

Original Article

Prevalence of Transfusion Transmissible Infections (HBV, HCV, HIV and *Treponema pallidum* in Volunteer Blood Donors in Shirajganj District

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Blood and its components are essential for life and often required to be transfused in critical health condition. However, such transfusion is reported to be associated with the risk of transfusion transmissible infections (TTIs) with notable pathogens e.g. Hepatitis B virus (HBV), Hepatitis C virus (HCV), Human immunodeficiency virus (HIV) and *Treponema pallidum*. These pathogens are of major public health concern especially in developing countries like Bangladesh. Increase in the number of TTIs is found to be associated with improper management of safe blood transfusion protocol (SBTP) and unethical practices. This study focuses on the prevalence of such TTIs in volunteers' blood collected between October and December 2018 from Sakhawath Memorial and Avicina Hospitals in Shirajganj district. Prevalence rate of HIV, HBsAg, HCV and *Treponema pallidum* were 1.2%, 6.8%, 0.8% and 1.6%, respectively. Among the infected individuals, 75% HIV positive cases were professionals, 70% HCV infected cases were from other professional groups and 50% of syphilis infected were homemakers. Male donors showed higher incidence rate of HBV (65%), HCV (72%) and HIV (85%) compared to the female donors. Although the findings of the study showed prevalence of TTIs in volunteer blood donors (VBDs) at an alarming rate, most of the infected individuals were not aware of their infections and potential risk of transmission from them. It is necessary to create awareness among blood donors about possible causes of transmission and prevention of infection. Such initiative from both governmental and non-governmental organizations can help reduce TTIs among VBDs.

Keywords: Blood donor, TTI, pathogenic bacteria

Introduction

More than 112.5 million units of blood are collected from donors' every year worldwide¹. If safe blood transfusion is not performed, it can be life-threatening due to the transmission of blood-borne pathogens called transfusion transmissible infections (TTIs). TTIs include human immunodeficiency virus (HIV), hepatitis A, B, C, D, *Treponema pallidum*, malaria, West Nile virus (WNV), Cytomegalovirus (CMV), Human T-cell lymphotropic viruses (HTLVs), Parvovirus B19, etc.² According to CDC, TTIs may also result from new or emerging infectious agents e.g. new variant Creutzfeldt-Jacob Disease and recently emerging Chikungunya virus, with potential of transmission from person-to-person²⁻³. Globally, 170 million people are chronically infected with HCV, 350 million people with HBV and 38 million people are infected with HIV⁴. To assure the quality and safety, World Health Organization (WHO) recommends screening of at least major TTIs in donated blood⁵. It is estimated that 0.6 million units of blood are required annually in Bangladesh. All donated units of blood in the country must be screened for HIV, Hepatitis B and C, syphilis and malaria as per the Safe Blood Act 2002 and Safe Blood Transfusion Program (SBTP)⁶. In 2010, the prevalence of TTI markers was found to be <1%⁶. However, the number of HIV and other TTIs is increasing in Bangladesh. To realize the true picture of TTIs in Bangladesh small rural districts should also be studied in addition to large city corporations e.g. Dhaka,

Chittagong, etc. In the present study, prevalence of HIV, HBV, HCV and *Treponema pallidum* was investigated among volunteer blood donors in Shirajganj district, Bangladesh.

Materials and Methods

Study design

The study was conducted in two laboratories of Sakhawat H. Memorial Hospital and Avicina Hospital in Shirajganj districts. The study was carried out over a period of three months, between October and December, 2018. A total of 250 samples were studied during this sampling period. HBsAg, anti-HIV, anti-HCV and VDRL tests were conducted on the collected blood. Rapid test kits were used for all screening. Prevalence rates were calculated for the Transfusion-Transmissible Infections per hundred donations.

Sample Preparation

Blood samples (5 cc) were collected from donated blood bags and transported in sterile test tubes and allowed to stand at room temperature for 10 minutes. Then the blood was centrifuged at 2000 revolution per minute for 5 minutes. Serums were collected in Eppendorf tubes and stored at -20°C until use.

Detection of Antigen/Antibody

Anti-HIV, HBV Surface Antigen (HBsAg), anti-HCV and anti-TP (Syphilis) was screened by Rapid Test kits. Information of test kits are given below-

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Epidemiological Study

Along with antigen detection a survey was conducted with questionnaire filled by the VBDs for thorough investigation of TTIs in different gender, age groups, and professional groups and to understand the underlying reasons of these infections.

Statistical analysis

All positive samples were repeated 3 times before labeling as seropositive and respective blood units were discarded. All data were analyzed by Microsoft-EXCEL 2016 ⁷.

Results and Discussion

This study was conducted for three months between October 2018 and December 2018 to determine the prevalence of TTIs in blood donated by volunteer blood donors. A total of 200 samples from Sakhawath Memorial Hospital and 50 samples from Avicina Hospital Ltd., Shirajganj were included in this study. Comparative results for both the donors from these hospitals are shown in Table 4.1. The proportions of HIV, HBV, HCV and syphilis positive samples were not significantly different between the two hospitals (p<0.01).

Table 2 shows the incidence of infections due to HBV, HCV, HIV and *Treponema pallidum* in both male and female donors. Numbers of male and female donors were 198 and 52, respectively. There was no significant difference of such infections in male and female donors (p<0.01). In our study, most prevalent

TTIs was found to be HBV, 6.8%; Syphilis, 1.6%; HIV, 1.2% and HCV, 0.8%.

Results of blood screening tests were further analyzed for different professionals e.g. students, service holders, business personnel, home makers and others. Table 3 shows that 75% of service holder were found to be infected with HIV; 70% were infected with HCV other professional groups and 50% of syphilis patients were home makers.

Occurrence of infections with HBV, HCV, HIV and *Treponema pallidum* in different age groups of volunteer blood donors is shown in Table 4. It was found that young and middle aged donors of 18-35 years were mostly affected by the mentioned pathogens.

Frequency of infections of HBV, HCV, HIV and *Treponema pallidum* in male and female donors is shown in Table 5. There was no significant difference between the male and female groups of blood donors (p<0.01).

Table 6 shows data was analyzed for possible reasons of such infections such as, HBV, HCV, HIV and *Treponema pallidum*. Pre-donation survey questionnaires was used for collecting data on previous history such as, unprotected sex, parental history, intravenous drug reception fusion of blood or blood components and other than these are considered unknown causes. It was found that most of the infected donors showed positive result due to unknown reasons (61.0-90.0%). The second highest cause was sex relation as per the information provided in the survey form.

Table 1. Details of the kits used in this study

Kit Used	Marker	Other Information
ABON, USA	Anti-HIV	Sensitivity:100% Specificity 99.7%
ABON, USA	HBsAg	Relative Sensitivity >99% Relative Specificity 96.7% Accuracy 98.3%
ABON, USA	Anti-HCV	Relative Sensitivity >99.5% Relative Specificity 99.78% Accuracy 99.85%
ABON, USA	Anti-TP	Relative Sensitivity 99.5% Relative Specificity 99.8% Accuracy 99.7%

Table 2: Proportions of HIV, HBV, HCV and syphilis positive samples in donated blood samples in two hospitals in Shirajganj district

Study sites	Samples screened	HIV positive	HBV positive	HCV positive	Syphilis positive
Sakhawath Memorial Hospital Shirajganj	200	2 (1.0 %)	12 (6.0 %)	1 (0.5 %)	2 (1.0 %)
Avicina Hospital Ltd. Shirajganj	50	1 (0.4 %)	5 (10.0 %)	1 (0.4 %)	2 (0.8 %)
Total	250	3 (1.2 %)	17 (6.8 %)	2 (0.8 %)	4 (1.6 %)

Table 3: Results of blood screening test for male and female donors

Screening Status		Male (n=198)		Female (n=52)		Total patients screened (n=250)	
HIV	Reactive	3	1.5 %	0	0 %	3	1.2 %
	Non-reactive	195	98.4 %	52	100 %	245	98.0 %
HBV	Reactive	15	7.5 %	2	3.8 %	17	6.8 %
	Non-reactive	183	73.2 %	50	96.1 %	233	93.2 %
HCV	Reactive	2	0.8 %	0	0 %	2	0.8 %
	Non-reactive	196	78.4 %	52	100 %	248	99.2 %
Syphilis	Reactive	1	0.4 %	3	5.2 %	4	1.6 %
	Non-reactive	195	78.0 %	49	94.2 %	246	98.4 %

Table 4. Incidence of HBV, HCV, HIV and *Treponema pallidum* infections among volunteer blood donors from different professional groups

Study population	HBsAg (%)	HCV (%)	HIV (%)	Syphilis (%)
Students	25 %	0 %	0 %	0 %
Service holders	30 %	30 %	75 %	45 %
Business personnel	05 %	0 %	0 %	0 %
Home makers	10 %	0 %	0 %	50 %
Others	30 %	70 %	25 %	5 %

Table 5. Incidence of HBV, HCV, HIV and *Treponema pallidum* infections in different age groups of blood donors

Study population	HBsAg (%)	HCV (%)	HIV (%)	Syphilis (%)
18-25 years	09	00	02	01
26-35 years	05	01	01	02
36-50 years	03	01	00	01

Table 6: Incidence of HBV, HCV, HIV and *Treponema pallidum* in male and female blood donors

Study population	HBV (%)	HCV (%)	HIV (%)	Syphilis (%)
Male	65.0	72.0	85.0	45.0
Female	35.0	28.0	15.0	55.0

Table 7: Possible causes of infections due to HBV, HCV, HIV and *Treponema pallidum* in volunteer blood donors

Study population	HBsAg (%)	HCV (%)	HIV (%)	Syphilis (%)
Unknown cause	61 %	90 %	80 %	85 %
Unprotected Sex	12 %	00 %	15 %	10 %
Parental history	02 %	00 %	05 %	00 %
Intravenous Drug reception	00 %	00 %	00 %	00 %
Transfusion of blood or blood components	25 %	10 %	00 %	00 %

Discussion

Blood transfusion is a potential route for the transmission of HIV, HBV, HCV and *Treponema pallidum*, which are commonly known as Transfusion Transmissible Infections (TTIs)^{8,9}. Considering the high morbidity and mortality rate of these TTIs a number of studies have been going on to determine the prevalence, risk factors and prevention mechanism of such

infections. In Bangladesh Prevalence of HIV, HBV, HCV and Syphilis infection has been investigated in selected regions, like Chittagong¹⁰, Khulna⁷, Dhaka¹¹ etc. and in groups professional blood donors¹²⁻¹³, pregnant mothers¹⁴, children¹⁵, patients with acute hepatitis¹⁶, prostitutes¹⁷, female sex workers¹⁸, drug users¹⁹ etc. However, volunteer blood donors from rural settings are underrepresented in these studies. In this study, we focused on

the prevalence of TTIs (HIV, HBV, HCV and *Treponema pallidum* infection) in non-professional blood donors from an under represented district, Shirajganj.

World Health Organization (WHO) has ranked HIV/AIDS as the 6th deadliest disease for human, as it caused almost 1.78 million deaths resulting in 3.1% of total human death. In Bangladesh current prevalence rate of HIV is <0.01% but this trend is going upwards²⁰. Since the detection of the first HIV-positive person in 1989, the current HIV-statistics stands with around 13,000 people living with HIV of which 4,400 are women, only 2470 infected patients are on antiretroviral therapy, and 1100 died²⁰⁻²¹.

Prevalence rate of HIV positive individual is less than 0.01% which categorizes Bangladesh to be a low HIV-prevalence country. Even in the high risk or key population (sex worker, intravenous drug user, worker returning from foreign countries), the percentage is near 1%²². In this study prevalence rate of HIV was found 1.2%. In previous studies prevalence of HIV among nonprofessional blood donors was found to be 0% in both Dhaka¹⁹ and Chittagong city¹⁰. But a recent study demonstrated 10% increase in the number of new HIV infections each year²⁰⁻²¹, which explains the high prevalence rate in our study. Again, when gender based prevalence was observed, prevalence rate of HIV was higher in male population (1.5%) within the age group of 18-35 years than in female population (0%) and transgender or hijra community (who are also considered high risk group)²³ was not included in this study. 75% of the HIV positive individuals were service holders and 25% were from other (farmer, unemployed etc.) professional groups. In a number of studies sex workers, drivers of heavy load vehicles and workers returning from foreign countries were found to be highly infected professional groups. In present study, 80% HIV infected patient were unaware of their infection, 15% was infected due to unprotected sexual behavior and 5% had parental history or vertical transmission. HIV infection due to intravenous drug reception, reception of blood or blood related product was not found in our study however, Azim *et al.*, 2008 found, 7% HIV infection was attributed to intravenous drug users in Dhaka.

Among the TTIs, HBV is found to be most prevalent infection. According to the World Health Organization (WHO) reports, the prevalence of HBV varies from 0.008% to 6.08% in different parts of the world²⁴. According to past reports, Prevalence of HBsAg was reported 7.8% in apparently healthy people in Bangladesh who applied for jobs in foreign countries¹⁶ and 4.88% in non-profession blood donors¹⁰. This study shows the prevalence of HBsAg in 6.8% in non-professional blood donors of Shirajganj district. Most of the previous studies were specific for donors of a particular region and specific groups hence cannot be considered as the general scenario of HBsAg prevalence in the community of non-professional blood donors. In other studies 10.7% first time blood donors and 3% voluntary blood donors were HBsAg positive in Japan²⁵ and Sub-Saharan African²⁶

respectively. A research conducted on commercial sex workers in Dhaka city, Bangladesh demonstrated that 78.7% had serologic evidence of current or past HBV infection¹⁷. In this study the age of volunteer blood donors was 18-50 years and 79.2% was male and 20.8% was female donors. HBsAg positive results were mostly showed by Service holder (30%), other group (30%), student (25%) and home maker (10%). Again a significant portion of individual was infected by unknown reasons (61%) and transfusion of blood or blood related products (21%).

According to a report by WHO, the prevalence of HCV is 0.004% to 1.96% in different parts of the world²⁴. In our study HCV prevalence was found to be 0.8%. All the infected individuals were male donors, 75% were service holder and 25% were from other professions. Whereas, in Chittagong, prevalence of HCV was 0.92% and 100% of positive individual (5.71% of blood donors) were businessman and about 50 % positive donors had an intravenous drug reception history^{10,23}. Another study reported that 1.2% professional blood donors were positive for HCV²⁷, anti-HCV was found to be positive in 7.3% among the blood donors in Gourgia²⁸, 4.16% among the blood donors in Pakistan²⁹, and 0.285%³⁰ among the replacement blood donors in the Western India¹⁰.

VDRL test for *Treponema pallidum* showed the prevalence of 1.6% among non professional blood donors of Shirajganj district. Among the infected individuals, aged between 26-50 years 75% were female and 25% were male donors. According to one report, incidence of Syphilis was greater among the service holders (2.74%) who were within the age group of 26-35 years¹⁰. The highest prevalence rate of syphilis infection among service holders was unknown but there are possibilities of sexual transfer of such infections.

Prevalence of syphilis was found to be 32.60% in street based, 57% were in brothel based female sex workers (FSWs) in Dhaka, Bangladesh¹⁸. This result is comparable with our neighboring country, where FSWs were found 24.2% and 22.9% syphilis-positive in the Ahmedabad and Surat in India³¹. But the prevalence of syphilis among blood donors in Bangladesh was not well documented. A cross sectional study among the slum dwellers in Dhaka city Bangladesh showed higher incidence of Syphilis, 11.5%³² than the present study (1.6%).

Conclusion

The incidence of TTIs in blood donated for transfusion at Shirajganj is high compared to national context. Known that all donors are voluntary, therefore proper screening of donated blood for HIV, HBsAg, HCV and *Treponema pallidum* with test methods having better diagnostic performance should be employed. It is important to screen all blood products before reception and stop professional blood donation according to WHO an SBTA Stringent donor selection, encouragement of blood donation from voluntary donors and creating awareness from both government and non government organizations (NGO)

should be strengthened. Finally, vaccination for TTIs should be made affordable or free of cost if possible to all blood donors.

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