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Original Article

Seroprevalence of Hepatitis Virus Antibodies in Newly Admitted Students of Sylhet MAG Osmani Medical College

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Abstract

Blood samples from randomly selected 100 newly admitted first year MBBS students of Sylhet MAG Osmani Medical College were tested to find the seroprevalence of antibodies against Hepatitis A, Hepatitis B, Hepatitis C and Hepatitis E viruses. The study revealed a lower seroprevalence of HAV antibodies than the common perception of their age group. The rate of vaccination against hepatitis B virus was found not very high, considering the affluence of their parents. Also there were lack of awareness about risk factors of viral hepatitis and many of the students were in habit of taking food outside. Institutionalized vaccination policy for 1st year medical students against Hepatitis A and Hepatitis B along with awareness building measures regarding the professional risk among the new entrants are suggested. Policy planners and other stakeholders in the field should come up with a comprehensive intervention strategy to protect the future caregivers from the scourge of hepatitis viruses.

Keywords: Hepatitis A, Hepatitis B, Hepatitis C, Hepatitis E, Seroprevalence

Introduction

Viral hepatitis is a public health problem in most developing countries, including Bangladesh, due to the poor hygienic and sanitary conditions, illiteracy and poverty. Though clinically described for many years, elucidation of multiviral causation of hepatitis and their distinctive epidemiologic features along with the isolation and biochemical characterization of viruses have occurred only in the last five decades.[1] Most of the viral hepatitis cases are caused by one of the four agents, hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV) and hepatitis E virus (HEV). Among them, HBV and HCV are transmitted parenterally, mainly through contaminated blood or other body fluids, mostly running a chronic course. Whereas HAV and HEV are enterically transmitted through unhygienic food and drinks, usually not leading to chronicity.[2]

Hepatitis A virus infection is often asymptomatic or present with mild, non-specific symptoms in young children, may lead to severe form of morbidity in the adults.[3] In countries with poor hygiene and sanitation, infection with HAV peak at early age, usually less than five years and majority of the population become seropositive by the time they reach adulthood.[4] Hepatitis B virus imposes substantial global disease burden due to high morbidity and mortality with 15-40% patients developing cirrhosis, liver failure, or hepatocellular carcinoma and culminating up to 1.2 million deaths annually.[5] The expression of Hepatitis C infection is

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usually milder than HBV, although 70-90% progress to chronic liver disease, 20-50% develop cirrhosis and 5-25% are at high risk for hepatocellular carcinoma.[2] Healthcare workers, particularly surgeons, microbiologists, pathologists, dentists, physicians and nursing staff, working in haemodialysis and oncology units, are at a higher risk of contracting HBV and HCV infections via minor skin cuts and accidental needle punctures during handling of infected patients and their body fluids.[6] The HEV has been reported to cause a substantial burden of sporadic and epidemic disease in Bangladesh, resulting in serious morbidity and mortality, especially among pregnant women.[7]

In a developing country like Bangladesh, enterically transmitted clinical or subclinical infection by hepatitis viruses is common due to underdeveloped sanitation and food hygiene.[8] Medical professionals are relatively more exposed to these viruses as they handle potentially infectious hepatitis patients and body fluids as part of their patient management activities. On many occasions, they take foods in substandard restaurants outside the hospital premises that are also shared by the patients and their attendants.[9] Majority of the HAV infections during the childhood are subclinical. Most of the newly admitted medical students live in the urban areas with their families before admission into the Medical Colleges. They had less chance of exposure to HAV during their childhood and adolescence due to restricted lifestyle imposed by the family and so are less likely to develop immunity against HAV through clinical or subclinical infections.[10]

Acute viral hepatitis causes significant morbidity in young adult group of people, leading to loss of valuable working hours. The outcome of chronic hepatitis infections often become more fatal like cirrhosis and hepatocellular carcinoma. Effective vaccines are available against hepatitis A and B viruses.[2] Many medical institutions in developed countries adopted policy of screening for hepatitis B, C and other bloodborne viruses before admission into their institutions, followed by mandatory vaccination against hepatitis B virus.[11] In 1994, committee of Vice Chancellors and Principals of medical colleges in the UK agreed to follow guidelines for admission of medical students recommending that, "successful applicants to Medical Schools must have proof of non-infectivity and immunization against Hepatitis B by the time of registration", and "students infectious for Hepatitis B should be excluded from clinical course."[12]

Newly admitted medical students entering the high-risk group of medical community may encounter infections by HAVs before acquiring knowledge about safe-guarding themselves against hepatitis viruses. Hepatitis B is the most important infectious occupational hazard for medical and dental students. The risk of being infected is proportionate to the deterrent measures practiced, prevalence of virus carriers in the population, the frequency of exposure to blood and other body fluids and the high contagiousness of HBV. The infected students or care givers may not only suffer incalculable harm, but may also act as potential sources of infection to patients handled by him.[11] Many hospitals providing standard medical care has policy of not allowing HBV- and HCV-positive caregivers in critical areas of medicare.

The present study on first-year medical students was conducted to explore the immune status against hepatitis viruses at the very start of their medical career. It was considered that such studies conducted among the well-defined population of medical entry students would generate necessary baseline data to evaluate the necessity of vaccination against hepatitis A and B among them. This study was, therefore, aimed to see the seroprevalence of antibodies against common hepatitis viruses among newly admitted medical students of Sylhet MAG Osmani Medical College, for the evaluation of the necessity of pre-admission screening and mandatory vaccination of students against hepatitis A and B viruses.

Methods

It was a cross-sectional study carried out in the department of Microbiology, Sylhet MAG Osmani Medical College in March, 2007. Out of 210 newly admitted first-year MBBS students of this medical college, 100 (53 male and 47 female) were randomly included in this study.

Detailed history of the students' socioeconomic background including occupation of the parents, previous residence in either rural or urban area, previous hostel stay, source of drinking water, sewage system of the residents, food habit etc. were recorded. History of jaundice of the subjects and their family members, vaccination history and other risk factors of viral hepatitis were also recorded in pre-designed data collection sheets.

Approximately 3 ml of venous blood was collected from each participant. After separation by centrifugation, serum was stored in the laboratory at -20°C until detection of HBsAg and IgG antibodies against 4 hepatitis viruses by Enzyme linked Immunosorbent Assay (ELISA). Kits used for HBsAg and anti-HCV detection were manufactured by Immune Diagnostic System (IDS), USA, Anti-HAV and anti-HBs were measured using kits manufactured by Adaltis Italia (SPA), Italy, and anti-HEV were estimated using kits from Medical Biological Services (MBS), Italy. All the tests were qualitative except anti-HBs, where quantitative estimation of antibody titre was done. Antibody titre of <10 IU/ml was considered negative or having no protective immunity and >10 IU/ml was considered positive or protective immunity, which were further subdivided into 10-100 IU/ml as low protective immunity and >100 IU/ml as high protective immunity.

Results

Age of the participating first-year medical students were 17-21 years (mean± SD=18.84± 0.77). Sociodemographic picture of these students showed that most of them (95, 95%) were from high- and middle-class background. The occupation of the parents showed that majority of their fathers were service holders and mothers were housewives. Almost all (96, 96%) were from urban area using safe drinking water and good hygienic practice. A few (5, 5%) students had previously stayed in hostels. Most of the students (93, 93%) were unaware of risks of viral hepatitis and their routes of transmission.

Majority (74, 74%) of the students had the habit of taking food from outside restaurants. Among them, 44 (44%) gave history of taking food outside daily and other 56 (56%) had a frequency of less than or equal to 2/3 times per week. Some 16 (16%) of the students had history of jaundice before. Although most of them could not specify the causative agent, on detailed history, all of them seemed to be infected previously. Many (37, 37%) of the students had a positive family history of jaundice, those also most likely to be infective. Only one student was found HBsAg-positive at the time of admission. However, he was asymptomatic and followed up for one year, in the mean time he was found to develop anti-HBs antibody.

Majority (85, 85%) of the students received EPI (Expanded Program on Immunization) vaccines, 33 (33%) were vaccinated against hepatitis B virus and only 1 of the students received Measles, Mumps and Rubella (MMR) vaccine. No student was found vaccinated against HAV. Among the 33 vaccinated students, 19 (57.6%) were female and 14 (42.2%) were male.

A total of 78 (78%) among the enrolled students were seropositive for anti-HAV. Of the anti-HAV-positive students, 43 (55.1%) were male and 35 (44.9%) were female. A total of 40 (40%) students were seropositive for anti-HBs, of which 16 (40%) had low protective immunity and the rest 24 (60%) had high protective immunity. Only 6 (6%) were seropositive for anti-HEV, of which 2 (33.3%) were male and 35 (66.7%) were female. No one was seropositive for anti-HCV, whereas 22% of the students were seropositive for both anti-HAV and anti-HBs, and 5% were positive for 3 antibodies (anti-HAV, anti-HBs and anti-HEV). (Table I)

Table I: Sex distribution and seroprevalence against hepatitis viruses

Antibodies	Seroprevalence	Male n (%)	Female n (%)	Total n (%)
Anti-HAV	Seropositive	43 (55.1)	35 (44.9)	78 (100)
	Seronegative	10 (45.5)	12 (54.5)	22 (100)
Anti-HBs	No Protective Immunity	32 (53.3)	28 (46.7)	60 (100)
	Low Protective Immunity	10 (62.5)	6 (37.5)	16 (100)
	High Protective Immunity	11 (45.8)	13 (54.2)	24 (100)
Anti-HCV	Seropositive	0 (0)	0 (0)	0 (0)
	Seronegative	53 (53)	47 (47)	100 (100)
Anti-HEV	Seropositive	2 (33.3)	4 (66.7)	6 (100)
	Seronegative	51 (54.3)	43 (45.7)	94 (100)

Among the students having previous history of jaundice, 16 were anti-HAV seropositive, 6 (37.5%) were seropositive for HBV and only 3 (18.8%) for anti-HEV. The difference was statistically significant ($p< 0.01$). Out of 37 students with positive family history of jaundice, 26 (70.3%) were found anti-HAV seropositive, 16 (43.2%) were seropositive for anti-HBs and 2 (5%) were seropositive for anti-HEV. (Table II)

Table II: Relationship of hepatitis antibody seroprevalence with previous history of jaundice among the students and their family members

Seropositivity	Previous H/O Jaundice		Family History of Jaundice	
	Yes n (%)	No (%)	Yes n (%)	No (%)
Anti HAV				
Positive	16 (100%)	62 (73.8)	26 (70.3)	52 (82.5)
Negative	0 (0)	22 (26.2.)	11 (29.7)	11 (17.5)
Anti-HBs				
No immunity	10 (62.5)	50 (59.5)	21 (56.8)	39 (61.9)
Low Immunity	2 (12.5)	14 (16.7)	8 (21.6)	8 (12.7)
High Immunity	4 (25)	20 (23.8)	8 (21.6)	16 (25.4)
Anti HEV				
Positive	3 (18.8)	3 (3.6)	2 (5.4)	4 (6.3)
Negative	13 (81.2)	81 (96.4)	35 (94.6)	59 (93.7)

Considering the relationship of food habit among the students showing seropositivity for anti-HAV and anti-HEV, it was found that majority (77%) were anti-HAV-positive, whereas majority (81.2%) were anti-HEV-negative. (Table III)

Table III: Relationship of anti HAV and anti HEV seropositivity with the habit and frequency of taking food outside

	Anti-HAV		Anti-HEV	
	Positive n (%)	Negative n (%)	Positive n (%)	Negative n (%)
Habit of taking Food outside				
Yes	57 (77)	17 (23)	4 (5.4)	70 (94.6)
No	21 (80.8)	5 (19.2)	2 (7.7)	24 (92.3)
Frequency of Meals Outside (Per Week)				
1	17 (70.8)	7 (29.2)	0 (0)	24 (100)
2	7 (58.3)	5 (41.7)	1 (8.3)	11 (91.7)
3	4 (100)	0 (0)	0 (0)	4 (100)
4	1 (50)	1 (50)	0 (0)	2 (100)
7	24 (85.7)	4 (14.3)	2 (7.1)	26 (92.9)
14	4 (100)	0 (0)	1 (25)	3 (75)

Among the 33 students who received hepatitis B vaccine, 27 (81.8%) had acquired protective level of immunity and 6 (18%) had not. Out of these 27 seropositive students with protective immunity, 18 (66.7%) had high titre (>100 IU/ml) of antibody, rest 9 (33.3%) had antibody titre 10-100 IU/ml. Among the 67 non vaccinated students, 13 (19.4%) had protective level of immunity. (Table IV)

Table IV: Relationship of anti-HBs seropositivity with vaccination against HBV

Protective Level of anti-HBs	Number (%) of students regarding vaccination against Hepatitis B virus	
	Received	Not received
No Protective Immunity	6 (18.2)	54 (80.6)
Low Protective Immunity	9 (27.3)	7 (10.4)
High Protective Immunity	18 (54.5)	6 (9)
Total	33 (100)	67 (100)

No statistically significant difference was observed in the seroprevalence of these antibodies due to parental occupation, socioeconomic background, family residence or sanitation. Students drinking chlorinated water of municipal supply showed increased seropositivity of hepatitis A antibody. All of the five students with history of previous hostel stay were anti-HAV seropositive and only one of them were vaccinated against HBV and found with high protective immunity

Discussion

This study on seroprevalence of hepatitis antibodies among first-year medical students in Sylhet MAG Osmani Medical College revealed seropositivity for anti-HAV, anti-HBs and anti-HEV were 78%, 40% and 6% respectively. Of the 40 anti-HBs seropositive students, 24 (60%) had high protective immunity and rest 16 (40%) had low protective immunity for Hepatitis B virus (HBV). There was no significant difference of seropositivity in both sexes, except slight higher percentage of anti-HBs in females which could be the effect of higher percentage of vaccination among female students.

In Bangladesh, two previous studies on the seroprevalence of Hepatitis A Virus (HAV) showed increasing HAV antibody positivity with age, reaching 98% in young adults of 16-20 years age group.[8,15] The present study showed much lower seropositivity among first-year medical students than similar age group of the studies probably because of the differences between socioeconomic background. Findings of the present

study were similar with a study carried out among medical students in All India Institute of Medical Science (AIIMS), New Delhi in 2002.[9]

The present study population were selected from a group of students most of whom previously stayed in a protected upper middle class or middle class family environment with their parents. When they came to reside in hostels, away from the family dwellings, they had to share common toilet, common dining with all other inmates. Drinking water was also from a common source. Within a few months, they develop the habit of visiting nearby restaurants in a desperate bid to avoid the monotonous dining room recipe. The condition of the kitchen and dining of the medical college hostels were also not much better than outside restaurants. The people working in kitchens and maid-servants involved in cooking and serving process were not practicing proper hygiene. All these factors increased the risk of enterically transmitted organisms including HAV and HEV. Many other studies showed that healthcare workers are at an increased risk of developing HAV infection,[9,10,16] showing increasing rate of seropositivity with increased duration of work at hospital. The present study showed that students frequently taking food outside are more susceptible to become infected with HAV, which is concordant with other study findings.[17] This observation is supported by seroepidemiological studies indicating a decline in the seroprevalence of HAV infection in communities achieving higher socioeconomic standard.[18-20] This study revealed that more than 20 percent of the newly admitted medical students were seronegative for HAV antibody and vulnerable to HAV infection. Considering this changing epidemiological scenario of HAV infection, need for selective vaccination of high risk group like medical students and nurses after screening should be evaluated.

Medical students are susceptible to HBV infection during their exposure to clinical cases and different procedures. Hence, medical students were advised to have vaccination against HBV before coming to clinical side.[21] Study findings in the neighbouring India, Pakistan and Sri Lanka also showed a similar trend of HBV seroprevalence.[22] A study from New Delhi in 1997 revealed that only 2.3% pre-clinical students were positive for HBsAg, and 18% and 10.4% for anti-HBs and anti-HBc respectively.[23] A study from Sri Lanka investigated the presence of HBV and Hepatitis C virus (HCV) markers in new entrant medical students and found all of them negative for HBsAg or anti-HCV and less than 1% were positive for anti-HBs.[24] Vaccination rates against HBV as disclosed in the present study was much higher in comparison to them, who showed no students had prior vaccination. But with a similar study in Lahore, Pakistan researchers showed that 42% of the students were vaccinated.[25] Another study from Mumbai in 2002 highlighted the lack of awareness about HBV infection and transmission, with 26.3% vaccination rates among medical students which was concordant with the findings of the present study.[26]

None of the students were seropositive for HCV. Seroprevalence of Hepatitis E virus (HEV) antibody was also low. So, majority of the students remained vulnerable to HCV and HEV for both of which there are no effective vaccine emphasizing the need for a comprehensive policy to address other preventive measures.

Although all of the students were born in and around 1990, more than a decade after introduction EPI programme in Bangladesh, 15% of them did not receive EPI vaccines, demonstrating motivational weaknesses in vaccination campaign. Also, 33% vaccination against Hepatitis B, only 1% found to receive MMR vaccine and no one received Hepatitis A vaccine is very low considering the socioeconomic status and affluence of their family. These data would be interesting to interpret in context of the overall situation and public attitude about vaccination in the country.

Medical students get exposed to hepatitis viruses during their study in the college and the risk increases when they start their professional career. Besides significant morbidity, and often fatal consequences, infection by these viruses increases the risk of transmission of these diseases to the patients during their close professional interactions. Steps should be taken to protect these future healthcare providers from these dangerous viruses, as well as the patients from being unwittingly infected through them. Early initiatives should be taken to educate these students about the risks and hazards of these viral infections including modes of transmission and preventive measures. Policy planners and other stakeholders in the field should take cognizance of the emerged facts to formulate future directions. There is an urgent need for formulation of a policy about mandatory vaccinations against HBV at the time of entry into a medical institution. The present study revealed that almost one fourth of the new entrants in a medical college were not immune to HAV infection. Vaccination against HAV after pre-vaccination immunity screening should also be considered. Similar studies in other medical institutes across the country will be more enlightening.

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[Conflict of Interest: none declared]