ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.ijrps.com

Prevalence of transfusion transmissible infection in blood donors at tertiary care centre of Eastern Uttar Pradesh

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Article History:

Received on: 08 Mar 2020
Revised on: 23 Mar 2020
Accepted on: 23 Apr 2020

Keywords:

Blood Bank,
Sero-prevalence,
TTI,
Voluntary Blood Donation,
Replacement Blood Donation

ABSTRACT

Microbiological safety is very important aspect of blood transfusion services (BTS). Viral infectious agents possess a great risk of transfusion transmitted disease. On the one hand, blood or component transfusion is a lifesaving modality but on the other hand it can cause great mortality or morbidity in recipient if not used judiciously. The main aim of the study is to evaluate the prevalence of HIV, HBV, HCV, Syphilis and Malaria amongst all types of donors donated at blood bank of Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi during the year 2017. This was a retrospective study. Total donation during that period was 22255 units. A detailed questionnaire was given to the donors for registration. A total of 226 units (1.01%) were seropositive. The sero-prevalence of HIV, HBV, HCV, and Syphilis were 0.9% (21), 0.79% (177), 0.09% (22), 0.02% (6) respectively. No cases of malaria were detected. TTI can be reduced by motivating maximum voluntary blood donation, reducing replacement donation, public information and donor education awareness programme, stringent donor screening criteria and vigilance of error.

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ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i4.3139

Production and Hosted by

IJRPS | www.ijrps.com

INTRODUCTION

On the one hand, blood or component transfusion is a lifesaving modality but on the other hand it can cause great mortality or morbidity in recipient if not used judiciously. Due to implementation of stringent blood donor and other blood safety criteria, the blood or component transfusion is safe but is not of without risk. Microbiological safety is very important aspect of blood transfusion services (BTS). Microbial agents that are transmitted through the blood or component transfusion are of great concern even blood is collected

from the voluntary donors. Viral infectious agents possess a great risk of transfusion transmitted disease. Asymptomatic carriers in the society, window period of the infectious agents, concealing medical history by the donors carries great risk of transmission of disease (Choudhury and Phadke, 2001). There are numerous viruses, bacteria, and parasites that can be transmitted through blood transfusion. Important ones are Human Immunodeficiency Virus (HIV I/II), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Syphilis, and Malaria. Characteristics of infectious agents that can be transmitted through blood or component transfusion are (World Health Organization, 2012).

1. Presence of agents in the one or more components of blood for long period and in infectious form
2. Stability at temperatures at which blood or components are stored
3. Generally long incubation period before the appearance of clinical sign and symptoms
4. Asymptomatic phase or only mild symptoms in blood donors, thus it can miss during donor selection procedures

The WHO recommends mandatory screening of all donated blood units for following infectious agents by markers like

1. HIV-1 & HIV-2: screening for either a combination of HIV antigen-antibody or HIV antibodies
2. Hepatitis B: screening for hepatitis B surface antigen (HBsAg)
3. Hepatitis C: screening for either a combination of HCV antigen-antibody or HCV antibodies
4. Syphilis (Treponema pallidum pallidum): screening for specific treponemal antibodies.

The national blood policy India included mandatory screening of Malaria in addition of WHO recommendation.

Accurate estimate of risk of TTI are essential for the monitoring of safety of blood supply and evaluating the efficacy of the currently employed screening procedures (Gupta *et al.*, 2011). Globally 2000 million people are infected with HBV and among them 350 million are chronic carriers of the disease. On the basis of prevalence of chronic Hepatitis B Virus infection, world has been divided into three areas as high (> 8%), intermediate (2-8%) and low (< 2%) (World Health Organization, 2002). India belongs to intermediate HBV endemic zone with approximately 37 million chronic carriers (Shah *et al.*, 2013; Puri, 2014). The predominant mode of spread of HCV in India is blood or component transfusion and unsafe therapeutic injections while most common mode of its transmission in developed countries is IV drug abuse (Mukhopadhyaya, 2008). HCV is a single stranded RNA virus of Flaviviridae family. It has 6 genotypes from 1 to 6. The prevalent HCV Genotype in India is 3 (Satendra *et al.*, 2016). Persistence of HBV and HCV infection can lead to chronic liver disease, Cirrhosis of liver and hepatocellular carcinoma (HCC).

Table 1: Blood Group wise donors

Blood Group	Total
A Positive	4959 (22.3%)
A Negative	116 (0.5%)
B Positive	7480 (33.6%)
B Negative	340 (1.5%)
AB Positive	1947 (8.7%)
AB Negative	203 (0.9%)
O Positive	6935 (31.2%)
O Negative	275 (1.2%)

As per report of NACO 2017, India has an estimated 21.40 (15.90- 28.39) lakh people living with HIV (PLHIV). Uttar Pradesh had 1.34 lakh (1.018-1.776) PLHIV with HIV incidence per 1000 uninfected population less than 0.05 (National AIDS Control Organization , 2017). Syphilis is mostly transmitted through direct contact with a syphilis sore during vaginal, anal or oral sex. It may be transmitted by blood and blood products donated by asymptomatic donors harbouring the infection (World Health Organization, 2014). Prevalence of Syphilis is low in most of the studies related to blood or component transfusion.

MATERIALS AND METHODS

This study was carried out at blood bank, Sir Sunderlal Hospital of Institute of Medical Sciences, Banaras Hindu University from January to December, 2017. The donors included in this study include all donors of blood donation camps organized by blood bank and coming directly to blood bank. Total donation during that period was 22255 units.

A detailed questionnaire was given to the donors for registration. This includes information regarding previous blood transfusion & illness, occupation,

Table 2: Sero-prevalence in total donation

Infectious Agent	Total donation (n=22255)	Male (n=21634)	Female (n=621)
HIV	21 (0.09%)	20 (0.09%)	1 (0.16%)
HBV	177 (0.79%)	174 (0.8%)	3 (0.48%)
HCV	22 (0.09%)	21 (0.09%)	1 (0.16%)
Syphilis	6 (0.02%)	6 (0.02%)	Nil
Malaria	Nil	Nil	Nil
Total	226 (1.01%)	221 (1.02%)	5 (0.8%)

Table 3: Blood Group wise Seropositivity

Blood group	HIV (n=21)	HBV (n=177)	HCV (n=22)	Syphilis (n=6)	Malaria
A Positive	6 (28.6%)	38 (21.5%)	5 (22.7%)	0	Nil
A Negative	0	0	0	0	Nil
B Positive	9 (42.9%)	58 (32.8%)	5 (22.7%)	1 (16.7%)	Nil
B Negative	1 (4.8%)	3 (1.7%)	2 (9.1%)	0	Nil
AB Positive	1 (4.8%)	14 (7.9%)	1 (4.5%)	2 (33.3%)	Nil
AB Negative	0	2 (1.1%)	0	0	Nil
O Positive	4 (19%)	58 (32.8%)	9 (40.9%)	3 (50%)	Nil
O Negative	0	4 (2.3%)	0	0	Nil

Table 4: Age Group wise Seropositivity

Age Group (years)	HIV (n=21)	HBV (n=177)	HCV (n=22)	Syphilis (n=6)	Malaria
18-30	15 (71.4%)	113 (63.8%)	16 (72.7%)	3 (50%)	Nil
31-40	5 (23.8%)	43 (24.3%)	5 (22.7%)	3 (50%)	Nil
41-50	1 (4.8%)	19 (10.7%)	1 (4.5%)	0	Nil
51-60	0	2 (1.1%)	0	0	Nil

high risk behaviour, tattoo marks, history of any surgery, consent to participate in study and others. After successful completion of registration, donors were tested for haemoglobin (Hb) and weight (Wt). A detailed history and physical examination were done as per donor's selection criteria. Those who had Hb less than 12.5 gm/dl or weight less than 45Kg were temporarily differed.

The routine screening for donated units of blood was done for HIV, HBV, HCV, Syphilis and Malaria. Screening for HIV (4th generation, Erba Diagnostics MannheinGmbh, Germany), HBV (Meril Diagnostic Pvt Ltd, India) and HCV (3rd generation, Erba Diagnostics MannheinGmbh, Germany) was done by ELISA method, Syphilis (Coral Clinical System, Tulip, India) by RPR method while Malaria (Viola Diagnostic System, Tulip, India) by Rapid method. All the sero-reactive samples were tested repeat before labelling them as reactive. The sero-reactive donor was informed confidentially about the test report and referred to voluntary counselling and testing centers. The reactive blood bags were discarded as per the protocols.

RESULTS AND DISCUSSION

Total donation during that period was 22255 units. Male comprised of 21634 (97.2%) and female 621 (2.8%) with M: F ratio 34.84:1. Total voluntary and replacement donation were 17628 (79.2%) and 4627 (20.8%) respectively. Amongst voluntary donation, male were 17043 (96.68%) while female were 585 (3.32%). There were 4591 (99.21%) males and 36 (0.79%) females in replacement donation. Of the total donation, the most common blood group was B positive while least common was A negative (Table 1). Amongst total donation, 226 units (1.01%) were seropositive. Sero-prevalence in voluntary and replacement donation was 0.81% (181) and 0.2% (45). Among all donors, 221 (1.02%) males and 5 (0.8%) females were sero-reactive. The

Table 5: Comparative study of TTI prevalence rate in different parts of India

Place	No. of Years of study	Year of study	Total number of donation	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)	Reference
Southern Haryana	3.5	Oct. 2002 – April 2006	5849	0.3	1.7	1.0	0.9	(Arora *et al.*, 2010)
Maha-rashtra	2	Jan 2009-Dec 2010	5661	0.07	1.09	0.74	0.07	(Giri *et al.*, 2012)
Andhra Pradesh	6	2004-2009	8097	0.39	1.41	0.84	0.08	(Bhawani *et al.*, 2010)
Ahmed-abad	7.5	Jan 2006-July 2013	92,778	0.162	0.977	0.108	0.234	(Shah *et al.*, 2013)
Delhi	6	Jan 2003-Dec 2008	157,466	0.35	1.66	0.65	2.8	(Gupta *et al.*, 2011)
Kolkata	1	2011	24320	0.6	1.41	0.59	0.23	(Karmakar *et al.*, 2014)
Darjeel-ing	3	2010-2012	28,364	0.42	1.24	0.62	0.65	(Mandal and Mondal, 2016)
Jaipur	14	2002-2015	706853	0.15	1.83	0.28	0.75	(Sharma *et al.*, 2018)
Present Study	1	2017	22255	0.09	0.79	0.09	0.02	(Satendra *et al.*, 2016)

sero-prevalence of HIV, HBV, HCV, and Syphilis were 0.9% (21), 0.79% (177), 0.09% (22), 0.02% (6) respectively. No cases of malaria were detected. Sero-prevalence in male and female is shown in Table 2 . None of the blood group A Negative donors were seropositive. This may be a chance as incidence of this blood group in general population is very low. Blood group-wise Seropositivity was shown in Table 3. No cases of co-infection were found in the study. Most of the reactive samples were in age group 18-30 years (Table 4).

Blood and component transfusion is a lifesaving therapeutic option in many acute and chronic disease conditions. Transfusion of blood and its product is not always safe as it is mandatory screened for only five infectious agents and thus it is not sterile. Blood collected from the voluntary donors are supposed to be safe as compared to the replacement donors. There are various studies on TTI from the different parts of the India but few studies are seen from the Uttar Pradesh and very few from this region. Studies regarding the sero-prevalence of TTI in various studies from (Arora *et al.*, 2010; Giri *et al.*, 2012; Bhawani *et al.*, 2010; Karmakar *et al.*, 2014; Mandal and Mondal, 2016; Sharma *et al.*, 2018) are shown in Table 5. Our study shows highest prevalence of HBV amongst all donated blood, while overall prevalance of TTI amongst these studies is low. None of the donors were positive for malaria.

We have studied several articles from India; none of them have seropositive for malaria parasite except one study from rural Darjeeling by Mandal R et al., 2016 who reported a case of malaria. This may be due to the sensitivity of the testing material or duration of the study.

Our study does not show any correlation between sero-prevalence of HIV and Syphilis in but several authors find a positive correlation between two (Gupta *et al.*, 2011). All the female donors of our blood bank were negative for syphilis.

There is serious concern of CMV TTI in transfusion dependent patients as the donated blood is not screened for this. The prevalence of CMV IgG antibody in Indian population is 90% but many of them are non-infectious. It became very difficult to separate infectious blood unit from non-infectious. Screening of blood products for CMV is not cost effective in country like India. So prevention of transfusion associated CMV can be done by provision of inline leucocyte filtered blood products (Choudhury and Phadke, 2001).

CONCLUSIONS

Although there is decreasing trend of transfusion associated infection, but the donors of window periods are of great concern. Many centers are now using Nucleic Acid amplification Testing (NAT) method to reduce this. But, this is a cost limiting factor India. Factors such as, motivating maximum voluntary blood donation, reducing replacement donation, public information and donor education awareness programme, stringent donor screening criteria and vigilance of error will help in reducing TTI.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

Funding Support

The authors declare that they have no funding support for this study.

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