalence and risk exposure of hepatitis B and C virus infections of pre-clinical medical students in a government-owned medical school.

Methods

Study Design

A cross-sectional study was conducted between January-March 2013 among pre-clinical, medical students of Kaduna State University (KASU), Kaduna, Nigeria.

Study Location and Population

Kaduna State University is sited in Kaduna, which is the capital of Kaduna State, located in northwestern Nigeria. The medical school of this universitywas established in 2007 with an initial intake of 46 students in 2009. At the time of conducting the study in 2013, the number of students had grown to 148, distributed acrossthree levels of study. The study population included all registered pre-clinical)medical students of the university.

Sampling Method

A whole population sampling method was used for the study, and all medical (pre-clinical) students of the university who were duly registered at the time of the study and gave informed consent were included in the study. Thus, a total sample population of 133 respondents(representing 89.9% of the student population) participated in the study.

Data collection

A self-administered, semi-structured questionnaire was used to collect information about: 1) Respondents' socio-demographic characteristics including age, gender, year of study in medical school, previous enrolment in other medical school(s)and previous employment as a health worker.2) Previous risk exposure with regard to sharp injuries, including needles.3) Previous testing and outcome for hepatitis B and Hepatitis C.

Before commencement of data collection members of the research team composed of threepublic health physicians and two laboratory scientists were trainedon the questionnaire and its mode of administration. The principal investigator supervised the overall data collection activities.Informed consent was obtained from all medical students that consented, but three students completed the questionnaire but declined to have their blood samples taken for undisclosed reasons. The questionnaire administration and taking of blood samples were done during afternoon breaks on consecutive days until all the students that consented were reached. Blood samples for testing were obtained from participants through a finger prick with a lancet under sterile conditions. Thereafter, laboratory testing for hepatitis B and C viral infections was performed on the samples.

Laboratory Testing:

For the diagnosis of hepatitis B virus and hepatitis C virus infections,finger prick specimens of whole blood were obtained from the participants with a lancet after cleaning the area to be lanced with an alcohol swab.Testing of each participant's whole blood sample for HBsAg and HCV antibodies were done using Micro-point HBsAg and HCV antibodies Gold Rapid Screening kits according to the manufacturer's instruction. Each test kit is a chromatographic immunoassay (CIA) for the direct qualitative detection of HBsAg and HCV antibodies. Similar rapid screening tests were also used in a study to assess the prevalence of hepatitis C in Makurdi, north-central Nigeriaand the prevalence of hepatitis B and C and co-infection with HIV in Malawi.[19,20]

Data Analysis:

The questionnaires were checked for completeness and consistency. Data were entered into data entry templates and analyzed usingStatistical Package for Social Sciences (SPSS), version 23.0 (IBM Corp., New York, USA). Main outcome variable was hepatitis B and hepatitis C serostatus while the independent variables were socio-demographic characteristics and risk factors for hepatitis B and C. Descriptive statistics such as mean and standard deviation were generated for variables including frequencies and percentages for categorical variables. Bivariate analysis was carried out, and the Chi-square (x^2) test was used to test associations between variables. A p-value of less than 0.05 was used as the cut off level for statistical significance.

Ethical Considerations:

The Ethics Research Committee of the Kaduna State Ministry of Health approved the research protocol. Permission was also obtained from the management of the Kaduna State University prior to conducting this study.Written informed consent was obtained from all studentsthat consented to participate. Confidentialitywas assured for all information provided and for the results of the investigations. Subsequently, administration of hepatitis B vaccine to HBV-negative individuals was done. Those who tested positive were linked with the health care system for further management.

Results

A total of 133 preclinical students participated in the study. This consists of 85 (63.9%) males and 48 (36.1%) females. Risk exposure and awareness of the consequences of the same were over 75% among participants (Table 1). Only 30.5% of the respondents were previously tested for HBV, out of which 2 (5.0%) tested positive for HBV. The prevalence of those that previously tested for HCV was 33.6% andthe seropositivityof 4.5% (Table 2). Only one respondent tested positive for each antigen (with a seroprevalence of 0.8% for each antigen) during current testing; the majority of participants (96.2%) tested negative for both HBV and HCV. Almost one-third (29.0%) of the participants had previously been vaccinated against HBV, 65.8% of whom had received 3 doses of the vaccine; while the majority of same (73.7%) had a fairly recent (<5 years) history of HBV vaccination.

Among the evaluated socio-demographic factors, only knowledge that viral hepatitis is preventable is positively associated with the previous testing of both hepatitis Band C (Table 3). Meanwhile, gender, age, year of study in medical school, previous enrolment in medical school or employment as a health worker, and knowledge of hepatitis being preventable of the medical student were not associated with previous vaccination against hepatitis B (Table 4).

Discussion

The health risks associated with patient care are a recognized occupational hazard in medical and paramedical professions globally; as accidental transmissions of infectious diseases have been reported in developing and developed countries.[21]The developing countries are of particular concern because over 90% ofsuchoccupational exposures among health workers occur in this setting.[22] Fundamentally, the risk of these occupational mishaps have been observed to bemore among novices in the profession such as students, interns and other categories of trainess[12].This has been attributed to several factors such as inadequate knowledge, lack of experience and professional expertise, fatigue, stress, anxiety, lack of supervision and tutorial support from older professionals etc.[11-12, 22]

Invasive medical procedures involving the use of sharp instruments particularly with ungloved hands exposes healthcare workers and students to the blood and other body fluids of patients, which may be infectious in nature.[7,23-24,25]These exposures increasethe risk of blood-borne infectionslike hepatitis B and C viruses.[26]Our study finding indicates ahigh prevalence of previous risk exposure due to injury by sharps among pre-clinical medical students. This is plausible considering the common use of sharp objects for personal (shaving, barbing and nail cutting), domestic and occupational purposes as well as cultural practices like scarification marks in the study setting. However, our result contrasts with lower prevalenceas reported in otherstudies conducted among medical students as well as students and interns of other paramedical and health-related professions in developingcountries, including Nigeria.[28-31] A much lower prevalence has been in the same category of students indeveloped nations.[32,33]Generally, developing countries have prevalence level similar to the global prevalence of needle stick injuries among medical students, which is lower than our finding.[34] Nevertheless, exceptionallyhigher prevalence has been reportedin some developing nations.[22,35]

It is remarkable that only a negligible number of the participants of this study had either been enrolled in a medical school or served as health workers in the past.Hence, the high prevalence of previous exposure to injury by sharps obtained in this study is rather alarming for preclinical students because most needle stick injuries have been documented to occur during clinical training.[36]Further investigation will be required to assess the risk exposure to sharp injuries in pre-clinical years, particularly during anatomy dissection session or Physiology practical classes. This will provide evidence about the suitability of instituting pre-exposure prophylactic vaccination for medical studentsat the onset of medical school rather than wait untilthe beginning of clinical training.[30]

The knowledge of the potential dangers and risks posed by such injuries by sharps, including needles for infection with hepatitis B and C was high among our study participants. This finding compares with studies among medical students in other parts of Nigeria.[28],[17]On the contrary, there are studies that showed limited or inadequate knowledge regarding sharps injuries among medical and dental students in Scotland and India.[32,37]Precisely, a lack of awareness among medical students entering into the profession and a significant difference between knowledge of pre-clinical and clinical students has been observed.[11,13]In spite of this relatively good level of awareness among the cited Nigerian studies,the continuous teaching and training of medical students on the risks and hazards associated with injuries with sharps. Additionally, the measures to be taken to avert them as well as manage them in the event of their occurrence should be encouraged as the mainstay of prevention of occupationally-acquired infections.

An estimated hepatitis B seroprevalence of one-tenth the adult population has been reported for sub-Saharan Africa, including Nigeria.[27]Thus, the laboratory testing to ascertain the hepatitis B and Cstatus of individuals is key to prevention and control of viral hepatitis. In this study, only one-third of the participants had previously been tested for both hepatitis B and C. This low proportionof those that hadpreviously tested for hepatitis B and C among the participants may be a reflection of the poor practice of routine or voluntary medical examinations in developing countries.[38]Our finding corroborates other Nigerian studies for low previous testing of hepatitis B and C even though a higher proportion had been screened for HIV at least once.[39]

The voluntary submission to routine medical examinations is uncommon among Nigerians as well as

nationals of many other developing nations. In this study, the knowledge that hepatitis B is a preventable disease was significantly associated withthe previous testing for hepatitis B and C. Contrary to expectation the of proportion those that had previously tested for hepatitis C were more than for hepatitis B. Generally,there is a higher level of awareness and knowledge in the larger population, of HBV infection as a disease entity, as compared to HCV.[40] Likewise, the World Health Organization reports that prevalence data and studies on HBV abound as compared with HCV, which has a relative paucity of information in circulation; and therefore, a lower level of awareness and understanding in the general population.[9] Furthermore; this situation is also reported to have engendered some confusion between HBV and HCV within certain populations.[41] This might have contributed to the resultant outcome reflected in this study.

Majority of ourstudy participants had a negative outcome for current testing, with only a participant that tested positive for either hepatitis B or C.It is documented that with a seroprevalence of over 10% reported from various studies and surveys,Nigeria is classified as a high endemic region.[5,6,42,43] The seroprevalence for HBV obtained in this studyis extremely lower than that reported by various authors working among undergraduate students in different parts of Nigeria.[15,44-47]The low seroprevalence we found may be due to the fact that the entire study population are pre-clinical students, who are yet to commence direct interactions with patients or the clinical environment with its attendant risks.

Pre and immediate post-exposure prophylactic vaccination with hepatitis B vaccine are globally recognized and advocated measures for the prevention and control of HBV infection.In this study, only about one-third of the participants had previously been vaccinated against HBV, and only 66% of them had received the recommended 3 doses of the vaccine.[48] The observed inadequateor sub-optimalvaccination is comparable with studies among medical students in Nigeria and other parts of sub-Saharan Africa[17,30,28,49]These sampled studiesreported values lower thanamong medical students and personnelindeveloped countries.[7,8] In the United States, for instance, the Centre for Disease Control and Prevention (CDC) has since set a goal of achieving 98% hepatitis B vaccination coverage among health workers, with the intention of eliminating occupationally-acquired HBV infection in that country.[50]Therefore, the goal of forestalling the huge morbidity and mortality consequences on human resource for health should be enhanced by advocacy for pre-exposure vaccination and instituted as mandatory for all medical students and personnel.

Finally,the majority of our participants had recent (1-4 years) history of HBV vaccination,which corresponded with the period of their admission to medical school. Whether this is merely a coincidence or an initiative taken up by these respondents as a prophylactic measure, in view of their enrollment into medical school was not further explored becauseof its non-inclusion in the scope of this study. Personal motivation could explain this behaviour, but none of the socio-demographic factors was found to significantly determine previous vaccination against HBV. The knowledge that HBV is preventable was positively associated withprevious testing for the disease and not for vaccination. Thismight suggest other barriersto HBV vaccine uptake among medical students. These factors includelimited or no opportunity, lack of time (busy or tight schedule), financial constraints (out-of-pocket expenses either for the vaccine or the consumables used, or both), information gaps (such as not aware a vaccine exists, fears and concerns regarding possible vaccine side effects etc.), indifference and procrastination.[28,30] As valid and genuine as some of these factors might be, all efforts need to be put in place to ensure higher HBV vaccine uptakes for medical students and health care workers in moderate to high endemic areas.

Conclusion

The risk exposure to injuries by sharps, including needlestick,was observed to behigh among preclinical students. Fortunately, the seroprevalences recorded for both hepatitis B and C were low. However, the low hepatitis B vaccine uptake in the context ofa high endemic adult population constitutes a major public health problem. Consequently, we recommend regular training on universal precaution and hepatitis B vaccination early in medical training.

Table 1: Previous exposure and testing for hepatitis B and C viruses among preclinical medical students

Variable	Frequency (%)
Previous needle or sharp injury	106 (80.9)
Aware of the consequences of sharp injuries	102 (77.9)
Previously tested for hepatitis B	40 (30.5)
Previously tested positive for hepatitis B	2 (5.0)
Previously tested for hepatitis C	44 (33.6)
Previously tested positive for hepatitis C	2 (4.5)
Tested positive for only HBV in current testing*	1 (0.8)
Tested positive for only HCV in current testing	1 (0.8)
Tested positive for both HBV and HCV in current test	0

*Declined consent for current testing=3 (2.3%); Some variables have missing records

Table 2. Prevalence of previous vaccination against hepatitis B virus among preclinical medical students

Variable	Frequency (%)
Previously vaccinated (n=131)	
Yes	38 (29.0)
Number of Doses Given (n=38)	
1	4 (10.5)
2	9 (23.7)
3	25 (65.8)
Time interval since previous vaccination in years (n = 38)	
1-2	8 (21.1)
3-4	20 (52.6)
≥5	10 (26.3)

Some variables have missing records

Table 3: Association between socio-demographic characteristics and previous testing for hepatitis B and C viruses among preclinical medical students

Characteristic (n=131)	Previous testing for hepatitis B		P-value	Previous testing for hepatitis C		P-value
	Yes (n=40)	No (n=91)		Yes (n=44)	No (n=87)	
Gender						
Female	14 (35.0)	31 (34.1)	1.000	11 (25.0)	34 (39.1)	0.123
Male	26 (65.0)	60 (65.9)		33 (75.0)	53 (60.9)	
Age in years						
<20	8 (20.0)	18 (20.0)	0.165	10 (22.7)	16 (18.6)	0.211
20-24	23 (57.5)	63 (70.0)		25 (56.8)	61 (70.9)	
≥25	9 (22.5)	9 (10.0)		9 (20.5)	9 (10.5)	
Year of study in medical school						
1st	7 (17.5)	20 (26.4)	0.341	11 (25.0)	20 (23.0)	0.499
2nd	13 (32.5)	22 (24.2)		15 (34.1)	20 (23.0)	
3rd	15 (37.5)	26 (28.6)		11 (25.0)	30 (34.5)	
4th	5 (12.5)	19 (20.9)		7 (15.9)	17 (19.5)	
Ever been previously enrolled in a medical school						
Yes	3 (7.5)	3 (3.3)	0.262*	3 (6.8)	3 (3.4)	0.322*
Previous employment as health worker						
Yes	2 (5.0)	3 (3.3)	0.485*	2 (4.5)	3 (3.4)	0.547*
Knowledge of hepatitis B is preventable						
Yes	36 (90.0)	33 (36.3)	0.003*	40 (11.8)	54 (62.1)	<0.05*

***Fischer's exact test;** Some variables have missing records

Table 4: Association between socio-demographic characteristics and previous vaccination against Hepatitis B among preclinical medical students

Characteristic (n=133)	Previous vaccination against Hepatitis B		P-value
	Yes (n=38)	No (n=93)	
Gender			
Female	12 (31.6)	33 (35.5)	0.669
Male	26 (68.4)	60 (64.5)	
Age in years			
<20	8 (21.1)	18 (19.6)	0.093
20-24	21 (55.3)	65 (70.7)	
≥25	9 (23.7)	9 (9.8)	
Year of study in medical school			
1st	6 (15.8)	25 (26.9)	0.280*
2nd	13 (34.2)	22 (23.7)	
3rd	14 (36.8)	27 (29.0)	
4th	5 (13.2)	19 (20.4)	
Ever enrolled in medical school			
Yes	3 (7.9)	3 (3.2)	0.246*
Previous employment as health worker			
Yes	2 (5.3)	3 (3.2)	0.581
Knowledge of hepatitis B is preventable			
Yes	33 (86.8)	61 (65.6)	0.014*

*Fischer's exact test; Some variables have missing records

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