ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 15, Issue 9, 2022

Online - 2455-3891
Print - 0974-2441

Research Article

SEROPREVALENCE OF TRANSFUSION TRANSMISSIBLE INFECTIONS AMONG BLOOD DONORS AT A TERTIARY CARE TEACHING HOSPITAL IN AJMER, RAJASTHAN: A 5 YEAR STUDY

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Received: 20 July 2022, Revised and Accepted: 26 August 2022

ABSTRACT

Objective: The objective of the study was to study the seroprevalence of TTIs (transfusion transmissible infections) among blood donors from the records (June 2017–May 2022) at blood center, JLN Hospital and associated group of Hospital, Ajmer, Rajasthan.

Methods: A cross-sectional study was carried out over a period of 5 years from June 2017 to May 2022. Serum samples were screened for hepatitis B virus (HBV), hepatitis C virus (HCV) (III generation ELISA), antibodies to human immunodeficiency virus (HIV) Type 1 and 2 (IV generation ELISA kits), Syphilis and Malaria parasite using modified Treponema pallidum hemagglutination test and rapid card test, respectively.

Results: A total of 75,034 healthy donors were included out of which majority of donors were male (97.4%). The overall seroprevalence of HIV, HBV, HCV, Syphilis, and Malaria were 0.07%, 0.71%, 0.06%, 0.29%, and 0.05%, respectively.

Conclusion: Methods to ensure a safety blood supply should be encouraged. The increase in public awareness regarding voluntary blood donation, meticulous donor screening, counseling and use of highly sensitive tests can help in reducing the risk of TTIs.

Keywords: Hepatitis C virus, Human immunodeficiency virus, Seroprevalence.

 DOI: http://dx.doi.org/10.22159/ajpcr.2022v15i9.46206. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Blood transfusion is a lifesaving intervention in an accident, in case of anemia and other hematological diseases. It was discovered by James Bundell in 1818 [1]. Like all other medical interventions, it also has different adverse effects and risks. Most important risk is chances of acquiring transfusion transmitted infections (TTI). There is 1% chance of adverse effects including TTI with every unit of blood. Globally, more than 81 million units of blood are donated each year. Providing safe and adequate blood should be an integral part of every country's national health-care policy and infrastructure. Timely transfusion of blood saves millions of lives, but unsafe transfusion practices puts millions of people at risk of TTIs [2]. Government of India has started screening of blood unit for hepatitis B virus (HBV) since 1971; Human Immunodeficiency virus (HIV) since 1989; hepatitis C virus (HCV) since 2001 [3,4] In spite of screening we cannot detect these diseases in their Window Period. More than 18 million units of blood are not screened for TTIs [5].

The diseases transmitted through blood transfusion are - HIV, HBV, HCV, syphilis, malaria, and infrequently cytomegalovirus, Epstein Barr virus, brucellosis, etc. Preventing transmission of these infectious diseases through blood transfusion presents one of the greatest challenges of transfusion medicine. As per guidelines of the ministry of health and family welfare (Government of India) under The Drug and Cosmetic Act, 1945 (amended from time to time), all the blood donations are to be screened against the five major infections namely HIV I and II, HBV, HCV, syphilis, and malaria [6,7].

India lies in an intermediate zone of HBV endemicity with the prevalence of 2–8% in general population and 1–2% in blood Donor [8-10]. Seroprevalence of HCV in blood donors in India is 0.12–2.5% and in general population it is <2% [11,12]. Global seroprevalence of HCV in blood donors is 0.4–19.2% [13]. Seroprevalence of HIV in adult population is 0.26% in 2015 with 2.39 million people living with HIV or AIDS [14]. Blood transfusion increases the risk of transfusion associated infections such as Hepatitis B, Hepatitis C, HIV, syphilis, and less commonly malaria, toxoplasmosis, and other viral infections [15]. It is quite difficult to prevent the transmission of infectious diseases through blood transfusion in developing countries because the resources required are not always available.

Even with effective strategies and policies transmission of diseases still occur because of the inability of the test to detect the disease in the window period of infection, high cost of screening, lack of trained staff, funds, and laboratory testing errors.

The aim of the present study was to find the prevalence of TTIs in voluntary and replacement donors at a tertiary care hospital based blood bank in Ajmer, Rajasthan.

METHODS

We conducted a cross-sectional study conducted at the blood center of Jawahar Lal Nehru Hospital, Ajmer. Data were collected from a period of 5 years from June 2017 to May 2022. Sera of voluntary and replacement donors were screened for HIV, HBV and HCV. A total of 75,034 blood units were collected and tested. No professional/paid donor was bled. Exclusion criteria for blood donation was any serious illness, H/O any medication, major surgical procedure, previous recent blood transfusion, weight <50 kg, age <18/>60 years, pregnant, and lactating women. All the samples were screened for hepatitis B surface antigen (III generation ELISA), HIV (IV generation ELISA), Hepatitis C (III generation ELISA). Syphilis (Modified TPHA Test), and Malaria (Rapid Card Test). Tests were done according to manufacturer's instructions. Positive samples were confirmed by ELISA method for Syphilis and by peripheral blood smear study for malaria. All the reactive samples were repeated before labeling them as seropositive. The donated blood was discarded whenever the pilot donor sample was found positive for any transfusion transmitted infection. All seropositive blood donors were sent to appropriate departments for treatment and they were rejected for blood donation.

RESULTS

In the present study, a total of 75034 donors were screened during the 5 year period from June 2017 to May 2022. Out of them, 53,873 (71.8%) were voluntary donors which included donors at the blood bank of J.L.N. Hospital, Ajmer and also donors at the blood donation camps. The remaining 21,161 (28.2%) were replacement donors (Table 1). It is shown that replacement donors constitute the largest group of blood donors in India, reflecting the lack of awareness among the general population.

When gender-wise distribution of the donors was studied it was found that majority of donors under voluntary and replacement group were males (97.4%) and rest 2.6% only, were females (Table 2). Female donors are less in number; this may be due to unfit for blood donation including anemic women, underweight, malnourishment, and social ignorance.

The year wise proportion (in percentages) of different TTIs among blood donors has been depicted in Table 3. With respect to individual TTIs, it was observed that out of total 75,034 donors screened, the maximum number of donors 536 were found positive for HBV infection followed by 222 donors for Syphilis, 55 donors for HIV, 42 donors for HCV and 38 donors for Malaria. Thus, the proportion (in percentages) of TTIs among blood donors at blood bank during 5 year period was the maximum for HBV (0.71%) followed by Syphilis (0.29%), HIV (0.07%), HCV (0.06%), and least for Malaria (0.05%).

Table 1: Distribution of type of donors

Year	Replacement donors	Voluntary donors	Total Donors
2017 [June–Dec]	3867	5800	9667
2018 [Jan–Dec]	5232	10623	15855
2019 [Jan–Dec]	4692	12065	16757
2020 [Jan–Dec]	2885	9134	12019
2021 [Jan–Dec]	2882	10219	13101
2022 [Jan–May]	1603	6032	7635
Total	21161	53873	75034

Table 2: Sex wise distribution of donors

Year	Male No. (%)	Female No. (%)	Total donors (%)
2017 [June–Dec]	9435 (97.6)	232 (2.4)	9667 (100)
2018 [Jan–Dec]	15379 (97.0)	476 (3.0)	15855 (100)
2019 [Jan–Dec]	16305 (97.3)	452 (2.7)	16757 (100)
2020 [Jan–Dec]	11719 (97.5)	300 (2.5)	12019 (100)
2021 [Jan–Dec]	1275 (97.4)	342 (2.6)	13101 (100)
2022 [Jan–May]	7467 (97.8)	168 (2.2)	7635 (100)
Total	73083 (97.4)	1951 (2.6)	75034 (100)

DISCUSSION

Blood being a scarce and expensive human resource, should be prescribed judiciously and appropriately. Prescribing decisions should be based on national guidelines on the clinical usage of blood; taking the individual patient's needs into consideration, with minimum cost and wastage, optimum safety and efficacy [16]. Despite of predonation counseling and medical fitness test, the presence of TTIs is inevitable in blood donations. Since a person can transmit infection during its asymptomatic phase (window period), transfusions can contribute to an ever widening pool of infection in the population [17]. Only continuous improvement and implementation of donor selection, sensitive screening tests, and effective inactivation procedures can ensure the elimination, or at least reduction, of the risk of acquiring TTIs [18]. We had excluded donors below 18 years and above 60 years and most of the donors were male, still our study reflected the disease burden in community of Ajmer. Various viruses, bacteria, and parasites can transmit through blood. Screening of these infections varies from country to country depending on magnitude of infection. Mandatory screening of blood and blood products before transmission is due to these infections can cause chronic disease with possible serious consequences and present the greatest infection risk to recipients. In the present study, out of total donors, voluntary donors constituted 71.8% and replacement donors 28.2%. Voluntary blood donation (%) in our study was higher than study done by Bhawani *et al*. [19] (41.64%), Fernandes *et al*. [20] (61.2%), Kaur *et al*. [21] (45%), and lower than Bhaumik *et al.* [1] (91.8%).

In our study, 97.4% were male donors and 2.6% were female donors. This finding was comparable with study done by Qureshi *et al*. [22] (2.2% female) but not consistent with the study done by Karmakar *et al*. [23] (15% female) and Panda *et al*. [10] (8.3% female).

HBV seroprevalence was highest in our study compared to another TTI and it was consistent with most of the study worldwide. HBV is a member of the hepadnavirus group and is an enveloped DNA virus. HBV is transmitted through parenteral route and may be found in blood and other body fluids such as semen and vaginal fluid. From the blood stream the virus travels to the liver as site of replication is hepatocytes. HBV is endemic globally and hyper-endemic in many parts of the world. While HBV is present in the bloodstream, the levels of the virus itself are variable. In recently infected individuals, viral DNA is normally present, although not always at high levels. Chronically infected individuals may either be infectious (DNA present) or non-infectious (viral DNA absent) and viremia would generally be expected to be very low or absent entirely [13,24-34].

The seroprevalence of TTIs in the present study was highest for HBV infection (0.71%). This finding was almost similar to study conducted by Leena *et al*. [24] (0.71%) and Gupta *et al*. [9] (0.66%).It was higher than Biswal *et al*. [25]. (0.394%), Qureshi *et al*. [22] (0.48%), Shrestha *et al*. [26] (0.12%) but lower than study done by Panda *et al*. [10] (1.13%), Amrutha *et al*. [27] (1.77%), Karmakar *et al*. [23] (1.41%), Kumar *et al*. [30] (1.03%), Buseri *et al*. [34] (18.6%), and Terenpuntsag *et al*. [29] (8.1%) (Table 4).

In the present study, syphilis prevalence was 0.29% which was similar to Amrutha *et al*. [27] (0.28%). It was lower than Fernades *et al*. [20] (2%), Kumar *et al*. [30] (1.74%), Gupta *et al*. [9] (0.85%), Leena *et al*. [13] (0.10%), Buseri *et al*. [34] (1.1%), Biswal *et al*. [25] (0.706%). It was higher than Sastry *et al* [31] (0.008%) and Karmakar *et al*. [23] (0.23%) (Table 4).

HCV is a member of the flavivirus group and is an enveloped RNA virus. It is transmitted through parenteral route and may be found in blood and other body fluids like vaginal fluid or semen. In present study hepatitis C prevalence was 0.06% which was lower than study done by Leena *et al*. [24] (0.14%), Amrutha *et al*. [27] (0.13%), Chandekar *et al*. 34 (0.23%) Panda *et al*. [10] (1.98%), Gupta *et al*. [9] (1.09%), Pahuja *et al*. [11] (0.66%), Biswal *et al*. [25]. (0.120%), Shrestha *et al*. [26] (0.64%), Kumar *et al*. [30] (1.53%), Buseri *et al*. [34] (6.0%), and Terenpuntsag *et al*. [29] (8.7%) (Table 4).

In the present study, HIV prevalence was 0.07% which was almost similar to Chandekar *et al*. [32] (0.08%) and Gupta *et al*. [9] (0.084%). However, it was lower than study done by Leena *et al*. [24] (0.27%), Kumar *et al*. [30] (0.26%), Panda *et al*. [10] (0.35%), Pahuja *et al*. [11] (0.56%), Karmakar *et al*. [23] (0.6%), Biswal *et al*. [25] (0.128%), Amrutha *et al*. [27] (0.63%), and Buseri *et al*. [34] (3.1%) (Table 4). For HIV, India is second only to South Africa in terms of overall number of people living with HIV [11]. The prevalence of HIV in various parts of India is different with high rate in western and southern parts [32].

In the present study, malaria prevalence was 0.12% which was which was almost similar to Leena *et al*. [24] (0.129%), Biswal

Table 3: Year wise trend of seroprevalence of TTIs from June 2017 to May 2022

Year	Number of donors	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)	Malaria (%)	Reactive Donors (%)
2017 [June–Dec]	9667	10 (0.10)	80 (0.82)	13 (0.13)	0	0	103 (1.06)
2018 [Jan–Dec]	15855	09 (0.06)	127 (0.80)	04 (0.02)	25 (0.16)	0	165 (1.04)
2019 [Jan–Dec]	16757	16 (0.09)	131 (0.78)	03 (0.01)	17 (0.10)	03 (0.01)	170 (1.01)
2020 [Jan–Dec]	12019	08 (0.07)	76 (0.63)	05 (0.04)	15 (0.12)	06 (0.05)	110 (0.91)
2021 [Jan–Dec]	13101	07 (0.05)	88 (0.67)	06 (0.04)	112 (0.85)	15 (0.11)	228 (1.74)
2022 [Jan–May]	7635	05 (0.06)	34 (0.44)	11 (0.14)	53 (0.69)	14 (0.18)	117 (1.53)
Total	75034	55 (0.07)	536 (0.71)	42 (0.06)	222 (0.29)	38 (0.05)	893 (1.19)

Table 4: Comparison of transfusion transmitted infections prevalence rate with other studies

Studies	HBV (%)	HIV (%)	HCV (%)	Syphilis (%)
Leena *et al.* [24]	0.71	0.27	0.14	0.10
Gupta *et al.* [9]	0.66	0.084	1.09	0.85
Biswal *et al.* [25]	0.394	0.128	0.120	0.706
Amrutha *et al.* [27]	1.77	0.63	0.13	0.28
Panda *et al.* [10]	1.13	0.35	1.98	-
Karmakar *et al.* [23]	1.41	0.6	0.59	0.23
Pahuja *et al.* [11]	2.34	0.56	0.66	-
Kumar *et al.* [30]	1.03	0.26	1.53	1.74
Chandekar *et al.* [33]	1.3	0.08	0.23	0.28
Buseri *et al.* [34]	18.6	3.1	6.0	1.1
Present study	0.71	0.07	0.06	0.29

et al. [25] (0.113%), and higher than Kumar *et al.* [30] (0.006%), Fernades *et al.* [20] (0.01%) but it was lower than Ali *et al.* [35] (16.5%).

Limitation of our study is that all TTI such as leishmaniasis and toxoplasmosis have not been covered.

CONCLUSION

Although the current trends of TTIs are fluctuating from year to year, the high prevalence necessitates additional studies to detect the main risk factors and formulate intervention strategies. The study reflects the seroprevalence of the general population in our area which may be helpful in planning public health interventional strategies. Methods to ensure a safe blood supply should be encouraged. Screening with a better selection of donors and use of sensitive screening tests including NAT assay will definitely reduce the risk of TTI.

AUTHORS' CONTRIBUTIONS

Dr. Dinesh Beelwal and Dr. Ravi Kant Sunaria have contributed to the preparation of this review and drafting of the manuscript Dr. Gokul Chand Meena and Dr. Shashi Bhushan Tailor contributed equally in the revisions and finalization of manuscript.

CONFLICT OF INTEREST

There is no conflict of interest

AUTHORS FUNDING

The study was not supported by any grants and funds.

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