

Seroprevalence of HIV, HBV, HCV and syphilis in blood donors at a G.M.E.R.S. General Hospital (blood center) at Morbi

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Abstract

Background and Aims: Blood transfusion is an important mode of transmission of infections to recipients. It is of utmost importance to know about the prevalence of various TTIs (transfusion transmitted infections) among blood donors. The aim of the study is to analyze the seroprevalence of HIV, HBV, HCV and Syphilitic infections in the pre-transfusion blood which will help in taking measures to prevent the transmission of infections.

Material and Method: A retrospective study was carried out over a period of 04 years from January 2018 to December 2021. Serum samples were tested for P24 antigen and antibodies to human immunodeficiency virus (HIV) Type 1 and 2, hepatitis B surface antigen (HBsAg) and hepatitis c virus (HCV) using ELISA with the 3rd and 4th generation kits while testing for syphilis was done using Rapid plasma reagin test.

Results: Out of total 35,174 donors, 6,168(17.54%) were replacement donors and 29,006(82.46%) were voluntary donors while majority of donors were male (92.97%). The seroprevalence of HIV was 0.1% in the total blood donors. No female donor was found to be positive for HIV and Syphilis. The low seropositivity among blood donors is attributed to pre-donation counseling in donor selection. The seroprevalence of HBV, HCV and syphilis was 0.54%, 0.04% and 0.04% respectively.

Conclusion: All blood donations should be screened for TTIs to ensure safe blood transfusion to the recipients. With the implementation of strict selection criteria and use of sensitive screening tests, it is possible to decrease the incidence of TTIs among recipients of blood and various blood products.

Key words: Seroprevalence, HIV, HBV, HCV, syphilis, TTIs (transfusion transmissible infections), blood donors.

Introduction

Transmission of infectious diseases through donated blood is of critical concern in order to provide safe blood for transfusion which forms an integral part of medical and surgical therapy. Blood transfusion carries the risk of transfusion induced transmissible infections including HIV, hepatitis, syphilis, malaria and less frequently toxoplasmosis, brucellosis and some viral infections like Epstein-Barr virus, cytomegalovirus and herpes ^[1]. With every unit of blood, there is 1% chance of transfusion-associated problems including transfusion-transmitted diseases ^[1]. Among all infections HIV and hepatitis are the most dreadful ^[2]. Screening for TTIs is also essential for blood transfusion safety and for protecting human life

hence meticulous pre-transfusion testing and screening for transfusion transmissible infections is mandatory ^[3]. The safety assessment of the blood supply, the quality of screening procedures and the risk of transfusion- transmissible infectious diseases in any country can be estimated by review and analysis of the records of blood donors, screening procedures, and the prevalence of serological markers of infectious diseases. The greatest threat to the safety of the blood supply is donation of blood by seronegative donors during infectious window period when the donors are undergoing seroconversion phase ^[4]. 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 & II, HBsAg, HCV, Syphilis and Malaria ^[5].

The aim of the present study was to analyze the seroprevalence of HIV, HBV, HCV and Syphilis which helps to ensure easily accessible and adequate supply of safe and quality blood and blood products collected/procured from a voluntary non-remunerated regular blood donor in well-equipped premises, which is free from transfusion transmissible infections if stored and transported under optimum conditions.

Material and Methods

This retrospective study was conducted at the Blood Centre, G.M.E.R.S. Medical College and Hospital, Morbi during the period of January 2018 to December 2021.

Inclusion criteria

Hb more than 12.5 gm% for both male and female, weight more than 50 kg for whole blood with no history of acute or chronic infections or high risk behavior. Care was taken to discourage and exclude professional donors and those with the history of jaundice by taking appropriate history and examination.

A total of 35,174 blood units from voluntary and replacement blood donors were collected and screened over the period of total four (04) years (January 2018 to December 2021). Samples were screened by National AIDS control organization (NACO) approved Enzyme Linked Immunosorbent Assay (ELISA) kits from J Mitra and Co Ltd. for HIV-1, P²⁴ antigen and anti-HIV I and II antibodies (4th generation Microlisa – HIV Ag and Ab), antibodies to HBsAg (Hepalisa) and anti-HCV (HCV Microlisa). Third generation anti-HCV ELISA test kits utilizing a combination of antigens with the sequence of both HCV structural and non-structural antigens i.e. Core, E1, E2, NS3, NS4 and NS5, with increased sensitivity and specificity were used. LISAWASH4000 and LISAQUANT IT instruments (Tulip diagnostics P. Ltd.) were used to read all the ELISA tests. The ELISA was validated by the acceptance criteria laid down by the manufacturer for the absorbance of reagent blank as well mean absorbance of positive and negative controls provided with the test kits. The cut off value was calculated as per manufacturer's directions for reporting positive and negative results. Known positive and negative samples were used randomly as external controls in each screening. Screening for syphilis was carried out by using Rapid plasma reagin / VDRL RAPID test kits. All reactive samples were retested before being labeled as seropositive and then all the seropositive blood units were disinfected and discarded. Confidentiality of reports was maintained as per standard guidelines.

Result

The data collected from total of 35,174 blood donors over a 4 year period was analyzed and distributed year wise. Amongst them, majority of donors in all years were of male, comprising 32,700 (92.97%), While the female donors comprised of 2,474 (07.03%). Majority of donors were of voluntary type [29,006 (82.46%)] as compared to replacement type [6,168 (17.54%)] [Table 1].

Table 1: Year wise distribution of donors according to sex and type of donor.

Year	Total donors	Voluntary donors N (%)	Replacement donors N (%)	Male N (%)	Female N (%)
2018	8242	6458(78.35)	1784(21.65)	7721(93.68)	521(6.32)
2019	9489	7633(80.44)	1856(19.56)	8863(93.40)	626(6.60)
2020	8007	6901(86.19)	1106(13.81)	7329(91.53)	678(8.47)
2021	9436	8014(84.93)	1422(15.07)	8787(93.12)	649(6.88)
Total	35174	29006(82.46)	6168(17.54)	32700(92.97)	2474(7.03)

Table 2: Distribution of Seroprevalence of HIV, HBV, HCV and syphilis according to age group, gender and type of blood donor

Character		Total donors N (%)	HIV N (%)	HBV N (%)	HCV N (%)	Syphilis N (%)	Total N (%)
Age group	18-30 Years	22792 (64.80)	11 (0.05)	83(0.36)	06(0.03)	07(0.03)	107(0.46)
	31-60 Years	12382 (35.2)	24(0.19)	107(0.86)	07(0.06)	08(0.06)	146(1.18)
Gender	Male	32700 (92.97)	35(0.10)	182(0.56)	11(0.03)	15(0.05)	243(0.74)
	Female	2474 (7.03)	00(0.0)	08(0.32)	02(0.08)	00(0.0)	10(0.03)
Type of donor	Voluntary	29006 (82.46)	24(0.08)	156(0.54)	09(0.03)	10(0.03)	199(0.69)
	Replacement	6168 (17.54)	11(0.17)	34(0.55)	04(0.06)	05(0.08)	54(0.15)

As shown in Table-2, almost 2/3rd of total blood donors were from the age group of 18-30 years with overall seropositivity of 0.46% while remaining 1/3rd blood donors were from the age group of 31-60 years with overall seropositivity of 1.18%. Amongst all male, female, voluntary and replacement blood donors, overall seropositivity was 0.74%, 0.03%, 0.69%, 0.15% respectively.

Table 3: Annual Distributions of Seropositive Cases (HIV, HBV, HCV and SYPHILIS).

	2018	2019	2020	2021	TOTAL
Total donors	8242	9489	8007	9436	35174
HIV N (%)	06(0.07)	09(0.09)	12(0.15)	08(0.08)	35(0.10)
HBSAG N (%)	48(0.58)	43(0.45)	38(0.47)	61(0.65)	190(0.54)
HCV N (%)	01(0.01)	02(0.02)	01(0.01)	09(0.09)	13(0.04)
Syphilis N (%)	00(0.0)	01(0.01)	07(0.08)	07(0.07)	15(0.04)
Total N (%)	55(0.67)	55(0.58)	58(0.72)	85(0.90)	253(0.72)

Out of total 253(0.72%) seropositive blood donors, HBV carried the highest seroprevalence of 190(0.54%) followed by HIV, Syphilis and HCV with seroprevalence of 35(0.10%), 15(0.04%) and 13(0.04%) respectively [Table- 3].

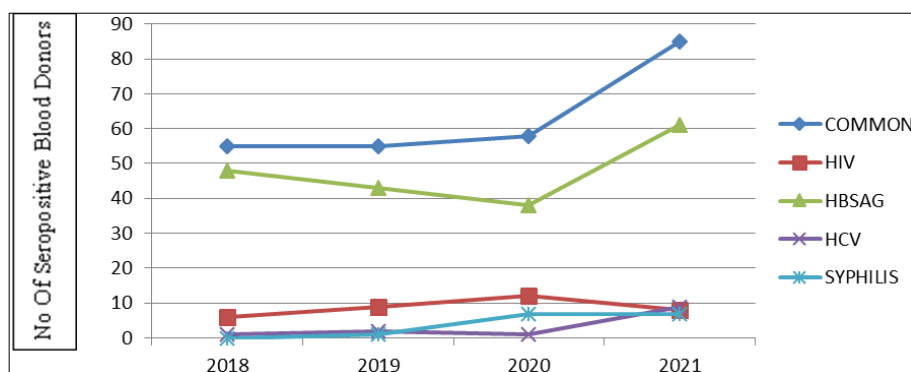


Chart 1: Trends of Seroprevalence of HIV, HBV, HCV and SYPHILIS.

The trends of the seroprevalence of HIV, HBV, HCV, and syphilis over the 4- year period show progressive increase in total seropositive blood donors [Chart 1] [Table 3]. Progressive increase in the seroprevalence of HBV, HCV and Syphilis has been observed with slight decline in HIV positive cases.

Discussion

Transfusion of blood and blood products is a life saving measure and helps innumerable people Worldwide. At the same time however, blood transfusion is an important mode of transmission of infection to the recipients. The risk of TTI has declined dramatically in high income nations over the past two decades, primarily because of extraordinary success in preventing HIV and other established transfusion transmitted viruses from entering the blood supply ^[6]. In developing countries, the prevalence of TTI is much higher and quite far from attaining a zero risk level at the present moment ^[6].

In the present study, majority of total donors are voluntary blood donors matching with the data of annual data for the year 2020-21 of GSACS bulletin report, Gujarat, India as well as study done by Praveen K. *et al.*, Patel SV. *et al.*, Patel PA *et al.* and Gupta PK *et al.* showing 65.55%, 52%, 95.56% and 61.9% of voluntary blood donors respectively ^[4, 7, 8, 9] [Table-1]. Such a high proportion of voluntary blood donation is because of increased numbers of voluntary blood donation camps and community awareness about voluntary blood donation.

Male blood donors shows predominance in the present study with 92.97% of total blood donors during the study period which is in concordance with the results of studies such as Kulkarni N. *et al.*, Arora D. *et al.*, Chandekar SA *et al.*, Parveen K *et al.*, D Patel *et al.*, Arora S *et al.*, Patel SV *et al.* and Gupta PK *et al.* showing 98.00%, 96.2%, 91.79%, 89.0%, 97.90%, 98.4%, 95.40% and 97.2% of male blood donors respectively ^[1, 2, 3, 4, 5, 6, 7, 8, 9] [Table-1]. Such a higher proportion of male blood donors are attributed to social factors like ignorance and social taboo in females about blood donation, high incidence of anemia in menstruating women with most of them being underweight and malnourished. All these factors make females unfit for blood donation.

Findings of this study shows overall high seroprevalence of 1.18% in blood donors of age group 31-60 years as compared to age group 18-30 years(0.46%) which doesn't correlate with Arora D. *et al.* showing low seroprevalence of 7.33% in blood donors of age group 32-44 years as compared to age group 18-31 years(8.33%) ^[2]. Reason for this mismatch can be due to more number of blood donors in the respective age group in both the studies.

Table 4: Comparison of overall seroprevalence with other studies according to gender and type of blood donors.

Study	Male donor	Female donor	Voluntary donor	Replacement donor
Present study	0.74%	0.03%	0.69%	0.15%
Arora D. <i>et al.</i> ^[2]	4.03%	3.18%	1.79%	5.16%
Parveen K <i>et al.</i> ^[4]	6.24%	3.80%	5.08%	7.67%
D Patel <i>et al.</i> ^[5]	1.67%	0.76%	0.98%	1.62%

High seroprevalence of 0.74% has been observed among male blood donors in this study compared to female (0.03%) blood donors which correlates very well with other studies such as Arora D. *et al.*, Parveen K *et al.* and D Patel *et al.* showing higher seroprevalence among male blood donors respectively ^[2, 4, 5] [Table-4].

Present study shows high seroprevalence among voluntary blood donors (0.69%) compared to replacement blood donors (0.15%) while other studies done by Arora D. *et al.*, Parveen K *et al.* and D Patel *et al.* shows high seroprevalence among replacement blood donors which can be justified by very high number of voluntary blood donors in the present study compared to other studies. ^[2, 4, 5] [Table-4].

Table 5: Comparison of seroprevalence of HIV, HBV, HCV and syphilis with other studies.

Study	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)
Present Study	0.10	0.54	0.04	0.04
Kulkarni N <i>et al.</i> (2012) ^[1]	0.91	3.28	0.35	0.04
Arora D <i>et al.</i> (2010) ^[2]	0.3	1.7	1.0	0.9
Chandekar SA <i>et al.</i> (2017) ^[3]	0.26	1.3	0.25	0.28
Parveen K <i>et al.</i> (2018) ^[4]	1.30	3.05	1.04	0.57
D Patel <i>et al.</i> (2018) ^[5]	0.12	0.94	0.15	0.15
Arora S <i>et al.</i> (2018) ^[6]	0.03	0.31	0.08	0.36
Patel SV <i>et al.</i> (2013) ^[7]	0.30	0.86	0.21	0.26
Pallavi P <i>et al.</i> (2012) ^[10]	0.44	1.27	0.23	0.28
Anjali H <i>et al.</i> (2012) ^[11]	0.6	1.5	0.4	0.1
Adhikari L <i>et al.</i> (2010) ^[12]	0.32	0.78	0.27	0.27
Gupta R <i>et al.</i> (2011) ^[13]	0.35	1.66	0.65	2.80
Gupta N <i>et al.</i> (2004) ^[14]	0.84	0.66	1.09	0.85

In the present study, seroprevalence of TTIs such as HIV, HBV, HCV and SYPHILIS is the lowest amongst various other similar studies.[Table-5] The overall seroprevalence of HBV is much higher as compared to seroprevalence of HIV, HCV and SYPHILIS in our study which shows concordance with the studies done by Kulkarni N *et al.*, Arora D *et al.*, Chandekar SA *et al.*, Parveen K *et al.*, D Patel *et al.*, Patel SV *et al.*, Pallavi P *et al.*, Anjali H *et al.* and Adhikari L *et al.* while Gupta R *et al.* and Gupta N *et al.* are showing higher seroprevalence of SYPHILIS and HCV respectively ^[1, 2, 3, 4, 5, 7, 10, 11, 12, 13, 14] [Table-5].

Patients requiring blood transfusion are more prone to acquire HBV, HIV, HCV, and Syphilis. HBV is highly contagious and easily transmitted from one individual to another by transfusion during birth, by unprotected sex and by sharing needles. Syphilis can be spread by sexual Contact, blood transfusion and by vertical transmission. Due to the nature of blood born virus, HCV is widely recognized as a major causative agent for post-transfusion Non- a, Non- b hepatitis. Other less common routes of transmission are sexual intercourse and mother to Child transfer. In case of HIV, transmission during window period is possible even if each unit is tested for HIV ^[3]. Adding nucleic acid testing (NAT) to routine blood screening protocol helps in detecting very low levels of viral RNA or DNA that may be present in the donated blood¹.

Conclusion

Every blood transfusion has a risk of TTIs. In our retrospective study of 35,174 donors, most of the donors were voluntary donors with male preponderance with estimated overall seroprevalence of HIV, HBV, HCV and syphilis were 0.10% 0.54%, 0.04% and 0.04% respectively which are much lower than the other parts of India. In the light of these evidences, we call for educational and promotional programs encouraging females for blood donation which can be implemented to promote voluntary blood donation among them. With the implementation of strict donor selection criteria, use of screening tests with high sensitivity and establishment of strict guidelines for blood transfusion it may be possible to reduce the incidence of TTIs in the Indian scenario. NAT has added benefits but the cost-effectiveness of NAT is a major concern.

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Conflicts of interest: None.

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