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Article

Prevalence and risk factors of Human Immunodeficiency virus, Hepatitis B virus, Hepatitis C virus and Syphilis infections among nonprofessional blood donors in Chittagong, Bangladesh

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Abstract: Human Immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Syphilis infection are the major public health problem, alarming the most developing countries like Bangladesh. These studies determined the prevalence rate and risk factors of HIV, Hepatitis B, Hepatitis C and Syphilis among nonprofessional blood donors in multiple blood transfusion center of Chittagong. Information was collected by questionnaire to find out the relationship of HIV, HBV, HCV and Syphilis infection with age, sex, socioeconomic status, residence and religious believes. The sero-prevalence of HIV, HBsAg (HBV), anti-HCV (HCV), VDRL (Syphilis) among the non-professional blood donors were 00.00%, 4.88%, 0.92%, and 0.70% respectively. So, the highest prevalence rate was HBsAg and the lowest was HIV. We didn't find more than one positive case in the same blood sample. The prevalence of HBsAg among the study population, students (120/6) were 5.00%, service holders (73/3) were 4.11%, businessmen (40/4) were 10%, housewives (14/0) were 00.00%, others (farmers, immigrant workers) (40/1) were 2.50%. The highest prevalence of HBsAg was due to illiteracy and unsafe sexual behaviors.

Keywords: HIV; HBV; HCV; Syphilis

1. Introduction

HIV, HBV, HCV and Syphilis infection are the major public health problem, alarming the most developing countries like Bangladesh. The prevalence of human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Syphilis in Bangladesh is still low, although infection rate is increasing since 1994, especially among high- risk groups such as female sex workers, injecting drug users and professional blood donors (who sells blood).

Prevalence of HIV, HBV, HCV and Syphilis infection in Bangladesh has been studied in selected population groups, mainly in professional blood donors (Mustafa *et al.,* 1989ab), pregnant mothers (Akter *et al.,* 1992), Children (Chowdhury, 1997), patients with acute hepatitis (Islam *et al.,* 1984), prostitutes (Satter and Islam, 1996), female sex workers (Motiur *et al.,* 2000), drug users (Shirin *et al.,* 2000) etc. However, these groups are not representative of the non-professional blood donors. All the previous study was carried out in different cities in Bangladesh but not in Chittagong. In these aspects a study in Chittagong among nonprofessional blood donors was high importance to understand the actual situation of the area, the country and even its neighbors.

In our study, the prevalence of HIV, HBV, HCV and Syphilis was determined among non-professional blood donors (voluntary blood donors and replacement donors) which includes students, service holders, businessman, housewives and others (immigrants workers, farmer etc) in multiple transfusion center (blood bank) of Chittagong city.

2. Materials and Methods

Information is not available concerning the human immunodeficiency virus, Hepatitis-B virus, Hepatitis-C virus and Syphilis infection among nonprofessional blood donors based on blood transfusion center in Chittagong City. In our study information was collected by a Questionnaire to find out the inter-relationship and risk factors of the diseases.

2.1. Place of study and study populations

This study was performed in the different blood transfusion center in order to get real picture of the prevalence of HIV, HBV, HCV, and Syphilis in Chittagong City area which were: 1.Blood transfusion center, Chittagong Maa-o-Shisu Hospitals Medical College. (CMHMC) 2. Blood transfusion center, University of Science and Technology, Chittagong (USTC). 3. Fatema Begum Red Crescent Blood Blank, Gemison Red Crescent Hospital. 4. Department of Microbiology and Immunology. Chevron Clinical Laboratory. LTD.

We grouped our study populations into four categories such as Businessman, Service holders, Students and others (house wives, immigrant workers etc). But male and female are two major classes. We also collected their age, religious believes, location of a residence.

2.2. Study design

When we collect data by Questionnaire, we asked four types of Question to the study populations which were 1. Blood reception history 2. Drug reception history 3. Sex relation to exposure (sex relation to commercial sex workers or extra married sex partners) 4. HIV, HBV, HCV family history.

A total of 287-blood donors sample were screening tested for anti-HIV (HIV), HBsAg (HBV) and VDRL for Syphilis, 218 samples were screening tested for anti-HCV (HCV). Only screening positive HBsAg and anti-HCV were tested for ELISA for more confirmation. The entire screening test was done in three different blood transfusion centers but ELISA test was done in Department of Microbiology and Immunology, Chevron Clinical Laboratory.

2.3. Samples

5cc blood samples were collected from donating blood bag and taken in sterile test tube and allowed to stand at room temperature for several minutes. Then the blood was centrifuge at 2000 RPM for 5 minutes for screening test and for ELISA, at 3000 RPM for 20 minutes. Serums were collected in an Ependorf tube and stored at-20°C until use.

2.4. Detection of viruses

HIV, HBV Surface Antigen (HBsAg) and anti-HCV was screened by Rapid Test Device (Acon Laboratories, Inc. San Diego, CA 92121,USA), Serodiagnosis of Syphilis by Immuntrep Carbon Antigen (Omega Diagnostic, Scotland. UK.). Only screening positive HBsAg and anti-HCV were tested for ELISA for more confirmation (Enzo Dignostic. Inc. 60 Executive. Bouevard. Farming Dal, Newyork, USA).

3. Results and Discussion

In our study, the prevalence of HIV, HBV, HCV and Syphilis was determined among non-professional blood donors which includes students, service holders, businessman, housewives and others (immigrants workers, farmer etc) in multiple transfusion center (blood bank) of Chittagong city. Thus this study is a global evaluation of the HIV, HBV, HCV and Syphilis in Chittagong area, Bangladesh.

A total of 287-blood samples were tested for anti-HIV (HIV), HBsAg (HBV) and VDRL tested for Syphilis, 218 samples were tested for anti-HCV (HCV). Only HBsAg and anti-HCV positive samples were tested for ELISA for more confirmation. Among the 287-studied population (male-232, female-55), 120 were students, 73 were service holders, 40 were businessmen, 14 were housewives and 40 were others (Immigrant workers, farmers etc).

In our study the overall prevalence of HIV among nonprofessional blood donors was 0% (Figure 1). Similar result was found in Dhaka city, Bangladesh (Shirin, *et al.*, 2000). So, nonprofessional blood donors were found free from HIV infection in Chittagong but some blood donors had a sexual relation to commercial sex workers or extra-married sex partners. These risky behaviors may accelerate the rate of HIV infection near the future. National AIDS and STD program, till December 2006 were reported 874 HIV cases, among them 240 have developed AIDS (Prothome-alo, 2007).The overall HIV prevalence of Bangladesh was <1% but the HIV

prevalence rate among the injecting drug users was increased day by day. Among the 10,368 people, the overall HIV prevalence was found 0.9% (Azim *et al*., 2008). The highest HIV rate was recorded in male Intravenous drug users (IDUs) from the capital city Dhaka (7%), and the rates have risen significantly. In India, the rate of HIV among blood donors was 0.084%, which was the highest in south Asia (Gupta *et al.*, 2004). Among the STDs attendants in India, HIV prevalence has been shown at 0.4% or higher (Mathai *et al.*, 1990). Previously it was thought that around 5 million people were living with HIV in India. It is now thought that around 2.5 million people in India are living with HIV (UNAIDS/ WHO, 2007).

Table 1. Comparative study of HBsAg, HCV and Syphilis among the studied nonprofessional blood donors according to socioeconomic status.

Study population	**HBsAg** (%)	**HCV** (%)	**Syphilis** (%)
Students	5.00%	00.00%	00.00%
Service holders	4.11%	00.00%	2.74%
Businessman	10%	5.71%	00.00%
House wives	00.00%	00.00%	00.00%
Others	2.50%	00.00%	00.000%

Table 2. Prevalence of HBsAg, HCV and Syphilis according to age groups among the non-professional blood donors.

Age ranges	**HBsAg %**	**HCV %**	**Syphilis %**
18-25 years	6.13%	00.00%	00.00%%
26-35 years	3.19%	1.54%	2.13%
36-50 years	3.57%	4.17%	00.00%
50 years	00.00	00.00%	00.00

Table 3. Prevalence of HBsAg, HCV and Syphilis among the nonprofessional blood donors according to sex.

Sex	**HBsAg %**	**HCV %**	**Syphilis %**
Male	5.17%	1.12%	0.86%
Female	3.64%	00.00%	00.00%

Table 4. Finding out the prevalence factors of HBsAg and HCV (anti-HCV) in positive donors.

Study donor	**HBsAg Positive**	**HBsAg Positive (%)**	**HCV Positive**	**HCV Positive (%)**
Unknown cause	10	71.43%	1	50.00%
Sex relation	3	21.43%	0	00.00%
Parents history	1	7.14%	0	00.00%
Drug reception history	0	00.00%	1	50.00%
Blood reception history	0	00.00%	0	00.00%

Table 5. Prevalence of HBsAg, HCV and Syphilis among nonprofessional blood donors according to religious believes.

Religions	**HBsAg** %	**HCV %**	**Syphilis %**
Muslims	4.18%	00.54%	0.84%
Hindus	13.33%	3.85%	00.00%
Buddhist	00.00%	00.00%	00.00%
Christian’s	00.00%	00.00%	00.00%

Table 6. Prevalence of HBsAg, HCV and Syphilis among nonprofessional blood donors according to area.

Area	HBsAg %	HCV %	Syphilis %
City corporation area	5.58%	0.60%	0.51%
Out of city corporation area	5.26%	00.00%	1.75%
Others districts	00.00%	9.10%	00.00%

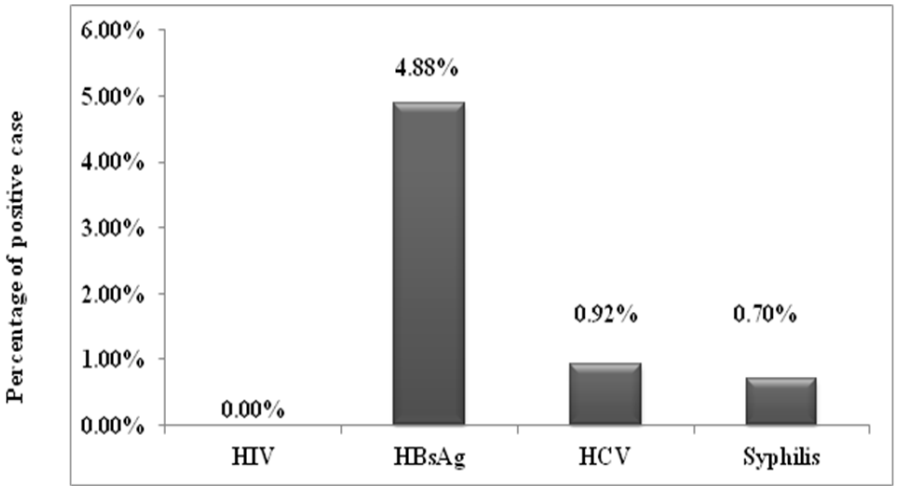

Figure 1. Comparative study of HIV, HBsAg, HCV and Syphilis among non-professional blood donors. X-axis represents the categories of sample tested and y- axis represents the percentage of positive case.

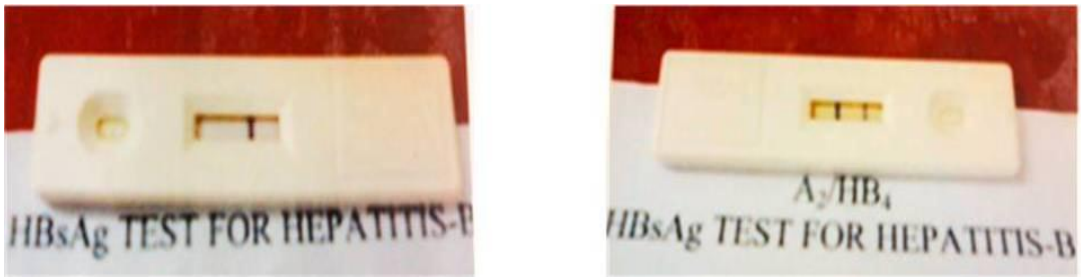

Figure 2. Photograph showing the HBsAg test for Hepatitis B virus (two line indicated positive result and one line indicated negative result).

The overall prevalence of HBsAg among the studied non-professional blood donors in Chittagong city were 4.88% (Figures 1 & 2). The prevalence of HBsAg was greater (10%) among the businessman than any others groups of our study (Table 1). We did not know specifically what factors was concerned for the transmission of HBV among the businessman but it was found that 21.43% positive donors had sexual relationship to the commercial sex workers or extra married sex partners, Even 7.14% positive donors informed about their parents that they (either father or mother or both) were carrier of Hepatitis B virus (Table 4). There was a significant difference between the prevalence of HBsAg of our study and studies done previously in Bangladesh. Previous studies reported that 20% professional blood donors (Mustafa *et al.*, 1989a), 3.6% healthy pregnant mothers (Akter *et al.*, 1992), 11% prostitutes (Mustafa *et al.*, 1989b), 15% children and 27.2% of adults patients with acute hepatitis (Islam *et al.*, 1984), 4.76% healthy children (Chowdhury, 1997), 4.4% non-intravenous drug users (Shirin *et al.*, 2000) were positive for HBsAg. In Bangladesh, the prevalence of HBsAg among apparently healthy people applying for jobs of foreign countries was 7.8% (Islam *et al.*, 1984) which was higher than that observed in our study. But these studies were specific to high risk groups, so these result should not considered as the general picture of prevalence of HBsAg in community of non professional blood donor. On the other

hand in the Yaounde University Teaching Hospital, Japan, found 10.7% HBsAg positive among the first time blood donors (Mbanya *et al.*, 2003) and 3% among the Sub-Saharan African voluntary blood donors (Batina *et al.*, 2007), which indicated the different prevalence rates in different regions. In a study carried out in another city, Dhaka, Bangladesh among commercial sex workers, 78.7% had serologic evidence of current or past HBV infection (Satter and Islam, 1996) whereas in our study overall HBsAg positive were 4.88%.

The overall prevalence of HCV among the studied non-professional blood donors in Chittagong city was 0.92% (Figure 1). The prevalence of HCV was greater (5.71%) in the businessman than any others groups of our study (Table 1). We did not know specifically what factors was contributed to transmission of HCV among the businessman but during our study, it was found that 50 % positive donors had an intravenous drug history (Table 4). There was a difference between the prevalence of HCV of our study and the studies which was done previously in Bangladesh. Previous studies reported that 1.2% professional blood donors (Chowdhury M.R., Medical Microbiology, 5th edition) were positive for HCV. But there was no work on the prevalence of HCV among non-professional blood donors in Bangladesh. On the other hand, 7.3 % anti-HCV positive among the blood donors in Gourgia (Butsahvili *et al.*, 2001) and 4.16% among the Pakistani blood donors (Bhatti *et al.*, 2007), which was indicated the different prevalence rates in different regions. But the incidence of HCV sero-positivity was 0.285% (Garg *et al.*, 2001) among the replacement blood donors in the Western India, which was approximately similar to our findings.

The overall prevalence of Syphilis among the study population was 0.72% (Fig 1). The prevalence of Syphilis was greater (2.74%) among the service holders than any others groups of our study (Table 1). The highest prevalence rate of Syphilis infection among service holders was unknown but some donors probably practicing unsafe sex. There was a difference between the prevalence of syphilis of our study and studies done previously in Bangladesh, Previous studies reported that 9.9% female IDUs and 8.6% female street-based sex workers were positive for Syphilis (Azim *et al.*, 2008). But there was no work on the prevalence of Syphilis among non-professional blood donors in Bangladesh. On the other hand, 4.7 % Syphilis positive among the voluntary and replacement blood donors in Dar es Salaam, Tanzania (Matee *et al.*, 2006) and 3.6% among the Sub-Saharan African blood donor (Batina *et al.*, 2007), which indicated the different prevalence rates in different regions. But the prevalence rate of syphilis positivity was 0.285% among the blood donors of Ludhiana, India (Gupta *et al.*, 2004), which was approximately similar to our findings. Butsahvili *et al.*, 2001 reported in Georgian blood donors that HBsAg was 4.1%, HCV was 6.9%, Syphilis was 2.3% and 3 were HIV positive. There was 7.9% positive for HIV, 10.7% for HBsAg, 4.8% for HCV, 9.1% for Syphilis among blood donors, University of Yaounde I, Yaounde, Cameroon (Mbanya *et al.*, 2003). This was higher than our study. In our study among the non-professional blood donors, the prevalence rate of HIV, HBV, HCV and Syphilis was 00.00%, 4.88%, 0.92%, and 0.72% respectively. But the sero- prevalence of anti-HIV, HBsAg, anti-HCV and Syphilis infection was 0%, 2.3%, 0.37%, and 0.02% among blood donors in Blood Center of Kocaeli University Hospital, Turkish (Mutlu *et al.*, 2005) which was approximately similar to our finding. In Germany among the blood donors HBsAg, HCV, Syphilis and HIV were reported 0.0853%, 0.1563%, 0.0048% and 0.0363% respectively (Offergeld, *et al.*, 2005)

In our study, a total of 287 samples were VDRL tested for Syphilis. The prevalence of Syphilis (VDRL) among the service holders (73) was 2.74 % (2). Higher prevalence of syphilis among the service holders may indicate the higher prevalence of HIV in the near future because HIV and syphilis is correlated with each other. In UK reported that 85% VDRL positive were found in HIV patients (Robinson and Evans, 1999). However no HIV positive were found in our study. This reports did not supported our study. The prevalence of syphilis was found 32.60% in street based FSWs, 57% were in brothel based in Dhaka, Bangladesh (Motiur *et al.*, 2000). This result is comparable with our neighboring country, where were found 24.2% & 22.9% syphilis in the Ahmedabad and Surat in India (Desai *et al.*, 2003). But the prevalence of syphilis among blood donors in Bangladesh was not well documented. In Bangladesh a cross sectional study among slum dwellers in Dhaka city, it was reported that the prevalence of Syphilis was 11.5% (Sabin *et al.*, 2003) that was higher than our finding. In another country UK, 85% VDRL positive were found in HIV patients. Sexually transmitted HIV patients may be in risk for other STIs (Robinson and Evans, 1999).

Transmission of syphilis via blood donation is not considered as major route in Bangladesh. Main mode of syphilis transmission in Bangladesh considered via sex relation. According to D'Costa *et al.*, 1985 Female Sex Workers (FSWs) was considered to be an important reservoir and high-risk groups for STIs and Human Immunodeficiency Virus. In Bangladesh, there are approximately 100,000 FSWs that are distributed in urban, suburban and rural areas. They either organized in brothels or worked as independent sex workers (Chowdhury,

1997). The prevalence of reproductive tract infections (RTIs) and STIs among females in the general population and among FSWs in Bangladesh was not well documented. In our study the prevalence rate of syphilis was 0.72%, which is not a matter of anxious for us because normal penicillin treatment is available.

The prevalence rate of HBsAg, HCV and Syphilis among blood donors and others risk groups were vary according to age (Table 2). In our study, prevalence of HBsAg was highest within 18-25(6.13%) years old; lower in 26-35(3.19%) years old and it was zero in above 50 years old, prevalence of HCV was found highest within 36-50(4.17%) years old, lower in 26-35(1.54%) years old and it was zero in 18-25 years old and above 50 years old and prevalence of Syphilis was highest within 18-25(6.13%) years old, lower in 26-35(3.19%) years old and it was zero in above 50 years old. A study in Central America reported that 11.5% HBsAg was found in the age groups of 6-8 years, 7.4% HBsAg in the age groups of 9-11years and 3% HBsAg in the age groups of 4-5 years (Chamberlins *et al.,* 1996). The virus is transmitted either during the period of breast-feeding or at primary school entry at 6-7 years of age.

In study of Koulentaki *et al.,* 2001 reported that HBsAg prevalence was found in the males were 5.4% and female were 3.09% respectively. In our study among the male samples 5.12% were HBsAg positive and female samples 3.64% were HBsAg positive, which was similar to previous study. We also found in male samples HCV was 1.12% and Syphilis 0.86% (Table 3).

We know that Hepatitis B virus is transmitted by blood, sexual contact, by birth, contact to body fluid etc. While our study, after getting any positive donor, we tried to find out by questionnaire what factors are contributed to transmit viruses (Table 4). In our questionnaire, 71.43% HBsAg positive donors was not aware of what factors are responsible for the transmission of Hepatitis B virus; 21.43% positive donors had sexual relationship to the commercial sex workers or extra married sex partners, Even 7.14% positive donors informed about their parents that they (either father or mother or both) were carrier of Hepatitis B virus. In similar questionnaire about the HCV study, 50% HCV positive donors was not aware of what factors are responsible for the transmission of Hepatitis C virus; 50% positive donors informed that they taken intravenous drug.

In our study 71.43% HBsAg and 50% HCV positive donor did not know about the route of HBsAg and HCV transmission, which indicated that the blood donors are unconscious and illiterate. So we can suggest that government and non-government organization taken special attention for HBV, HCV infection by blood donation.

Prevalence of HBsAg was found higher in Hindus than Muslims in Chittagong area. Among 287 studied samples, 239 were Muslims, 30 were Hindus, 17 were Buddhist and 1 were Christian's. Among 239 Muslims 10(4.18%) were HBsAg positive, whereas among 30 Hindus 4 (13.33%) were HBsAg Positive but there was no positive case in Buddhists and Christian's. Prevalence of HCV was higher in Hindus than Muslims in Chittagong area. Among 186 Muslims 1(0.54%) were HCV positive, whereas among 26 Hindus, 1(3.85%) were HCV Positive but there was no positive case in Buddhists and Christian's. Prevalence of Syphilis was higher in Muslims than any others groups in Chittagong area. Among 239 Muslims 2(0.84%) were Syphilis (VDRL) positive, but there was no positive case in Hindus, Buddhists and Christian's (Table 5).

We divided our study subjects from three different areas including city corporation area, out of city corporation area (but including Ctg. Dist.) and other dist (Table 6). Among the 287 HBsAg samples, 197 blood donors were City Corporation area, 57 were out of City Corporation area (but including Ctg. Dist.), 13 were others dist. The highest prevalence rates of HBsAg (5.58%) were found among the blood donors who lived in city corporation area. The prevalence rate of HBsAg among out of city corporation area were 5.26%, other dist. were 0%. It was not clear what factors were contributed to prevalence of HBsAg in city corporation area, most probably reception of unscreening blood, sex relation to available sex workers. Among the 218 HCV blood samples, 166 blood donors were City Corporation area, 41were out of City Corporation area (but including Ctg. Dist.), 11 were others dist. The highest prevalence rates of HCV were found among the blood donors who lived in others districts (9.10%). The prevalence rates of HCV among city corporation area were 0.60% and out of city corporation area were 0 %. Among the 287 Syphilis samples, highest prevalence rates of Syphilis were found among the blood donors who lived in out of city corporation area (1.75%). The prevalence rate of syphilis among the city corporation area was 0.51% and other dist. was 0%.

There were several reports supporting the fact that prevalence of HBsAg differs geographically, even the picture of two neighboring villages is different. This variation depends on various local, ethnic, socio-economic, cultural, geographical, religious and other factors (Sobeslavsky, 1980). Another possible reason of high prevalence of HBsAg was the methodology of the study (Islam *et al.,* 1984).

4. Conclusions

In conclusion we can say that in global circumstances, Bangladesh is among those countries with a low prevalence of HIV and HCV but higher prevalence rate of HBsAg and Syphilis. However, high risk behaviors including selling of professional blood, unprotected sex between commercial sex workers, sharing of injection equipments among injecting drug users (IDUs), lack of knowledge about route of HIV, HBV, HCV and Syphilis transmission and the exponential spread of the disease in neighboring countries push Bangladesh at high risk of an HIV, HBV, HCV and syphilis epidemic. It is important to screen all blood products before reception and stop professional blood donation. Taken special attention for youth blood donors because youth blood donors had sexual relationship to the commercial sex workers or extra-married sex partners. The Government of Bangladesh, along with Non- Government Organization has created awareness about HIV, HBV, HCV and Syphilis infection. Hepatitis B free person should be taken Hepatitis B vaccine and Government should include Hepatitis B Vaccine as immunization programs.

Conflict of interest

None to declare.

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