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Prevalence of Transfusion Transmitted Infections among Blood Donors at Regional Blood Bank in north India

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***Abstract*: TTIs can be rooted by microorganisms which may be present in the blood or blood component. The major worldwide prevalent TTIs are caused by HIV, HBV, HCV, Treponema pallidum and malaria. The popular of the problems are due to the prevalence of asymptomatic carriers in the public and under window episode of infections. The WHO and National Blood Policy of India recommend that National Blood Services should be based on voluntary, non-remunerated blood donation. Laws related to blood transfusion in India are a part of the Drugs and Cosmetics Act 1945 (D&C Act). Every collected unit mandatorily tested for five major TTIs. With every unit of blood transfusion there is 1% chance of transfusion associated problems including transfusion-transmitted diseases. *Design:* This retrospective study was carried out over a period of 5 year i.e. 2011 to 2015. The testing protocol was followed in the blood bank, after complete physical examination of blood donor by blood bank medical officer. *Results:* Over a five year period total blood donation was 33507, in which 30184 (90%) were voluntary and remaining 3323 (10%) were replacement. This was due organized the blood donation camp time to time. The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria was 52 (0.15%), 404 (1.20%), 396 (1.18%) and 04 (0.01%) respectively. The seropositivity of HBV was decreased every year continuously, whereas HIV, HCV and syphilis remain similar. The overall prevalence of the five year retrospective study (2011-2015) was 2.55%. *Conclusion:* Nucleic acid amplification testing (NAT) must be applied that identify blood donation made during the immunological window period before seroconversion. Information to TTIs reactive donor be a best method for prevent the chance of repeat reactive donation. Donor self-exclusion and encourage about the autologus blood transfusion will be effective in decreasing the TTI's as well as practices of autologus blood transfusion should be encouraged.**

***Keywords:* HIV, HBsAg, HCV, VDRL, North India, TTI,**

1. INTRODUCTION

More than million blood units are collected from donor every year. Transfusion medicine being comparatively emerging field, risk for transmit of infections from blood transfusion was considered unavoidable in the past, however by the advent of new screening techniques the risk is greatly reduced[1]. Worldwide more than 81 million units of blood are donated each year[2].

TTIs can be caused by various microorganisms which may be present in the blood or blood component being transfused. The major worldwide prevalent TTIs are caused by human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), Treponema pallidum and malaria parasite[3]. The majorities of the problems are due to the prevalence of asymptomatic carriers in the society, as well as blood donations during the window period of infections.

The World Health Organization and National Blood Policy of India recommend that National Blood Services should be based on voluntary, non-remunerated blood donation. Laws related to blood transfusion services in India are a part of the Drugs and Cosmetics Act 1945 (D&C Act). Every collected unit mandatorily tested for five major TTIs which are HIV-1 and 2, HBV, HCV, Syphilis and Malaria. Over the last two decades, much attention has been given to the prevention of

TTIs viral infections and such as HTLV (I and II), West Nile Virus etc the attention also given to the potential transmission of viruses during the 'immunological window phase i.e. the period of early infectivity when an immunologic test is non-reactive[4].

With each unit of blood transfusion, there is 1% chance of transfusion associated problems including transfusion-transmitted diseases[5,6]. Among all infections HIV and Hepatitis are serious complications due to the potential serious clinical sequelae associated with these readily transmitted agents[5]. There are second highest pool 5.7 million cases of HIV in India. Syphilis is less often transmitted by blood and the prevalence is low in most studies reported[7,8]. Keeping in mind the severe consequences these infections and to control the transmission to minimum, it is very important to remain alert about the possible spread of these[9.10]. (122/7)

In transmission of HCV, a large quantity of virion enters the blood. Most countries in the developing world do not screen blood donations for the presence of HCV. WHO's Global Database on Blood Safety estimates that 43% of donated blood in the developing world is not screened adequately for transfusion-transmitted infections, including HCV. In India, HCV screening of blood products is mandated by law but not usually done due to financial constraints[11].

In New Delhi, among 182 anti-HCV-negative hospitalized patients calculated prospectively following a blood transfusion, HCV infection developed in 5.4%.136.9% of HCV patients received blood transfusion in a study conducted by Rehan et al[12]. Unsafe therapeutic injections, Injection drug use (IDU) are the primary mode of transmission for HCV infection in the developed world. In countries such as the USA and Australia where the highest seroprevalence is among middle-aged people[11,12].

There are three types of blood donors: voluntary unpaid; family/replacement and paid. Voluntary unpaid blood donors are vital for ensuring a sufficient, stable blood supply. A well-established voluntary unpaid blood donor programme can contribute to a significant reduction in the risk for infections such as HIV, hepatitis B, hepatitis C and syphilis. The prevalence of TTIs in voluntary, non-remunerated blood donors is lower than among family/replacement[13] and paid donors.

Majority of the troubles are due to the prevalence of asymptomatic carriers in the society, as well as blood donations during the window phase of infections[13]. These unsafe blood transfusions are very costly from both human and economic points of view. Hence, implementation of effective donor selection criteria and quality of screening tests are important and critical in preventing transmission of these infections. Serological testing for transfusion transmitted diseases had historically been the foundation of blood screening, while newer strategies like nucleic acid testing (NAT) have helped further shorten the "window period".

Transmission of malaria by blood transfusion was one of the first recorded incidents of transfusion transmitted infection[14]. HBV has 2%-7% zone and has the second largest global pool of chronic HBV infections[2] causing death due to chronic hepatitis, cirrhosis liver and hepatocellular carcinoma.

The present retrospective study was carried out with the aim to find out the prevalence of Transfusion Transmitted Infectious markers and their trends among the blood donors at Regional Blood Bank in north India over a period of five years.

2. METHOD & MATERIALS

The retrospective 5 year study (i.e. 2011 to 2015) was undertaken to determine the prevalence of TTIs among blood donors in the Regional Blood Bank at North India. **Inclusion criteria:** Physically fit blood donors aged between 18 to 65 years.

Exclusion Criteria: Exclusion criteria followed in blood donors who had previous history of HIV, HBV, and HCV infection. If the donor below 18 years weighted less than 45 kg, having anemia and history of jaundice within past six months, high risk behavior of drug use donated blood within past three months were also excluded.

Diagnostic Testing: 3rd generation Microlisa was used to detect the HIV Antigen and Antibody in donor serum. 4th generation Hepalisa was used for detection of Hepatitis B Surface Antigen and 4th generation HCV Microlisa was used for detection of HCV Antibody in serum or plasma of donor. The Sero-Max RPR (slide agglutination method) was used for VDRL screening.

3. RESULTS

We evaluated a total of 33507 units of blood during 1st January 2011 to 31st December 2015. The results were interpreted and following details were drawn in tables.

Table I: Blood Collection during Study Period

Study Years	Unit Collection
2011	6600
2012	6255
2013	7068
2014	6867
2015	6717
Total Collection	**33,507**

Table showing the year wise collection of blood units, year 2012 show the lowest collection (6255), and the highest collection was found in 2013 (7068). Result also shows similar blood collection in every year.

Table II: Distribution of Voluntary and Replacement

Donor Year	Voluntary	% of Vol	Rep	% of Replacement
2011	5,811	88.05%	789	11.95
2012	5,438	86.93%	817	13.07%
2013	6,878	97.31%	190	2.69%
2014	6,157	89.66%	710	10.34%
2015	5,900	87.83%	817	12.17%
Total	**30.184**	**90.00%**	**3,323**	**10.00%**

Out of 33507 blood donation, 30184 (90%) were replacement and 3323 (10%) were volunteer. The highest volunteer donation trend seen in 3rd year (2013) of study 6878 (97.3%). And in other year of study the voluntary donation is likely similar.

Table IV: Distribution of Seropositivity

Infections	2011	2012	2013	2014	2015	Total
HIV	13 (0.20%)	19 (0.30%)	07 (0.10%)	04 (0.05%)	09 (0.11%)	52 (0.15%)
HBV	113 (1.71%)	101 (1.62%)	77 (1.11%)	55 (0.80%)	58 (0.76%)	404 (1.20%)
HCV	70 (1.06%)	77 (1.23%)	85 (1.23%)	93 (1.35%)	71(0.93%)	396 (1.18%)
Syphilis	2 (0.03)	00 (0%)	00 (0%)	01 (0.01%)	01(0.01%)	4 (0.01%)
Total	**198 (3.0%)**	**197 (3.15%)**	**169 (2.44%)**	**153 (2.22%)**	**139 (1.83%)**	**856 (2.55%)**

Seropositivity distribution shows the high prevalence in year 2012 (3.15%) and 2011 (3.0%) than the average prevalence 2.55 and lower in 2013 (2.44%), 2014 (2.22%) and 2015 (1.83%). This prevalence shows the decreased trend of seropositivity. And the particular trend of malaria is zero and syphilis is 0.01, whereas HBV and HCV have the similar positivity 1.20% and 1.18% respectively in over five years. In five year study the overall seropositivity is decreased.

4. DISCUSSION

In past 10 years there had been a unique attention in donor selection tactics in blood transfusion services in order to supply secure blood transfusion of blood and its component. The aim of this study was to find out the prevalence of infectious markers and their trends among the blood donors at Regional Blood Bank in north India over a period of five years, and no such study had been carried out in this region in the past.

In our present study 30184 (90%) of the donors were voluntary and remaining 3323 (10%) were replacement, in same study at Mullana by Kumar Y et al (2013) showed opposed results that were 90.39% of the donors were replacement-donor and remaining 9.61% were voluntary-donor in a four year retrospective and one year prospective study[2]. The opposite results were also represented by Makroo et al (2014) 96.93% of their donor were replacement[15], 85.6% replacement donors in a study carried out by Chattoraj A et al[16], whereas in Chandigarh 55% replacement donor in a study by Kaur G et al[17], in reflection of these studies our present study have much better results of voluntary donor, this is probably reflect the good basic awareness in urban population regarding blood donation, and organizing of voluntary blood donation camp time to time.

The HIV seropositivity was although same in every year in our present study. The prevalence of HIV reported in Indian blood donors ranges from 0.084% to 3.87%[15], in our five year retrospective study prevalence of HIV was 0.15% (range 0.05% to 0.30%) as compared to high than Kumar Y et al studied from Mullana 0.10%[2], and similar to Makroo et al 0.11% resulted in 2014[15], HIV 0.08% by Sunderam S et al (2015)[18], and much less than HIV prevalence Shubhangi K et al 0.92%[19]. The similar results showed 0.12% in 2003, 0.17% in 2004 and 0.10% in 2005 by Chattoraj et al[16]. Singh et al showed increased HIV seropositivity 0.54% in Delhi[20]. And similar results showed in previous study at Mullana resulted 0.09% HIV positivity by Garg Met al[21]. In South-African countries HIV prevalence are much greater than our results and other developing countries.

In our present study overall prevalence of HBV was 1.20%, whereas 1.18% the similar result (2014) by Makroo et al[15] and prevalence of HBV was 1.01% detected at Ranchi by Sunderem S[18], this result is slightly greater than our past study (0.86%) at Mullana by Kumar Y et al[2] and 1.0% in 2008 at Mullana by Garg Met al[21]. According to WHO classification the area qualify as a low prevalence area (< 1%). In Chandigarh and south Haryana, prevalence of HBV was higher than the present study and in south-Indian region this positivity rate higher noted 2.82% by Rangroo et al[22], in Maharashtra 1.5 and 2.27% in West Bengal by Sinha et al[23]. The most widely used HBV marker, namely HBsAg is not usually detecting the window period of the infection. Our results came under high prevalence. The trend of HBV infection is continuously decreased from 1.71% to 0.76 in 2011 to 2015 respectively. In our best review the HBV is highest (3.2%) by Shubhangi T et al 2014[19].

In our present study prevalence of HCV was 1.18% is much similar with our past study at Mullana 1.21% by Kumar Y et al[2], 1.23 % by Jayagowri SM et al[13], higher than the past five year results (2008) 0.65% by Garg M et al[21], 0.21%. HCV by Khan MI et al[5]. The other parts of India show the low prevalence except Punjab region 1.38% by Kaur H et al[24] and 1.45% Gupta S et al 2015[25], Makroo et al resulted much lower 0.43% at Delhi in a nine years retrospective study (2014)[15], the lowest results were showed by Sunderem S et al 0.14%[18]. The trend of HCV was dramatically up-down during the study and lower

The prevalence of syphilis was 0.01% in our present study, this is much better than Kumar Y et al 0.24% (2015)[2], 0.22% in Maharashtra by Rangroo et al[22]. And significantly decreased than 0.5% was resulted by Garg M et al in 2008 at Mullana, Haryana[21]. Makroo et al found (0.23%) in (2014) Delhi[15], And also lower than 0.5% showed by Biswas et al in Rajasthan[26] and 0.7% by Kaur G et al[17] from Chandigarh. 1.79% positivity was detected by Sial GR et al[1] 2016 from Lahor Pakistan. In the contrast of other region of India our results are much better.

The total seropositivity at Regional Blood Bank Karnal was 2.55%, in a five year (2011-2015) is much similar Kumar Y et al at Mullana (2013) as 2.52%[2], Garg M et al 2.25% (2008) at Mullana[21], Biswas et al in 2010 (2.26%) at Sri Ganganagar[26] and 3.8% in Chandigarh detected by Kaur G et al[17] in 2005. But our trends are much higher than 0.53% (2011) in Ahmedabad by Piyush et al[27], in East India (Calcutta) Sinha SK et al resulted much more 5.8%[23]. In the comparison of previous study in Mullana, we found 0.03%[2] more positivity and 0.30% than Garg M et al Mullana (2008)[19].

As compared to developed countries our TTIs prevalence was so higher. This is due to the modern technologies and new improved health strategies in developed countries than the developing countries. In Karnal region (Haryana) agriculture workers, history of blood transfusion, tattooing, intravenous drug use and sexual promiscuity were among the significant risk factors for transfusion transmitted infection in our donation. A particularly high prevalence of HBV and HCV infection has been found in this region, carrier of HBV and HCV are the main reason for this high prevalence. Through the implementation of NAT (PCR) the TTIs ratio will be increased but transfusion of infection will surely significant decreases. As compared to ELISA nucleic acid testing is costly especially in economically restricted countries.

5. CONCLUSION

This retrospective five year study suggests that the development and appropriate of new technologies implementation like NAAT (Nucleic Acid Amplification Testing) or PCR (Polymerase Chain Reaction) particularly for Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) for in the blood transfusion services those will help in the reducing the window period of these type of viral markers. The most effective strategy must be started that to inform the TTI positive donor and advice for no such donation in future. Pre-donation counseling and donor self-exclusion will be effective in decreasing the Transfusion Transmitted Infections as well as practices of autologus blood transfusion should be encouraged.

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