ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 01(D), pp. 30441-30445, January, 2019

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

SEROPREVALENCE OF TRANSFUSION TRANSMITTED INFECTIONS AMONG BLOOD DONORS IN SMS HOSPITAL JAIPUR: A CROSS SECTIONAL STUDY

Ashok Pal., SunitaBundas., RachnaNarain., Amit Sharma., Meena BS and Pachouri P

Dept. of Immunohaematology & Transfusion Medicine, SMS Medical College and Hospital, Jaipur. Rajasthan

DOI: http://dx.doi.org/10.24327/ijrsr.2019.1001.3059

ARTICLE INFO

Article History:
Received 12th October, 2018
Received in revised form 23rd November, 2018
Accepted 7th December, 2018
Published online 28th January, 2019

Key Words:

Transfusion Transmitted Infections among Blood

ABSTRACT

Background: Although blood transfusion is a life-saving modality, it is associated with certain infectious and non infectious risks, Transfusion Transmitted Infections (TTI) are quite hazardous among them. Transfusion-transmissible infectious agents such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) Syphilis and Malaria are among the greatest threats to blood safety for the recipient. To assess the magnitude of disease transmission and for its prevention and control, the study of its seroprevalence is important. **Method**: This prospective study was done in Blood donors in Blood Bank, Dept. of IHTM, SMS Medical college & Hospital Jaipur, which is the largest tertiary Health center in Rajasthan. Study aimed to determine the seroprevalence of HIV, HBV, HCV Syphilis and Malaria infections among blood donors in study centre. Study was done on 15173 Blood donors who met the standard criteria for donor fitness were screened for HIV, HBS, HCV, Syphilis and Malaria, from July 2017 to June 2018 (1 year).**Results:** Out of 15173 units collected, 237 (1.56%) units had seropositivity for HBsAg/, p24 Ag. & anti-HIV Ab/ anti-HCV Ab/ anti-Treponemal Ab, 1 unit revealed co infection infections with HIV-HBV. Seropositivity rates of HIV, HBsAg, HCV, Syphilis were 0.085%,1.25%,0.07%,0.15% respectively, no donor was found positive for Malaria among study population. Seroprevalence of TTI was more in replacement donors (1.15%) in comparison to voluntary donors (0.40%). Most common age group of blood donors (68.7%) was 18-30 years. **Conclusion:** Even with the implementation of effective preventive strategies, there is significant risk of transmission of infectious agents in India. Efforts to ensure an adequate and safe blood supply should include proper screening and striving for optimal use of blood and its products.

INTRODUCTION

Blood transfusion is an integral and life-saving modality imparted to the patients during various surgeries, in certain medical conditions like anaemia, thalassemia, renal pathologies etc. After the starting of the blood transfusion scientifically in the early 1940s, various transfusion related problems like Transfusion Transmitted Infections (TTIs) have been associated with blood transfusion. Transfusion Transmitted Infections was first noted in late 1940s[1].It has been calculated that for every unit of blood transfused, there is 1% chance for transfusion associated problems including transfusion transmitted diseases[2].

Transfusion transmissible infections include[3]

Viruses

- Hepatitisviruses: A, B, C, D and E
- Herpes viruses:(EBV, CMV, HHV8)
- Retroviruses: HIV1, HIV2 HTLV I, HTLV II
- Parvovirus B19 (Human Erythrovirus)
- West Nile fever virus (WNV), Ebola virus, Zika virus

Parasite

- Malaria (P.vivex, P.falciparum, P. malariae , P.ovale)
- Chagas' disease (Trypanosomacruzi)
- Nantucketfever (Babesiamicroti)
- Toxoplasmosis (rare, Toxoplasma gondii)
- Leishmaniasis (rare, Leishmaniadonovani)

Bacteria

- Syphilis (Treponemapallidum)
- Brucellosis (Brucella)

Prions: Variant Creutzfelt-Jakob disease (vCJD)

Corresponding author:* **Ashok Pal
Dept. of Immunohaematology & Transfusion Medicine, SMS Medical College and Hospital, Jaipur. Rajasthan

Transmission of infections still occurs because of the inability to detect the disease in the pre-seroconversion or "Window" phase of the infection, Immunological variant viruses, Immuno silent carriers and Laboratory testing errors[4]. The prevalence of the transfusion transmitted infections, among blood donors allows for assessment of epidemiology of these infections in the community[5].

Globally, approximately 35 million people are living with HIV. Yearly, worldwide infection rate of HIV through blood transfusion alone range from 80,000 to 160,000. It has been estimated that over 350 million individuals worldwide are chronically infected with HBV, resulting in about 620,000 deaths per year. The World Health organization (WHO) estimates that 3% (170 million) of the world's population is chronically infected with HCV[6]. Total number of people living with HIV (PLHIV) in India is estimated at 21.17 lakhs in 2015. Whereas National adult (15–49 years) HIV prevalence is estimated at 0.26% (0.22%–0.32%)[7].India has 43 million HBV positive and 15 million HCV positive persons. WHO has placed India in the intermediate zone of prevalence of hepatitis B (2-7%)[8].The risk of transfusion transmission of these viruses may be alarming due to high seroprevalence of HIV, anti-HCV, and HBsAg among blood donors.

In this paper we report the trend in the detected sero prevalence of human immunodeficiency virus (HIV), hepatitis B (HBV), hepatitis C (HCV), syphilis and malaria over a period of 1 year at SMS medical college and hospital.

MATERIAL AND METHODS

The present study was done from 1st July 2017 to June 2018 (1yr.) in Blood bank, Department of Immunohaematology and Blood Transfusion. Total of 15173 apparently healthy adult donors were screened for TTIs during the study period. Healthy voluntary and replacement blood donors who were fit to donate blood according to standard blood donor selection criteria (as per NACO & WHO guidelines), were included. The serum was tested for HIV infection by 4th generation ELISA technique, HBsAg and HCV infection by 3rd gen. ELISA, RPR test was used for syphilis and malaria antigen card used for malaria infection.

OBSERVATION AND RESULTS

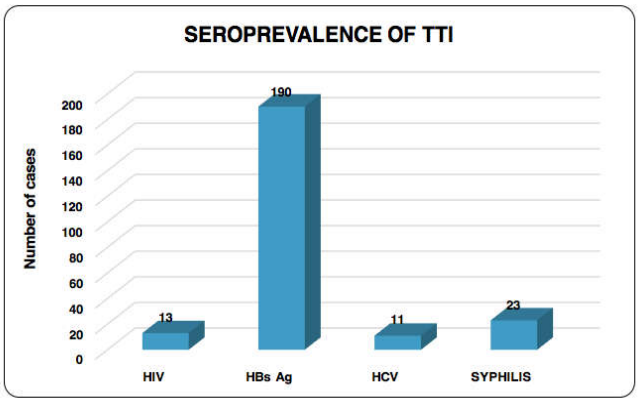
Blood donors belonged to age group ranging from 18 to 60 years. Maximum donors were in 18-30 (68.7 %) and minimum donors belonged to >50 year age group (1.04%). Mean age of donors was 28.73 ±7.44 years.

Out of total 15173 donations, 15060 were Male (99.25%) donors and 113 (0.74%) were Female donors. 68.62% (10412/15173) donors were Replacement donors and 31.37% (4761/15173) donors belonged to Voluntary blood donor category.

Overall seroprevalence of TTI in study population was 1.56%.Out of total study population 13 donors were found seroreactive for HIV,190 donors were seroreactive for HBsAg, 11 donors were seroreactive for Hepatitis C virus, 23 donors were found reactive for syphilis with percentage prevalence of HIV, HBsAg, HCV, Syphilis 0.085%, 1.25%, 0.07%, 0.15% respectively. No donor among study population was found positive for Malaria.74.53% donors were residing in urban area at the time of donation while 3864 (25.46%) donors had their residence in rural area.Maximum 35.03% donors were of B group followed by O group (32.4%), A group (23.06%) and AB group (9.46%). Prevalence of blood group in our study population was B>O>A>AB. 92.23% donors were Rh D positive and 7.77 % donors were Rh D negative.

Seroprevalence of TTI among replacement donors was 1.15% while in voluntary donors it was 0.40% The difference of seroprevalence among replacement and voluntary donors was statistically not significant (P=0.531). Among replacement donors maximum seroreactivity of HIV (0.28%) was seen in 31-40 year age group While in voluntary donors it was maximum (0.06%) seen in 18-30 year age group. In replacement donors maximum seroreactivity for HBsAg(1.23%) was seen in 18-30 year age group, whereas in voluntary donors it was maximum (2.1%) in51-60 years. Seroreactivity for HCV Among replacement donors maximum (0.15%) was seen in 41-50 year age group While in voluntary donors maximum seroreactivity (0.09%) was seen in 18-30 years. Seroreactivity for syphilis among replacement donors maximum (4.54%) was seen in 51-60 years age group.While in voluntary donors maximum seroreactivity (0.46%) was seen in 41-50 years.

Seroprevalence of overall TTI in rural area was reported 1.78% (69/3864), in comparison to urban area where seroprevalence was 1.48% (168/11309). Whereas seroprevalance of HCV was more in urban area (no donor was found seroreactive belonging to rural area). But the difference is not significant statistically (P=0.230)



DISCUSSION

The discovery of Transfusion-Transmissible Infections has heralded a new era in blood transfusion practice worldwide with emphasis on safety and protection of human life. Human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) are of great concern because of their prolonged viremia and carrier or latent state. They also cause fatal, chronic and life-threatening disorders[9]. The risk of TTI has declined dramatically in high income nations over the past two decades. But the same may not hold good for the developing countries. The national policy for blood transfusion services in our country is of recent origin and the transfusion services are hospital based and fragmented [10].

Table 1 Profile of seropositive blood donors

Characteristics		No. of units (%)	HIV	HBsAg	HCV	Syphilis
Age Group	18-30	10436(68.7)	06(0.05%)	123(1.17%)	08(0.07%)	09(0.08%)
	31-40	3514(23.1)	07(0.19%)	58(1.65%)	02(0.05%)	08(0.22%)
	41-50	1065(7.01)	0(0)	07(0.65%)	01(0.09%)	03(0.28%)
	51-60	158(1.04)	0(0)	02(1.26%)	0(0)	03(1.89%)
Gender	Male	15060 (99.2%)	13(0.08%)	189(1.25%)	13(0.08%)	22(0.14%)
	Female	113(0.74%)	0(0)	01(0.8%)	0(0)	01(0.8%)
Type of donation	Replacement	10412 (68.6)	11(0.07%)	143(0.94%)	08(0.05%)	14(0.09%)
	Voluntary	4761(31.3)	02(0.01%)	47(0.30%)	03(0.01%)	09(0.05%)
Blood groups	A	3500(23.6)	03(0.08%)	41(1.17%)	02(0.06%)	02(0.06%)
	B	5318(35.04)	5(0.09%)	71(1.34%)	04(0.08%)	12(0.23%)
	O	4918(32.41)	04(0.08%)	58(1.18%)	05(0.10%)	06(0.12%)
	AB	1437(9.47)	01(0.07%)	20(1.39%)	0(0)	03(0.21%)
Rural/ Urban	Rural	3864(25.4)	04(0.10%)	59(1.52%)	0(0)	06(0.15%)
	Urban	11309(74.5)	09(0.07%)	131(1.15%)	11(0.09%)	17(0.15%)

Table 2 Seroprevalence of TTI according to Age distribution in Replacement and Voluntary donors

Age group		18-30yrs	31-40yrs	41-50yrs	51-60yrs
Replacement Donors	Total	7213	2499	634	66
	HIV	04(0.05%)	07(0.28%)	0	0
	HBsAg	89(1.23%)	50(2%)	04(0.63%)	0
	HCV	05(0.06%)	02(0.08%)	01(0.15%)	0
	Syphilis	06(0.08%)	04(0.16%)	01(0.15%)	03(4.54%)
Voluntary Donors	Total	3223	1015	431	92
	HIV	02(0.06%)	0	0	0
	HBsAg	34(1.05%)	08(0.78%)	03(0.69%)	02(2.1%)
	HCV	03(0.09%)	0	0	0
	Syphilis	03(0.09%)	04(0.39%)	02(0.46%)	0

In current study replacement donors (68.62%) were more as compared to voluntary donors (31.37%).Which is comparable with most of the similar studies in India where percentage of replacement donors was more than the voluntary donors. Prevalence of replacement and voluntary donors In Gupta R et al[11] is 60.2%, and 39.7%,In Makroo RN et al[12] 96.9% and 3.06% and in Chowdhury FS et al [13] 79.1%and 20.8% respectively. Cause of less voluntary donations may be lack of awareness and presence of social and cultural taboos in the society. Certain studies like Sethi B et al[9], no. of voluntary donors (50.5%) were slight more or equal to Replacement donors (49.9)%. In other studies Rawat A et al[14] and Sharma DC et al[15]no. of voluntary donors were more than replacement donors that was (74.17%) and (25.83%), (65.3%) and (34.7%) respectively.

Better response towards blood donation in the present study was seen in the younger age group i.e. (68.7%) in 18-30 years, followed by (23.1%) in 31-40 years which is similar to that observed in the study of Thakral et al[16].It is also comparable with study by Sethi B et al[9] where majority of donors (41.12%) were from age group of 18-25 years. Thereafter, the contribution towards blood donation decreased with increase in age in both voluntary as well as replacement donors; the donors beyond 50 years contributing the least. This might be due to the fact that large numbers of elderly age group donors were rejected due to their lower health standards. Females made a very small section of the present study, only 113 (0.74%) female donors contributed in present study out of which 99 females donors (87.6%) were voluntary and 14 (12.3%) were replacement donors. The prevalence of female donors in current study (0.74%) is comparable to Makroo RN et al[12], Dobariya GH et al[17]where prevalence of female donors was around 4.14%and 2.84% respectively.

Since more males qualified following the criteria of fitness and a higher proportion of males came for voluntary donations, especially in camps. During donor screening deferral rate of females was higher than male because of anaemia, deferral during menstruation and other fitness issues like lactation etc.

Overall seroprevalence of TTI in study population reported was 1.56%.Seroprevalence of HIV, HBsAg, HCV, Syphilis was 0.085%,1.25%,0.07%, 0.15% respectively. Prevalence of infections (HIV, HBsAg, HCV, Syphilis) in present study among replacement donors were 0.07%, 0.94%, 0.05%, 0.09% respectively while in that of voluntary donors were 0.013%, 0.30%, 0.19% ,0.059% respectively but this difference is statistically not significant (P=0.531).Studies like Makroo RN et al[12], Jain R et al[18]have shown high seropositivity rates of TTI in replacement donors compared to voluntary donors, a similar finding was noted in present study. The risk of having TTIs in the replacement donors was 2 to 2.5 times more when compared with the voluntary donors. This emphasizes the importance of repeat, non- remunerated, regular voluntary donations. The discrepancy of TTI seropositivity in replacement/relative versus voluntary donors in various studies including present study may be due to the large number of replacement/ relative donors compared to the voluntary donors. Lack of knowledge about TTI probably accounted for high infection in replacement blood donors.

In the present study seropositivity of HIV was reported in 0.085% donors, which is comparable to other studies from India those reported lower or almost similar prevalence of present study like Dobariya GH et al[17], Giri PA et al[19] 0.081%, 0.07% respectively. While Sastry JM et al [20], Sethi B et al[9], Makroo RN et al[12], Leena MS et al[21], Sundramurthy et al[22] reported higher prevalence rate of HIV among blood donors than current study that was 0.28%, 0.19%,0.24%, 0.27%, 0.13% respectively. All the HIV seropositive donors were males and no female donor was found to be HIV seropositive, with males constituting 0.10% (11/10412) and 0.04% (2/4761) respectively in replacement and voluntary groups.

Geographically urban area constituting 0.07% (9/11309) and rural area constituting 0.10% seroreactive donors for HIV (4/3864) in current study. Difference of HIV seropositivity in rural verses urban was not found to be significant statistically (P =0.230)

Seroprevalence of hepatitis B in present study noted was 1.25% which is higher than certain previous studies done in various

regions in India like Dobariya GH et al[17], Sastry JM et al[20], Sethi B et al[9], Makroo RN et al[12], Giri PA et al[19], and Sundaramurthyet al[22]where seroprevalence of Hepatitis B was reported 0.98%, 1.23%, 0.63%,1.18%, 1.09%, 0.42% respectively. Whereas Seroprevalence of Hepatitis B in current study was lower than certain studies which have been done in various regions in country like Bommanahalli B.et al[25], Chandra T. et al[23], Chandekar SA[24] et al where prevalence rate was 2.12%,1.96%1.30% respectively. The prevalence of Hepatitis B varies from country to country and even in different regions of our country, and may depend upon a complex mix of behavioural, environmental, and host factors. In India, the highest prevalence has been reported among the aborigines of Andaman as well as from Arunachal Pradesh [26]. There was only one HBsAg reactive female in entire study which belonged to replacement group, no female was found reactive in voluntary group in any age group.While comparing HBsAgseropositivity with geographical area, urban area constituting 1.15% (131/11309) and rural area constituting 1.52% (59/3864) seroreactive donors. Difference of HBsAgseropositivity in rural verses urban area was not found to be significant statistically (P =0.230).

CONCLUSION

Blood transfusion is becoming a leading risk factor for spread of these above mentioned infections thus showing need and importance of screening of these infections in blood donors. Though the risks of infections associated with blood transfusions are declining, a lot is still to be done to improve access and accountability of the health services. Achievements of these goals are only possible through greater awareness, motivation to participate and supplying the laboratories with advanced and affordable technologies. Effort should be made to achieve 100% voluntary blood donation as they have very low prevalence of TTI and for this, donor motivation and education is advised. Extensive pre-donation counselling should be done to provoke self deferral of donors along with donor education. More sensitive and more specific Nucleic Acid Testing (NAT) based screening systems for TTIs should be introduced in blood bank to screen donors. Education of public at large scale is necessary to increase the general awareness towards TTIs. By minimizing irrational or inappropriate use of blood and blood products, risk of TTI can be minimized to an extent.

Comparison of Prevalence of TTI in Various Studies in India

Study/year	Study Region	Total TTI	HIV	HBsAg	HCV	Syphils
Chandekar SAet al[24] (2017)	Mumbai	2.09%	0.26%	1.30%	0.25%	0.28%
Sundaramurthyet al[22](2016)	Tamilnadu	1.12%	0.13%	0.42%	0.56%	-
Dobariya GH et al[17](2016)	Gujrat	1.34%	0.081%	0.98%	0.09%	0.16%
Makroo RN et al[12] (2014)	Delhi	2.09%	0.24%	1.18%	0.43%	0.23%
Sethi B et al[9] (2014)	Uttarakhand	1.05%	0.19%	0.63%	0.20%	0.02%
Bommanahalli,Bet al[25](2014)	Karnataka	-		2.12%	0.1%	-
Sastry JM et al[20](2014)	Pune	1.92%	0.28%	1.23%	0.41%	-
Giri PA et al[19] (2012)	Maharashtra	1.97%	0.07%	1.09%	0.74%	0.07%
Leena MS et al[21](2012)	South India	1.35%	0.27%	0.71%	0.14%	0.1%
Chandra T. et al[23]2009	Lucknow	3.05%	0.23%	1.96%	0.85%	0.01%
Present study	Jaipur	1.56%	0.08%	1.25%	0.07%	0.15%

Seroprevalence of HCV among present study population was 0.07%. Prevalence rate of HCV in various other studies in India as Chandekar SA et al[24] (Mumbai), Sundaramurthy et al[22], Dobariya GH et al[17], Sastry JM et al[20], Sethi B et al[9], Makroo RN et al[12], Giri PA et al[19], was 0.25%,0.56%, 0.098%,0.41%, 0.20%,0.43%,0.74%, respectively. In present study seroprevalence of HCV was lower than these comparable studies. Seroprevalence rate of HCV drastically varies in different part of India, reason of this variation is again host factors, environmental, behavioural and geographical factors etc. No female donors was found reactive for HCV in entire study. Urban area constituting 0.09% (11/11309) seroreactive donors. NO donor was found seroreactive from rural area. Difference of HCV seropositivity in rural verses urban area was not found to be significant statistically (P =0.230).

Seropositivity of Syphilis in present study population was 0.15% which was second highest after HBsAg. Prevalence rate of Syphilis in current study was lower than various other studies done in India like Chandekar SA et al[24], Makroo RN et al[12], Dobariya GH et al[17],where seroprevalence was 0.28%,0.23%,0.16%, respectively. Prevalence of syphilis was higher than Sethi B et al[9] (0.02%), Giri PA et al[19] (0.07%) and Chandra T et al[23] (0.01%). Only one female donors was found reactive for Syphilis in voluntary category. Geographically urban (17/11309) and rural area constituted similar seroprevalence for syphilis which was 0.15%.

References

1. Choudhury N. Transfusion transmitted infections: How many more? *Asian J Transfus Sci*. 2010 Jul; 4(2): 71–72.
2. Widman FK (ed) (1985) Technical manual. American Association of Blood Banks, Arlington, p 325-44.
3. Barbara J, Regan F, Contreras M. Transfusion transmitted infections then and now. In: Transfusion microbiology. Cambridge: Cambridge University Press; 2008.p.2.
4. NACO. Standards for Blood Banks and Blood Transfusion Services. 2007; 33-4.
5. Bhattacharya P, Chandra PK, Data S, Banerjee A, Chakraborty S, Rajendran K, et al. Significant increase in HBV, HCV, HIV and syphilis infections among blood donors in West Bengal, Eastern India 2004-2005: Exploratory screening reveals high frequency of occult HBV infection. *World J Gastroenterol* 2007; 13:3730-3.
6. Walana W, Ahiaba S, Hokey P, Vicar E, Acquah S, Der E et al. Sero-prevalence of HIV, HBV and HCV among Blood Donors in the Kintampo Municipal Hospital, Ghana. *Br Microbiol Res J* 2014; 4(12):1491-9.
7. NACO & ICMR. India HIV Estimation 2015. Technical Report. p. 2-5.
8. World Health Organization South-East Asia Regional Office. Prevention of hepatitis B in India-an overview. Available from: whqlibdoc.who.int/searo/2002/SEA_

Hepat.-5.pdf.Cited on Oct 7, 2018.
9. Sethi B, Kumar S, Butola K, Mishra J, Kumar Y. Seroprevalence pattern among blood donors in a tertiary health care center. *Internet Journal of Medical Update*. 2014;9(1):10–15.
10. Gupta PK, Kumar H, Basannar DR, Jaiprakash M. Transfusion transmitted in infections in armed forces: prevalence and trends. MJAFI 2006; 62:348–50.
11. Gupta R, Singh B, Singh DK, Chaugh M Prevalence and trends of transfusion transmitted infections in a region blood transfusion centre Asian *J Transfus Sci*. 2011 Jul-Dec; 5(2): 177–8.
12. Makroo RN, Hegde V, Chowdhry M, Bhatia A ,Rosamma NL Seroprevalence of infectious markers & their trends in blood donors in a hospital based blood bank in north India. *Indian J Med Res*. 2015 Sep;142(3):317-22
13. Chowdhury Fs, Begum Ha, Adnan Sd, Hoque Mm Hossain Mz, Siddiqui Mae Study On Screening Tests Among The Blood Donors In Dhaka Medical College Hospital, *Bangladesh J Dhaka Medcoll*. 2010; 19(1): 16-8.
14. Rawat A, Diwaker P, Gogoi P, Singh B. Seroprevalence & changing trends of transfusion-transmitted infections amongst blood donors in a Regional Blood Transfusion Centre in north India. *Indian J Med Res* 2017;146:642-5
15. Sharma DC, Rai S , Bharat S, Iyenger S , Gupta S , Jain B. 10 years comparative study to assess trends in seroprevalence of transfusion transmitted infections among blood donors at Gwalior. *Open J Blood Dis*., 2014, 4, 24-32
16. Thakral B, Marwaha N, Chawla YK, Saluja K, Sharma A, Sharma RR et al. Prevalence and significance of hepatitis C virus (HCV) seropositivity in blood donors. *Indian J Med Res* 2006 Oct; 124(4):431-8.
17. Dobariya GH, Raja KA, Unagar CA, Pandya AN, Patel JN, Jarag MA, et al. Prevalence and trends of transfusion transmitted infections among blood donors of blood bank attached to government hospital of South Gujarat, India. *Int J Res Med Sci* 2016; 4:4123-7.
18. Jain R, Aggarwal P, Gupta GN. Need for nucleic acid testing in countries with high prevalence of transfusion-transmitted infections. ISRN Hematol 2012; 2012: 718671.
19. Giri PA, Deshpande JD, Phalke DB, Karle LB. Seroprevalence of transfusion transmissible infections among voluntary blood donors at a tertiary care teaching hospital in rural area of India. *J Family Med Prim Care* 2012; 1:48-51.
20. Sastry JM, Agawane SU, Harke VA. Retrospective study of the five-Year Prevalence and Trends of transfusion transmitted infections (TTIs) among blood donors at a charitable hospital blood bank in Pune, India. *Int J. Health Biomedical Res*. 2014; 2(3):193-200.
21. Leena MS, Mohd. S. Trend and prevalence of transfusion transmitted infections among blood donors in rural teaching institute, south India. *J. Pathol Nepal*. 2012; 2:203-6.
22. Sundaramurthy R, Arunagiri R, Ganesan V, Perumal S, Tiruvanamalai R, Charles J. Seroprevalence of transfusion transmissible infections among blood donors by chemiluminescent assay in a tertiary care centre. *J of Infect Dev Ctries*.2018; 12(01):31.
23. Chandra T, Kumar A, Gupta A. Prevalence of transfusion transmitted infections in blood donors:an Indian experience. Tropical Doctor.2009;39(3):152-4
24. Chandekar SA, Amonkar G, Desai H, Valvi N, Puranik G. Seroprevalence of transfusion transmitted infections in healthy blood donors: A 5-year Tertiary Care Hospital experience. *Journal of Laboratory Physicians*. 2017; 9(4):283.
25. Bommanahalli B, Javali R, Swamy CM M, Gouda K, Siddartha K, Shashikala KP. Seroprevalence of Hepatitis B And Hepatitis C viral infections among blood donors of central Karnataka, India. *Int J Medical Sci Public Health* 2014;3(3):285-8
26. Chaudhary A. Epidemiology of hepatitis B virus in India. Hep B Annual. 2004; 1:17-4.

How to cite this article:

Ashok Pal *et al*.2019, Seroprevalence of Transfusion Transmitted Infections Among Blood Donors In Sms Hospital Jaipur: A Cross Sectional Study. *Int J Recent Sci Res.* 10(01), pp. 30441-30445. DOI: http://dx.doi.org/10.24327/ijrsr.2019.1001.3059

****