Prevalence of Anti-HBc Total Positivity in an Impoverished Urban Community in Bangladesh

Ghosh DK[1], Ghosh CK[2], Nath M[3], Safwath SA[4], Saha SK[5], Rowshon AHM[1]

[1]*Deptt. of Gastroenterology, Shaheed Suhrawardy Medical College & Hospital, Dhaka, Bangladesh*
[2]*Deptt. of Gastroenterology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh*
[3]*Deptt. of Emergency, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh*
[4]*Deptt. of Gastroenterology, Jalalabad Ragib Rabeya Medical College, Sylhet, Bangladesh*
[5]*Deptt. of Paediatrics, National Center for Control of Rheumatic Fever & Heart Disease, Bangladesh*

email: dkghoshmukta@gmail.com

Abstract

The infection with the Hepatitis B virus (HBV) is a global health problem. Hepatitis B virus (HBV) infections are rapidly spreading in developing countries due to the lack of health education, poverty, illiteracy and Hepatitis B vaccination. No widespread population based data of HBV is available in the country. So, a population-based serological survey was done to determine the prevalence of the Hepatitis B core antibody total (IgM+IgG) in an impoverished Urban Community in Dhaka, Bangladesh. A descriptive cross sectional study was conducted among 384 healthy individuals and age between 18-60 years from the urban slum in Dhaka city. The study was implemented through collaboration with Shaheed Suhrawardy Medical College, Dhaka from January 2013 to June 2013. The study participants were selected through systematic sampling procedure and blood samples tested for anti-HBc. Anti-HBc estimations were carried out by VITROS Immune diagnostic assay. The study was obtained ethical permission from Bangladesh Medical Research Council (BMRC) and every participant was informed regarding the study, and written informed consent was taken. Among the 384 respondents, 183(47.6%) individuals were positive for the core antibody of hepatitis B virus (anti-HBc). The anti HBc positive group consisted almost of equal number of male 93, (24.2%) and female 90 (23.4%). There was a significantly increasing prevalence of the core antibody among young adults and middle age of the respondents (28.7%). Major risk factors for exposure to Hepatitis B appeared to be ear-nose-body piercing, Circumcision by Hajam, unsafe blood transfusion and unsterile dental intervention. High prevalence of hepatitis B core antibody (47.6%) indicates that the members of this urban community are highly exposed to hepatitis B virus.

Keywords: Anti-HBc total, Hepatitis B virus surface antigen (HBsAg), Immunoassay

Introduction

Chronic HBV infection is a serious clinical problem because of its worldwide distribution and potential adverse outcomes, including cirrhosis, hepatic decompensation, and hepatocellular carcinoma (HCC). HBV infection is particularly important in the Asian-Pacific region, where it is endemic, with the majority of infections being acquired perinatally or in early childhood.[1]

The prevalence of chronic HBV infection varies geographically, from high (>8%), intermediate (2-7%) to low (<2%).[2] Whereas in India, carrier rate of 3%, contributes nearly 10% of the HBV carriers in the world. About one million HBV infections are added to the HBV pool in India yearly, contributing to its rapid expansion.[3,4] Among the Filipino blood donors HBV was found 4.2%.[5] Prevalence is low, < 1% in Australia and New Zealand, 1-5% in Japan, Singapore and Thailand. 6-8% in Indonesia, Northern China and highest, 10% in Taiwan, Southern China, Korea, Philippines and malaysia.[6]

The World Health Organization ranked Bangladesh, moderate to high-risk group of countries for HBV infection, where the prevalence of HBV is 19% to 29% among professional donors and 2.4% among voluntary donors. Seropositivity for HBsAg reported in another study among professional blood donors

was 19.6%, replacement blood donors 9% and the voluntary blood donors was 10%.[7] Another report revealed that the HBV prevalence in Bangladesh is 2.3 to 9.7 percent with an approximate carrier pool of 10 million. These include healthy adult population 4.4 to 9.7%, healthy children 3%, school girls 2.3%, a rural community 6.4%, and slum communities 3.8%. Vertical transmission of HBV in Bangladesh is infrequent due to a low HBsAg positivity rate (30.1%) among pregnant females with HBV infection.[8-9]

There is paucity of information on the prevalence of HBV infections among General population in Bangladesh and majority of the previous studies are conducted in selected group of people with higher risk factors such as blood donors, drug addicts, commercial sex workers (CSWs) or hospitalized patients.[8-12] However, a recent report revealed 5.5% HBsAg positivity among the general population living in Savar region, a semi-urban area on the outskirts of Dhaka.[13]

Due to lack of literacy, there is a lack of access to health information like health safety, mode of transmission of diseases, un-safety associated with blood transfusion practice, un-sterile injection, unsafe sex practice, unhealthy living conditions etc. adversely affecting individual's physical health leading to different diseases like HBV infection in Bangladesh.[14] The anti-HBc antibody is an important marker for surveying the burden of HBV infection as it persists even after resolution of infection, and thus identifies both past and current HBV infection.[15]

So, the study was designed to estimate the prevalence of anti-HBc total positivity among impoverished urban population of Dhaka city in Bangladesh and attempted to identify the gravity and magnitude of hepatitis B virus infection among the general population.

Materials and Methods

This cross sectional study was conducted in collaboration with Department of Gastroenterology, Shaheed Suhrawardy Medical College, Dhaka from January 2013 to June 2013 among Kalyanpur slum (porabosti) at Dhaka.

Bangladesh Bureau of Statistics (BBS), 2011 stated that Kalyanpur slum (porabasti) which is situated at Kalyanpur mahalla under Kalyanpur ward of Mirpurthana in Dhaka district. There are eight wards and 57 mahallas in this thana. Among eight wards, Kalyanpur ward is situated in ward no.11. This ward is divided into four mahallas. BBS report, 2015 also referred that the total population of Kalyanpur mahalla is 42,801, while male population was 55.8%, and female population was 44.2%. The total household and population of Kalyanpur slum (porabasti) was 2,184 and 8,129 (male 4,126, female 3,998 and others 5), respectively. In this study, 384 healthy individuals of either sex aged between 18-60 years were included. Respondents not willing to participate in the study were excluded.

Systematic sampling technique was adopted for the study. From the sampling frame, a starting point is chosen at random, and choices thereafter are at regular intervals. In this study, first sample was randomly selected then every fifth individual was selected as sampling interval.

During data collection, trained field research assistants (FRAs) were visited the selected households in accordance with the systemic randomization list and approached the head of the family and explained the purpose and objective of the study through obtained written informed consent from. Prior to the commencement of this study, the research protocol was approved by National Research Ethics Committee (NREC) of BMRC. Research physicians were collected 4 ml of blood from the anti cubital veins under aseptic conditions. The blood specimens were transported to Popular Diagnostic Centre Ltd. Shantinagar, Dhaka and centrifuged within 6 hours and stored at -20°C in aliquots. Anti HBc estimation was carried out by VITROS Immuno diagnostic assay. A Result of < 1.00 indicates a reactive sample and the possible presence of anti-HBc and ≥1.20 indicates a non-reactive sample, negative for anti–HBc.

All the relevant collected data were compiled on a master chart first and then statistical analysis of the results was obtained by using window based computer software device with Statistical Packages for Social Sciences (SPSS-17.0) (SPSS Inc, Chicago, IL, USA). The result was presented as odd ratios with 95% confidence intervals. A two- sided p value less than 0.05 was regarded as statically significant, and 95% confidence

intervals was computed using a logistic regression model.

Results

Study population consisted of 384 respondents, 174 (45.3%) male and 210 (54.7%) female. The majority 148 (38.5%) of the study population belonged to middle age group of up to 30 years and the mean age of them was 31 years. The male to female ratio in percentage was 16.9: 21.6. In this study, 318 (82.8%) of the participants were married whereas 194 (50.5%) were female and 124 (32.3%) were male. In regards to the occupation of the respondents, majority were housewives 108 (28.1%), about 103 (26.8%) from daily laborers and about 125 (32.6%) constituted other occupation like, garment workers, students, teachers and self-employed. In respects of the educational background, more than 200 (52.1%) of the respondents were illiterate and the next highest group 87 (22.7%) read up to class V. The highest literate women group 57 (14.8%) belonged to class I-V. About 190 (49.5%) of the respondents reported to earn a monthly income of BDT. 3001- 4000 with an average income BDT. 4,170. Although the average income of men (BDT. 4,370) was a bit higher than that of women (BDT. 4,003). (table-I & II).

Table I: Percentage distribution of demographic/ socio-economic characteristics of the respondents (n=384)

i. Age Groups	Male(174)	Female(210)	Total (384)
< 20	34 (8.9%)	53 (13.8%)	87 (22.7%)
21-30	65 (16.9%)	83 (21.6%)	148 (38.5%)
31-40	37 (9.6%)	44 (11.5%)	81 (21.1%)
41-50	19 (5.0%)	22 (5.7%)	41 (10.7%)
51+	19 (5.0%)	8 (2.1%)	27 (7.0%)
Total	174 (45.3%)	210 (54.7%)	384 (100%)
Mean Age (years)	**32.17**	**30.23**	**31.11**
ii. Marital Status			
Married	124 (32.3%)	194 (50.5%)	318 (82.8%)
Unmarried	50 (13.0%)	16 (4.2%)	66 (17.2%)
Total	**174 (45.3%)**	**210 (54.7%)**	**384 (100%)**
iii.Occupation			
Service	10 (2.6%)	11 (2.9%)	21 (5.5%)
Business	24 (6.3%)	3 (1.0%)	27 (7.0%)
House wife	0, (0.00%)	108 (28.1%)	108 (28.1%)
Daily Laborer	63 (16.4%)	40 (10.4%)	103 (26.8%)
Others	77 (20.1%)	48 (12.5%)	125 (32.6%)
Total	**174 (45.3%)**	**210 (54.7%)**	**384 (100%)**
iv. Education			
Illiterate	84 (21.9%)	116 (30.2%)	200 (52.1%)
Class I-V	30 (7.8%)	57 (14.8%)	87 (22.7%)
Class VI-IX	22 (5.7%)	18 (4.7%)	40 (10.4%)
SSC & equivalent	8 (2.1%)	3 (1.0%)	11 (2.9%)
HSC & equivalent	30 (7.8%)	16 (4.2%)	46 (12.0%)
Total	**174 (45.3%)**	**210 (54.7%)**	**384 (100%)**
v. Monthly family Income			
Tk 2000-3000	28 (7.3%)	51 (13.3%)	79 (20.6%)
Tk3001-4000	75 (19.5%)	115 (30.0%)	190 (49.5%)
Tk4001-5000	47 (12.2%)	35 (9.1%)	82 (21.4%)
Tk5000+	24 (6.3%)	9 (2.3%)	33 (8.6%)
Total	174 (45.3%)	210 (54.7%)	384 (100%)
Mean Income	**4,370**	**4,003**	**4,170**

Table II: Percentage distribution of respondents by monthly family income, education and occupation (n=384).

i. Education	Average monthly family Income (Tk.)				
	2000-3000	3001-4000	4001-5000	5000+	Total
Illiterate	16.7	28.6	5.5	1.3	52.1
Class I-V	3.4	13.5	5.5	0.2	22.6
Class VI-IX	0.2	4.2	5.2	0.8	10.4
SSC & equivalent	0.3	0.5	1.3	0.8	2.9
HSC & equivalent	0.0	2.6	3.9	5.5	12.0
Total	20.6	49.4	21.4	8.6	100.00
ii. Occupation					
	2000-3000	3001-4000	4001-5000	5000+	Total
Service	0.0	0.0	3.4	2.1	5.5
Business	0.3	2.9	2.9	1.0	7.1
House wife	5.2	19.5	3.4	0.00	28.1
Daily Laborer	12.0	12.2	2.6	0.00	26.8
Others	3.1	14.8	9.1	5.5	32.5
Total	20.6	49.4	21.4	8.6	100.00

Among 384 study population, 183 (47.7%) belonged to anti HBc positive group against 201 (52.3%) persons possessing the anti HBc negativity test results. The anti HBc positive group consisted almost of equal number of male 93 (24.2%) and female 90 (23.4%, table-III).

Table III: Distribution of respondents by Anti HBc status by sex.

Sex	Anti HBc Positive		Anti HBc Negative		Total	
	Number	%	Number	%	Number	%
Male	93	24.2	81	21.1	174	45.3
Female	90	23.4	120	31.3	210	54.7
Total	183	47.6	201	52.4	384	100.0

In this study, the bivariate analysis of tested anti HBc positivity, four risk factors along with educational background of the respondents were identified to be significantly associated. The Odd Ratio (OR) and p-values (p) respectively of those were: education level 1 (Illiterate) – OR= .223; p=.001, education level 2 (Class I-V) – OR=.184; p=.000, education level 3 (Class VI-IX) – OR=.158; p=.001, History of dental procedure 45 (24.6%); OR=.433; p=.003, History of Blood Transfusion 9 (4.9%); – OR=.187; p=.015, History of Ear-nose-body piercing 96 (52.5%) – OR=.453, p=.044 and History of Circumcision by Hajam 93 (50.8%);– OR=.322; p=.004 were significant among the anti HBc positive individuals (table-IV).

Table IV: Bivariate analysis for significant risk factors for tested Anti HBc positivity (n=384)

Risk factors	Anti HBc Positive (183)	Anti HBc Negative (201)	Odd Ratio (at 95% Confidence Interval)	*p-value*
1.Education				
Level 1-Illiterate	106 (24.4%)	94 (27.6%)	0.223 (.093 - .534)	.001
Level 2-Class I-V	41 (12.0%)	46 (10.7%)	0.184 (.071 - .476)	.000
Level 3-Class VI-IX	22 (4.7%)	18 (5.7%)	0.158 (.055 - .449)	.001
2.History of Dental Procedure				
Present	45 (24.6%)	25 (12.4%)	0.433 (.251 - .746)	.003
Absent	138 (75.4%)	176 (87.6%)		
3.History of Blood transfusion				
Present	9 (4.9%)	3 (4.9%)	0.187 (.041 - .855)	.015
Absent	174 (95.1%)	198 (95.1%)		
4.History of Ear-nose-body piercing				
Present	96 (52.5%)	116 (57.7%)	0.453 (.209 - .980)	0.044
Absent	87 (47.5%)	85 (42.3%)		
5.History of Circumcision by Hajam				
Present	93 (50.8%)	77 (38.3%)	0.322 (.149 - .696)	0.004
Absent	90 (49.2%)	124 (61.7%)		

Multinomial logistic regression analysis results were showed the similar findings of bivariate analysis except education. (table-V).

Table V: Multinomial logistic regression analysis for significant risk factors for tested Anti HBc positivity

Risk factors	Anti HBc Positive (183)	Anti HBc Negative (201)	Odd Ratio (at 95% Confidence Interval)	p-value
Dental Procedure	45 (24.6%)	25 (12.4%)	0.433 (0.251 - 0.746)	0.003
Blood Transfusion	9 (4.9%)	3 (4.9%)	0.187 (0.041 – 0.855)	0.015
Ear-nose-body piercing	96 (52.5%)	116 (57.7%)	0.453 (0.209 - 0.980)	0.044
Circumcision by Hajam	93 (50.8%)	77 (38.3%)	0.322 (0.149 - 0.696)	0.004

Discussion

Prevalence studies are not always easily undertaken in the developing countries including Bangladesh due to high cost, we made efforts to prospectively estimate Prevalence of anti-HBC total positivity among a population living at Kalyanpur, a densely populated community in Dhaka, the capital city of Bangladesh.The results of our study suggest a high HBV exposure among our study population.

In this study, 384 respondents were tested for the Hepatitis B core antibody. Among them 183(47.7%) were positive and 201(52.3%) were negative. The anti HBC positive group consisted almost of equal number of male (24.2%) and female (23.4%). The prevalence of Hepatitis B core antibody (anti-HBc) was 47.7% among our study population. It was higher to that reported from previous study of healthy adult and children in Bangladesh (21.1%) but within the range of previous studies from selected population of Dhaka; 24.1% in non-Intravenous Drug Users (NIDUs) and 31.8% in Intravenous Drug Users(IDUs); 35.2% among women at a Sexually Transmitted Disease (STD)clinic ; 48.1% among truck drivers and helpers ; 49.3% among women living near a truck stand; and 73% among Commercial Sex Workers (CSWs).[16-21].The higher rates among our study population could be attributed to the general lack of proper health care because of deprived socio-economic status (monthly household income of US $ 50) and less public health awareness about the transmission of Hepatitis B Virus infection as well as the lack of hepatitis B vaccination in the community.

The varied prevalence of the anti HBc, a marker for exposure to HBV infection has been reported from different parts of India, ranging between 8%-18% of total donor population.[22] In the study from Behrampur, Ganjam in Orissa, about 30.1% of total donations (220 of 729) was anti HBc positive indicating a very high rate of exposure to HBV infection among the blood donors from this region. Studies from other parts of India reported that the prevalence of anti HBV core antibody ranging from 21% in Kolkata (Eastern India), 20.9% in New Delhi (Northern India) to 8.4% in Chandigarh (Northwestern India).[23,24]

The socio-demographic analysis of the 183 responded who were positive for anti- HBc antibody showed that it had a higher preponderance in female (7.3% in males Vs 8.6% in females). A study was conducted in India by Asim et al. which showed a difference in the sero prevalence of the core antibody between the male and the female donors (19.3% Vs 18%), but as in our study, the difference was statistically not significant.[25] We observed a significantly increasing prevalence of the core antibody was among young adults and middle age individuals. Almost equal percent of anti HBc positive cases was observed in the illiterate males and females. This favors horizontal transmission in early childhood as the principal mode of transmission of the virus, contrary to vertical transmission, which is popularly assumed. Similar observations have also been made in Nepal and India.[26,27] Overcrowding and poor levels of sanitation may be responsible for such early horizontal spread of the virus.

The risk factors for exposure to HBV as revealed by this study, include History of Dental procedure (OR .433; p=.003), History of Blood Transfusion (OR .187; p=.015), Ear-nose-body piercing (OR .453; p=.044) and Circumcision by Hajam (OR .322; p=.004).The most important risk factor for HBV as revealed by the study, include dental procedure and circumcision by Hajam who were unaware of the consequences of unhygienic and unsterilized intervention. Blood transfusion is another important risk factor for HBV transmission revealed by the study. The screening of the blood units for the core antibody adds to the cost, but it is definitely useful in reducing the residual risk of post transfusion

hepatitis. The traditional practice of ear and nose piercing by women is also an important route of HBV transmission and thus extra care is warranted before one pierces a tissue.

HBV poses a huge burden on the health of Bangladeshis, being the leading cause of all forms of chronic liver diseases (CLD). HBV is responsible for 76.3% of cases of chronic hepatitis and 61.2% of cases of cirrhosis.[28,29] Things have changed very little over the years, as a Bangladeshi study in 1994, found that HBV responsible for 40.5% of cases of CLD in this country.[30] In India >60% of cases of CLD is due to HBV.[31] The same applies to Pakistan, where HBV is responsible for 60% of cases of CLD.[32] In Nepal, 60% of cases of chronic hepatitis and 40% of cases of cirrhosis of the liver are due to HBV.[33]

HBV also ranks the first as the cause of Hepato Cellular Carcinoma (HCC) in Bangladesh. Studies have shown that HBV is responsible for 33.3% of cases of HCC in Bangladesh. [34]

The intermediate rate of chronic HBV carriage of around 3% was observed in most general populations (clinics, villagers), suggesting that this population would benefit from universal hepatitis B vaccination.[35] In 2004, the Government of Bangladesh and United Nation International Children Emergency Fund (UNICEF) have introduced the hepatitis B vaccine into the Expanded Programme on Immunization (EPI) against six infectious diseases. The successful continuation of the programme is expected to reduce chronic HBV infections in the next generations. Since 90% of the HBV infected older children and adults successfully clear the infection and do not become chronic carriers, the prevalence of HBsAg alone might not describe the total burden of HBV infections.

Therefore, estimation of the prevalence of anti-HBc, in addition to the estimation of the prevalence of HBsAg which is the most reliable biological biomarker of HBV infection, is much more informative about indicator of HBV disease burden among the population.

There are some limitations of this study. First, it could not be performed surface Antigen tests for HBV (HBsAg) and HBV DNA the presence of which indicates current status of infection; and anti-HBs that differentiate susceptible persons from those immune persons, which can be due either to natural infection or hepatitis B vaccination. All the above limitations are mainly due to study cost constraints, mostly related to laboratory tests. The second limitation is that the study was conducted in a single population in Dhaka, and may not reflect all of Bangladesh, although the literature we have cited suggests that it should. A final limitation is the relatively short observation window, which may have missed important secular trends in the background prevalence of the hepatitis B viruses.

Conclusion

Based on the findings of the study, it may be concluded that high prevalence of Hepatitis B core antibody (47.6%) indicates that the memebers of this urban community are highly exposed to hepatitis B virus.

Acknowledgement

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