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Prevalence and Risk Factors of Hepatitis B Virus, Hepatitis C Virus, and Human Immunodeficiency Virus Infections among Drug Addicts in Bangladesh

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ABSTRACT

This cross-sectional study investigated the prevalence and risk factors of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infections among 266 drug users attending a drug-addiction treatment centre in Dhaka, Bangladesh, from November 1996 to April 1997. Of the 266 addicts, 129 were injectable drug users (IDUs), and 137 were non-injectable drug users (non-IDUs). The seroprevalences of hepatitis B virus surface antigen (HBsAg), anti-HBc, anti-HBs, and anti-HCV antibodies among the IDUs were 8 (6.2%), 41 (31.8%), 15 (11.6%), and 32 (24.8%), and among the non-IDUs were 6 (4.4%), 33 (24.1%), 9 (6.6%), and 8 (5.8%) respectively. None of the drug users were positive for anti-HIV antibody. Although the prevalence of HBV infection did not significantly differ between the IDUs and the non-IDUs, the prevalence of HCV infection was significantly higher among the IDUs. Among the IDUs, the prevalence of both HBV and HCV infections was associated with sharing of needles and longer duration of injectable drugs used. The seroprevalence of HBV infection in both IDUs and non-IDUs was significantly higher among those who had a history of extramarital and premarital sex. The prevalence of HCV infection was not associated with sexual promiscuity. There was no association between the seroprevalence of HBV and HCV infections and age. Active preventive programmes focusing on educational campaigns among the youths against substance abuse should be undertaken.

Key words: Hepatitis B; Hepatitis C; HIV; Substance abuse; Risk factors; Cross-sectional studies; Epidemiology

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INTRODUCTION

Drug users, especially those injecting intravenously, are at an increased risk of infection with blood-borne viruses, including hepatitis B virus (HBV) (1), hepatitis C virus (HCV) (2), and human immunodeficiency virus (HIV) (3). Viral transmission is primarily parenteral through sharing of contaminated injection equipment (4-6).

Studies have shown that the prevalence rates of these blood-borne viral infections are higher among individuals with prolonged drug use (2,4,7,8). Among drug-using populations, sharing of contaminated injection equipment and abnormal sexual behaviour are common, thus facilitating viral transmission by either parenteral or sexual route. Although sexual transmission of HBV has been demonstrated in non-injectable drug users (IDUs) (9-12), several studies failed to show any association between high-risk sexual behaviour and HBV and HCV infections (2,7,8,13). In HIV infection, the seroprevalence is associated with high-risk sexual behaviour (1,8).

There are few data on the prevalence of these infections among drug users in Bangladesh. This study was, therefore, carried out to estimate the prevalence of HBV, HCV and HIV infections among drug addicts treated in a drug-addiction treatment centre in Dhaka and to examine the interrelationship between the presence of these blood-borne viral infections and sociodemographic characteristics, including sexual behaviour, sharing of syringes and needles, and duration of drug use.

METHODS AND MATERIALS

This cross-sectional study was conducted in the Central Drug Addiction Treatment Centre in Dhaka, Bangladesh, from November 1996 to April 1997. The study-subjects included those drug addicts who were treated at the Centre. These patients were known to be drug users through oral, inhalation, or intravenous/intramuscular routes. The addiction treatment centre is the only government institution of its kind in Dhaka with a population of more than 8 million. There are 2 similar but smaller centres operated privately in the city.

A total of 266 drug users attended the Central Drug Addiction Treatment Centre during the study period, and were enrolled into the study after obtaining voluntary informed consents. Of the 266 subjects, 129 were IDUs, and 137 were non-IDUs. Data regarding sociodemographic characteristics, types of drugs used with duration and routes of administration, and sexual practices were collected by interviewing them. Pethidine and diazepam were the most commonly used injectable drugs, while non-injectable drugs used included heroin, *ganja*, diazepam, and *Phensedyl* (a mixture of chlorphenitamine maleate, codeine phosphate, and ephidrine).

Five mL of venous blood was drawn from the addicts under aseptic conditions; sera were separated and stored in aliquots at -20 °C until tested for HBV, HCV and HIV seromarkers. For detection of HBV infection, HBV surface antigen (HBsAg) and antibody (anti-HBs), antibody to HBV core antigen (anti-HBc), and HBVe antigen (HBeAg) and antibody (anti-HBe) were determined using commercially-available enzyme-linked immunosorbent assay (ELISA) kits (Hepanostika HBsAg Uni-Form II, Hepanostika anti-HBs, Hepanostika anti-HBc, and Hepanostika HBeAg/anti-HBe microelisa system, Organon Teknika, Holland). For HCV infection, anti-HCV antibody was detected using a third-generation ELISA kit (UBI HCV EIA 4.0, Organon Teknika, Holland). The UBI EIA 4.0 uses synthetic peptides corresponding to highly antigenic segments of core, NS3, NS4 and NS5 regions of the HCV genome. The serum samples were tested for anti-HIV using commercially-available ELISA kits (Virostika HIV Uni-Form II Organon Teknika, Holland). Kit specifications were strictly followed for determining the positive cut-off values.

Epi Info version 6.0 and SPSS Windows version were used for analyzing data. Group means were compared by Student's *t*-test. chi-square test was used for testing the difference in categorical variables, and Fisher's exact test was used if the expected value was less than 5 in any of the cells. Odds ratios with 95% confidence interval (CI) were also calculated to assess the strength of the difference.

RESULTS

All the 266 drug users were males with a median age of 30.5 years (range 16-60 years). Of them, 129 (48.5%) were IDUs, and 137 (51.5%) were non-IDUs. Two-thirds of the subjects were in the age group of 20-30 years, had a monthly income less than US$ 300, and 50% had less than 10 years of schooling (Table 1). The daily cost of drug used was less than US$ 4 in 75% of the subjects. Drug addiction was significantly higher among those who had high-risk sexual habits ($p<0.0001$).

Fourteen (5.3%) of the 266 drug addicts were positive for HBsAg (Table 2). Anti-HBc was detected in 74 (27.8%) and anti-HBs in 24 (9%) subjects. Due to laboratory cost constraints, HBeAg and anti-HBe were tested only when a subject was positive for HBsAg. Of the 14 HBsAg-positive subjects tested, 5 (35.7%) were positive for HBeAg, indicating an active replication of HBV. Five HBsAg-positive patients, who were HBeAg-negative, were positive for anti-HBe. Subjects positive for HBsAg and anti-HBs were also positive for anti-HBc. However, 36 subjects were exclusively positive for anti-HBc. The prevalence of HBV infection did not differ between the IDUs and the non-IDUs. Of the 266 patients, 40 (15%) were positive for anti-HCV–32 among the IDUs and 8 among the non-IDUs ($p=0.00002$). None was, however, positive for anti-HIV antibody.

Age was not associated with the seroprevalence of HBV among the IDUs or non-IDUs (Table 3). Among those who shared needles, 43.4% and 16.8% were

positive for anti-HBc and anti-HBs respectively compared to 10.9% and 2.2% of those who did not (p=0.0003 and 0.02 respectively). Of the 88 IDUs who had a history of high-risk sexual behaviour (multiple partners, extramarital and premarital sex), 39.8% were positive for anti-HBc. This contrasts with 14.6% of the subjects who were positive for anti-HBc but had no such history (p=0.004). The seroprevalence of anti-HBc was also significantly associated with longer duration of injectable drugs used, the prevalence being 43% among 72 subjects taking injections for more than one year compared to 17.6% among 51 subjects using parenteral drugs for less than a year (p=0.003).

High-risk sexual behaviour was reported by 55 non-IDUs, of whom 34.5% were positive for anti-HBc. Of the 82 non-IDUs who reported no such experience, 14 (17%) were positive for anti-HBc (p=0.02). Unlike in the IDUs, the duration of drug use among the non-IDUs was not associated with any particular HBV seromarker. The prevalence of anti-HCV antibody was similar in the 2 age groups of drug users (Table 4). However, 32 (38.5%) of the 83 subjects who shared needles were positive for anti-HCV compared to none of the 46 subjects who did not share needles (p<0.0001). High-risk sexual behaviour was not associated with the increased prevalence of HCV infection. The prevalence of HCV antibody was significantly higher among those who used injectables for more than one year (p=0.002).

DISCUSSION

We investigated the prevalence of markers of viruses that have a predilection for being transmitted through parenteral route among a group of drug addicts treated in a drug-addiction treatment centre. The results indicate that the seroprevalence of HBV markers is higher, although not significantly different, among the IDUs than among the non-IDUs. In Bangladesh, Islam *et al.*, in 1984, reported that the prevalence of HBsAg among apparently healthy people applying for jobs in foreign countries was 7.8% (12), which is higher than that observed in our study, i.e. 6.2% among IDUs and 4.4% among non-IDUs.

Table 1. Sociodemographic characteristics of drug addicts treated in a drug-addiction treatment centre in Bangladesh

Characteristics	Injectable drug users (n=129)	Non-injectable drug users (n=137)	Total (n=266)
Age (in years)			
£20	8 (6.2)	16 (11.7)	24 (9)
20-30	98 (75.9)	99 (72)	197 (74)
³30	23 (17.8)	22 (16)	45 (16.9)
Education (in years)			
0	28 (21.7)	36 (26.3)	64 (24)
1-<10	76 (58.9)	59 (43)	135 (50.7)
> 10	25 (19.4)	42 (30.6)	67 (25)
Employment status			
Student	5 (3.9)	13 (9.5)	18 (6.8)
Unemployed	48 (37.2)	54 (39.4)	102 (38.3)
Employed	76 (58.9)	70 (51)	146 (54.9)
Monthly family income (in $)			
<60	44 (34)	26 (18.9)	70 (26.3)
60-300	67 (51.9)	86 (62.8)	153 (57.5)*
>300	18 (13.9)	25 (18.2)	43 (16)
Daily cost of drug (in $)			
<1	34 (26.4)	30 (21.9)	64 (24)
1-4	63 (48.8)	74 (54)	137 (51.5)
>4	32 (24.8)	33 (24)	65 (24.4)
Marital status			
Married	63 (48.8)	73 (53)	136 (51)
Unmarried	63 (48.8)	59 (43)	122 (45.8)
Separated	3 (2.3)	5 (3.6)	8 (3)
History of extramarital or premarital sex†			
Yes	88 (68)	55 (40)	143 (53.7)†
No	41 (31.8)	82 (59.9)	123 (46.2)

Figures in parentheses indicate percentage; * p=0.01, OR 2.1 (95% CI 1.1-4.0); † p<0.0001, OR 3.2 (95% CI 1.8-5.4)

Table 2. Distribution of markers of HBV, HCV and HIV antibody among injectable and non-injectable drug users treated in a drug-addiction treatment centre in Bangladesh

Serologic markers	Injectable drug users (n=129)	Non-injectable drug users (n=137)	Total (n=266)
For HBV			
HbsAg			
+ve	8 (6.2)	6 (4.4)	14 (5.3)
-ve	121 (93.8)	131 (95.6)	252 (94.7)
Anti-HBc			
+ve	41 (31.8)	33 (24)	74 (27.8)
-ve	88 (68.2)	104 (75.9)	192 (72)
Anti-HBs			
+ve	15 (11.6)	9 (6.6)	24 (9)
-ve	114 (88.4)	128 (93.4)	242 (90.9)
HbeAg (n=14)			
+ve	3 (21)	2 (14.3)	5 (35.7)
-ve	5 (35.7)	4 (28.6)	9 (64.3)
Anti-HBe (n=14)			
+ve	3 (21)	2 (14.3)	5 (35.7)
-ve	5 (35.7)	4 (28.6)	9 (64.3)
For HCV			
Anti-HCV			
+ve	32 (24.8)*	8 (5.8)	40 (15)
-ve	97 (75.2)	129 (94.2)	226 (84.9)
For HIV			
Anti-HIV	0	0	0

Figures in parentheses indicate percentage; * p=0.00002, OR=5.3 (95% CI 2.2-13.1)

The prevalence of anti-HCV antibody in our study among the IDUs was significantly higher than among the non-IDUs, indicating that hepatitis C virus is predominantly transmitted through parenteral route. This is consistent with other studies demonstrating that hepatitis C virus infection is an alarming problem among parenteral drug users (8,14,15).

The surveillance of the Bangladesh AIDS Prevention and Control Programme (BAPCP) from 1989 to January 1997 revealed only one HIV-positive subject among 2,200 drug users (Islam MN, unpublished). Till August 2000, the total number of anti-HIV positive cases in Bangladesh has been reported to be 157, and most of them were native wage earners who returned home after having worked abroad (Islam MN, personal communication). The prevalence of HIV infection in Bangladesh is still relatively low, the reasons being largely unknown. In the present study, anti-HIV antibody was not detected in any patients, whereas in neighbouring Myanmar, the rate of HIV among IDUs is the highest in the world–74% in Yangon city (16).

Results of this study showed no association of HBV and HCV seromarkers with age among the IDUs and non-IDUs. However sharing of needles was significantly associated with HBV and HCV infections. The prevalence of anti-HBc was significantly higher among both IDUs and non-IDUs with a history of risky sexual behaviour among both the groups. In a study carried out in Dhaka city among 164 commercial sex workers, 129 (78.7%) had serologic evidence of current or past HBV infection (17). This indicates that HBV infection also spreads through sexual route, and, therefore, those who share needles and indulge in high-risk sexual practice are the most vulnerable groups.

The prevalence of HBV infection among the IDUs is not higher than among the non-IDUs in Dhaka, Bangladesh. However, the prevalence of HCV infection is higher among the IDUs. The seroprevalence of HBV and HCV infections is significantly higher among those who share needles and use injections for more than one year. HBV infection is strongly associated with multiple sexual partners.

Among individuals infected with HBV infection, 5-10% become carriers, and 4% suffer from chronic infection which may lead to either chronic persistent or chronic active hepatitis, cirrhosis, or hepatocellular carcinoma (18). Infection with HCV has a high risk of progression to chronic liver disease (19-20). About 50% of those infected with HCV develop chronic liver disease, and some of them progress to cirrhosis and even hepatocellular carcinoma (21).

Table 3. Distribution of HBV seromarkers among injectable and non-injectable drug users by age, sharing of needles, history of high-risk sexual behaviour, and duration of drug use

Variables	Total	Injectable drug users			Total	Non-injectable drug users		
	(n=129)	HBs-Ag +ve	anti-HBc +ve	anti-HBs +ve	(n=137)	HBs-Ag +ve	anti-HBc +ve	anti-HBs +ve
Age (in years)								
<20	8 (6.2)	1 (12.5)	2 (25)	1 (12.5)	16 (11.7)	1 (6.2)	6 (37.5)	2 (12.5)
³20	121 (93.8)	7 (5.8)	39 (32.2)	14 (11.6)	121 (88.3)	5 (4.1)	27 (22.3)	7 (5.8)
Sharing of needles								
Yes	83 (64.3)	8 (9.6)	36 (43.4)*	14 (16.8)†	-	-	-	-
No	46 (35.7)	0	5 (10.9)	1 (2.2)	-	-	-	-
History of exposure								
Yes	88 (68.2)	4 (4.5)	35 (39.8)‡	11 (12.5)	55 (40.2)	1 (1.8)	19 (34.5)¶	4 (7.3)
No	41 (31.8)	4 (9.7)	6 (14.6)	4 (9.7)	82 (59.8)	5 (6.1)	14 (17)	5 (6.1)
Duration of drug use§	(n=123)				(n=131)			
<1 year	51 (41.5)	1 (1.9)	9 (17.6)**	3 (5.9)	12 (9)	0	3 (25)	0
³1 year	72 (58.5)	7 (9.7)	31 (43)	12 (16.6)	119 (90.8)	6 (5)	30 (25.2)	9 (7.5)

Figures in parentheses indicate percentage; * p=0.0003, OR 6.2 (95% CI 2.1-22.1); † p=0.02, OR 9.1 (95% CI 1.2-394); ‡ p=0.004, OR 3.8 (95% CI 1.3-12.2); ¶ p=0.02, OR 2.6 (95% CI 1.0-6.1); § Duration of drug abuse could not be ascertained in 6 IDUs and 6 non-IDUs; ** p=0.003, OR 0.2 (95% CI 0.1-0.7)

Table 4. Distribution of HCV seromarkers among injectable and non-injectable drug users by age, sharing of needles, history of high-risk sexual behaviour, and duration of drug use

Variables	Injectable drug users		Non-injectable drug users	
	Total (n=129)	anti-HCV	Total (n=137)	anti-HCV
Age (in years)				
<20	8 (6.2)	2 (25)	16 (11.7)	0
³20	121 (93.8)	30 (24.8)	121 (88.3)	8 (6.6)
Sharing of needles				
Yes	83 (64.3)	32 (38.5)*	-	-
No	46 (35.6)	0	-	-
History of exposure				
Yes	88 (68.2)	22 (25)	55 (40)	3 (5.4)
No	41 (31.8)	10 (24.4)	82 (59.8)	5 (6)
Duration of drug use†	(n=123)		(n=131)	
<1 year	51 (41.5)	6 (11.7)‡	12 (9)	1 (8.3)
³1 year	72 (58.5)	26 (36)	119 (90.8)	7 (5.9)

Figures in parentheses indicate percentage; * p=<0.0001, OR 0.07 (95% CI 0.01-0.3); † Duration of drug abuse could not be ascertained in 6 IDUs and 6 non-IDUs; ‡ p=0.002, OR 0.24 (95% CI 0.07-0.6)

Given the fact that adequate programmes against substance abuse are lacking in Bangladesh, active preventive programmes focusing on educational campaigns among the youths against substance abuse should be undertaken. The fact that injection of illicit drugs using shared injection equipment is associated with infection of the liver by dangerous viruses, such as HCV and HBV, should be highlighted in the campaigns. The high prevalence rate of HBV infection among the drug users also warrants a hepatitis B vaccination programme in the country.

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