

Seroprevalence of hepatitis B and C among secondary school children in a rural population of Bangladesh

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ABSTRACT

Background: In the past, Hepatitis B virus (HBV) was a menace to mankind and was considered a serious global health burden. WHO reported that, HBV resulted in an estimated 1.1 million deaths in 2022, mostly from cirrhosis and hepatocellular carcinoma, it could have been prevented by vaccines that are safe, available and effective. Despite the availability of vaccine, 61 million people are reported to be infected in the South-East Asia Region. Many studies have been conducted in Bangladesh but these focused on risk groups such as blood donors, Rohingya migrants, health professionals. The aim of this study was to determine the prevalence of hepatitis B and C virus infection among the secondary school children of rural Bangladesh.

Methods: This was a cross-sectional study and was conducted from May and June 2024. Three secondary schools of two upazilas were purposively selected, one girl and two boys. All participants were selected randomly from six to ten classes. The participants were tested for hepatitis B virus surface antigen (HBsAg) and anti-HCV using enzyme-linked immunosorbent assay (ELISA). The investigations included height, weight, waist and hip girth, body mass index (BMI), waist-to-hip ratio and waist-to-height ratio, as well as blood pressure (BP), fasting blood glucose (FBG) and serum glutamic-pyruvic transaminase (SGPT).

Results: Two hundred and fifty students (boys / girls = 165 / 85) participated in three secondary schools. The biophysical characteristics were assessed (mean \pm SD, 95% CI) and found that the boys had significantly higher general obesity (BMI $P < 0.001$); central obesity (WHR $p < 0.001$, WHtR $p < 0.001$). The values for FBG ($p = 0.045$) and DBP ($p < 0.001$) were significantly higher in girls than among boys. The prevalence of hepatitis B virus (HBV) was found 0.4% among the secondary school students in this study. No hepatitis C virus (HCV) was detected.

Conclusion: The prevalence of HBV was 0.4% and the absence of HCV among secondary school children in rural areas indicates a decline compared to the previous studies. This trend suggests that vaccination coverage for HBV in the rural population has been satisfactorily achieved. The study finding also suggests that elimination of this disease is highly possible.

Key words: Body mass index, fasting blood glucose, hepatitis B virus, hepatitis C virus.

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INTRODUCTION

Hepatitis B virus (HBV) infection is a major global health problem and a leading cause of chronic hepatitis, liver cirrhosis and hepatocellular carcinoma. Thirty-eight countries have been identified as priority countries, accounting for approximately 80% of the global burden of viral hepatitis, Bangladesh is the one of them.¹ Considering its high prevalence worldwide, a vaccination program was consequently initiated. Low- and middle-income countries had the highest priority and vaccination coverage reached almost 90%.² It was

estimated that if vaccination coverage is increased 10% then hepatitis B infection rate is likely to be decreased about 40%.³ Now, a global target is to eliminate HBV infection.⁴ For such measures action proposals were – a) countries must establish effective public health system aligned with World Health Organization (WHO) guidelines, b) people oriented services and prevention, c) prioritizing the implementation of health strategies adopted by WHO and d) using complete and measurable data to monitor progress towards elimination of the disease. It may be mentioned a substantial number of studies were conducted on HBV and hepatitis C virus (HCV) prevalence among different population with respect to risk exposures such as sex, occupation, migration etc.^{5-9,13} The most previous studies were conducted in urban setting in our country. Therefore, the objective was to determine the present prevalence of HBV and HCV infection among the secondary school students in a rural setting.

METHODS

It was a cross-sectional study carried out among secondary school students between May and June 2024. Three secondary schools were purposively selected: two from Kharua Union under Nandail Upazila (one boys' school and one girls') and one from Vulbaria under Santhia Upazila. For each selected school, local social leaders, parents and school teachers including the headmasters were communicated. They were informed about the objectives and the procedural details of the study. From each class (VI to X), twenty male students and ten female students were randomly selected. The selected participants were advised to attend the school in the morning with overnight fast. The teachers maintained disciplined queue of the participants during investigations. Investigation included – a brief clinical history including sociodemographic information and anthropometry measurement height, weight, waist and hip girth, body mass index (BMI), waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR). Finally, a fasting venous sample was collected maintaining aseptic measure. Blood samples were centrifuged and serums were refrigerated and transported to Laboratory Science

Division of BIRDEM General Hospital. Serum samples were tested for hepatitis B virus surface antigen (HBsAg) using enzyme linked immunosorbent assay (ELISA). Diagnostic cut-off value using ELISA for HBsAg and anti-HCV were 0.12 and 0.17, respectively. This study protocol was approved by the Institutional Review Board of Ibrahim Medical College.

Descriptive statistics such as frequency and proportions were used to report the findings. The biophysical characteristics were given in mean with SD and 95% confidence interval (CI). The differences of characteristics were estimated using students t-test. The level of significance was taken at $p < 0.05$.

RESULTS

A total of 250 students (boys / girls = 165 / 85) were included in this study. The biophysical characteristics are shown (mean \pm SD with 95% CI) in Table I. The mean (\pm SD) with 90% CI of age, BMI, WHR, FBG, SGPT and Creatinine were (14.47 ± 2.1 ; 90% CI: 14.21-14.73), (17.8 ± 3.2 ; 90% CI: 17.3-18.2), (0.84 ± 0.08 ; 90% CI: 0.83-0.85), (6.4 ± 0.9 ; 90% CI: 6.2-6.4), (25.8 ± 13.9 ; 90% CI: 24.1-27.5) and (0.84 ± 0.14 ; 90% CI: 0.83-86) respectively. Table II shows the comparison of demographic, arthrometric and biophysical characteristics between boys and girls. This table showed that all anthropometric measures (height, weight, waist-girth, hip-girth, for all $p < 0.01$) were significantly higher in boys than compared with girls. The boys had also significantly higher central obesity (WHR; $p = 0.018$ and WHtR; $p < 0.001$). The clinical parameters FBG ($p < 0.001$) and DBP ($p < 0.05$) were significantly higher in girls than among boys. The mean serum creatinine level was significantly higher in boys compared to girls ($p < 0.01$).

Considering the diagnostic cut-off values of 0.12 for HBsAg and 0.17 for anti-HCV by ELISA, we observed only one out of 250 (0.4%) students was positive for HBsAg and none of the students were tested positive for anti-HCV. The participant was a boy with an HBsAg level of 0.62 mIU. He had no clinical symptoms and was found to maintain a healthy lifestyle, including playing outdoor games. His SGPT was 20 mg/dl and serum creatinine was 0.69 mg/dl.

Table I. Characteristics of the secondary school students (both boys and girls: N =250)

Characteristics	Mean	SD	95% CI
Age (y)	14.47	2.1	14.21–14.73
Height, cm	156.55	10.1	155.3–157.8
Weight, kg	43.82	9.8	42.5–45.05
Waist-girth, cm	59.48	18.4	57.1–61.7
Hip-girth, cm	70.95	21.4	68.2–73.6
Body Mass Index (BMI)	17.75	3.20	17.3–18.15
WHR	.84	.07	0.83–0.85
WHtR	0.37	0.11	0.36–0.39
SBP, mmHg	109.31	14.9	107.4–111.2
DBP, mmHg	66.6	8.9	65.4–67.7
MAP, mmHg	80.8	9.5	79.6–82.02
FBG, mmol/L	6.4	0.89	6.2–6.4
SGPT, mg/dl	25.79	13.9	24.05–27.53
Creat, mg/dl	0.84	0.14	0.83–0.86

BMI: body mass index (weight in kg / height in met. sq.); creat: creatinine; SBP & DBP: systolic & diastolic blood pressure; FBG: fasting blood glucose (mmol/L); MAP: mean arterial pressure; SD: standard deviation; SGPT: serum glutamic pyruvate transaminase; WHR: waist-to-hip ratio; WHtR: waist-to-height ratio.

Table II. Comparisons of biophysical characteristics between boys and girls

Characteristics	Boys(n=185)		Girls(n=65)		<i>p</i>
	Mean	SD	Mean	SD	
Age (y)	14.54	1.98	14.33	2.29	0.47
Height, cm	158.5	10.9	152.6	6.9	0.001
Weight, kg	44.9	10.6	41.6	7.8	0.014
Waist-girth, cm	67.9	10.3	43.09	19.6	0.001
Hip-girth, cm	80.0	10.2	53.29	26.0	0.001
BMI	17.7	3.20	17.8	3.20	0.704
WHR	0.84	0.08	0.82	0.06	0.018
WHtR	0.42	0.06	0.281	0.13	0.001
SBP, mmHg	110.4	15.2	107.26	14.06	0.119
DBP, mmHg	65.7	9.2	68.1	8.1	0.045
MAP, mmHg	80.60	9.70	81.2	9.2	0.640
FBG, mmol/L	6.06	0.7	6.9	0.74	0.001
SGPT, mg/dl	25.88	14.3	25.62	13.26	1.14
Creat, mg/dl	0.86	0.14	0.81	0.14	0.01

p – Values after independent t-test.

BMI, body mass index (weight in kg / height in met. sq.); Creat, creatinine; SBP & DBP, systolic & diastolic blood pressure; FBG, fasting blood glucose (mmol/L); MAP, mean arterial pressure; SD, standard deviation; SGPT, serum glutamic pyruvate transaminase; WHR, waist-to-hip ratio; WHtR, waist-to-height ratio.

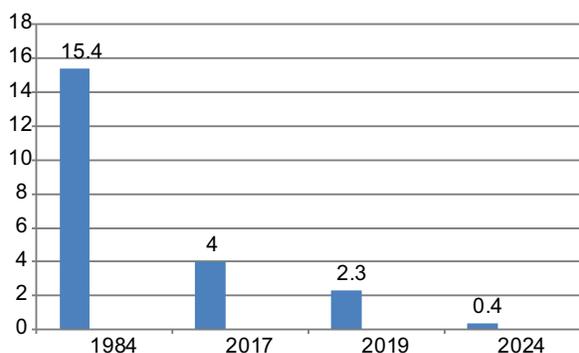


Figure 1. Different studies on the prevalence (%) of HBV in Bangladesh are shown according to years (15.4% was found in 1984 and gradually reduced to only 0.4% in this study in 2024).

DISCUSSIONS

In this cross-sectional study, 250 students (165 boys, 85 girls) aged 10-19 years in the rural setting. Among them, one participant tested positive for HBsAg and none were anti-HCV positive. This study revealed a prevalence of HBV among children was 0.4% and 0% for HCV, which was lower than the previously reported national average. World Health Organization (WHO) announced that Bangladesh, Bhutan, Nepal and Thailand had become the first countries in WHO South-East Asia Region to achieve hepatitis B control and the prevalence was less than one percent among children under five-years old.⁷ According to Paul RC et al.(2018), the prevalence of HBsAg among 2100 children aged 10– 11 years in the pre-vaccine era was 1.2%, which declined to 0.8% among 2100 children in the vaccine era.¹⁰ Masuda et al. (2023), reported that in a study conducted during 2003-2004, the prevalence of HBsAg among children aged 5 – 15 years in the pre-mass-vaccination era was 1.2%.¹¹ Banik S et al. reported from systematic review and meta-analysis that the pooled estimated prevalence of HBV infection in the general population of Bangladesh from 1995 to 2017 was 4.0%.¹²

In our study, the prevalence of HCV among secondary school children was 0%, which is consistent with another study conducted in Bangladesh in 2022. Begum F et al. reported 0% prevalence of HCV in study carried out among 600 high school students in Manikganj.¹³ Similarly, World Health Organization (WHO) reported that the prevalence of HCV in Bangladesh was estimated between 0.2% and 1% in 2024.¹⁴

This study may be considered important as it reflects a declining trend of viral hepatitis (figure 1) in Bangladesh. Forty years ago, the prevalence of hepatitis B among children was reported 15.4%.¹⁵ This figure has declined to 0.4%, as demonstrated by recent finding in 2024. This decline indicates that hepatitis B vaccination coverage in rural population of Bangladesh has been a successful public health intervention. It also suggests that the elimination of hepatitis is no longer an unrealistic goal. Bangladesh has been listed by the WHO as one of the ten priority countries with a high global hepatitis burden.¹ However, the findings of this study, along with previous evidence, suggest that the elimination of hepatitis in Bangladesh is feasible and achievable with sustained efforts. This study provides measurable data that can help monitor progress towards the national hepatitis elimination targets.

Conclusions

It may be concluded that the prevalence of HBV among the rural school students was found to be lower than the rates reported in previous studies, while no HCV infection was detected in this study population. These findings suggest that HBV vaccination coverage in the rural community has been satisfactorily achieved. If this trend continues, elimination of HBV from this population in the future appears to be achievable.

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