

Syphilis Burden: An Extensive Study, Evaluating Transfusion Transmitted Syphilis And Other Co-Infections Among Blood Donors

Roopam Jain*, Mohit Kashiv*, Preeti Jain*, P.Desai**, U.Chudgar***, N. Choudhury****, V.K. Mahadik*

*C R Gardi Hospital and R D Gardi Medical College, Ujjain, **Tata Memorial Hospital, Parel, Mumbai,

Prathama Blood Centre, Ahmedabad, *Fortis Memorial Hospital, Delhi

Abstract: Background: Syphilis is a chronic sexually infectious disease caused by the Spirochaete, *Treponema pallidum* (T. pallidum). T. pallidum can also be transmitted by transfusion of blood or blood components from donors. It is not the transmission of syphilis that is distressing, being a sexually transmitted disease, seropositivity signifies donor's involvement in "high risk" behavior. The purpose of this study is to analyze the status of Transfusion transmitted Syphilis and other co-infections among seemingly healthy donors, targeting the non-remunerated blood donors (voluntary and replacement) during the period January, 2009- September, 2018. Material and Method: It is a cross-sectional, observational study conducted at Regional Blood Transfusion Bank Centre, C R Gardi Hospital and R D Gardi Medical College, Ujjain. All the donated blood samples were screened for Syphilis using Syphilis Rapid Test. Data was analyzed. Result: Overall prevalence of transfusion transmitted infections was 2.26%. There was increased incidence among replacement donors. Prevalence of Syphilis was estimated at 0.69%. Age is an important risk factor. Syphilis is the second most common infection after HBV among blood donors. Conclusion: There is a fluctuating trend for seropositivity of syphilis, with a slight reduction in recent years. Overall syphilis prevalence is high in the study region. With the adaptation of strict donor selection criteria, use of sensitive screening tests and implementation of strict guidelines for blood transfusion it may be possible to reduce the prevalence of TTI [Jain P Natl J Integr Res Med, 2019; 10(1):31-35]

Key Words: Syphilis, Transfusion transmitted infections, Blood donors, seropositivity

Author for correspondence: Dr. Preeti Jain, Department of Physiology, C R Gardi Hospital and R D Gardi Medical College, Ujjain, E-mail: drroopamjain@gmail.com M : 6265447700

Introduction: Syphilis is a chronic infectious disease caused by the spirochaete, *Treponema pallidum* (T. pallidum). Syphilis is conventionally thought to be transmitted by sexual contact or from mother to infant, whereas endemic syphilis by non-sexual contact in communities living under poor hygienic conditions. T. pallidum can also be transmitted by transfusion of blood or blood components from donors with active syphilis or when the blood is unscreened.¹

The infectious agent or infection might have the following properties in order to be transmissible via blood: presence for long periods in blood; high titres, stability in blood stored at 4°C or lower, long incubation period before clinical signs, asymptomatic phase or only mild symptoms in the blood donor, hence not detectable during the donor selection process.² However, Treponemes are relatively sensitive to low temperatures; hence the risk of transmission through transfusion of blood stored below 20 °C for more than 72 hours is very low.^{3,4} The risk of transfusion-transmitted syphilis is particularly high in developing countries with limited blood supplies where the blood is collected from donors and transfused within hours. A screening test is essential to prevent transfusion-transmitted syphilis in such regions.

The risk of transfusion-transmitted syphilis is closely related to risk factors in the blood donor, in particular sexual behaviour since the disease is primarily transmitted by the sexual route, seropositivity shows donor's indulgence in "high risk" behavior and higher risk of exposure to infections like HIV and hepatitis.⁵

The World Health Organization (WHO) estimated that there are 12 million new cases of syphilis each year, with more than 90% occurring in developing nations.⁶ In India, several studies have been published regarding transfusion transmitted infections, including Syphilis. This study in particular, discusses about the prevalence of syphilis and other co-infection with other transfusion transmitted diseases among the blood donors at Regional Blood Transfusion Center in Central India.

Materials and Methods: Place of study- Regional Blood Transfusion Bank Centre, C R Gardi Hospital and R D Gardi Medical College, Ujjain. Duration of study- January, 2009- September, 2018.

Type of study- Cross-sectional and observational study.

Inclusion Criteria - The present study included all the replacement and voluntary blood donated in

the study duration. Donors were selected by taking history, clinical examination and following donors' selection criteria according to the Indian FDA rules and regulations for donor selection.

Sample Collection - Written consent was taken. Blood was collected in blood bags containing anticoagulant-preservative solution. Approximately 5 ml of donor blood was also collected in two pilot tubes (Plain and EDTA) for blood group typing and testing of infectious diseases.

All the donated blood samples were screened for Syphilis using Syphilis Rapid Test strips, based on qualitative membrane based immunoassay for the detection of TP antibodies (IgG and IgM) in serum/plasma. All the samples were screened for Hepatitis B surface antigen (HBs Ag), HIV (1 and 2), Hepatitis C virus (HCV) by ELISA method for determination of respective antigens and antibodies in human serum/plasma. Malaria screened, using RDT, based on immunochromatographic methods detecting antigens. Thick and thin smears were made and examined for parasitic forms for all positive cases, to corroborate the results of RDT.

The donated blood was discarded whenever the pilot donor sample was found positive for any TTI. Additional data analysis was conducted to examine the prevalence trends associated with each infection.

Statistical Method: Information regarding donor was extracted from Donor register. Donor

Table 01 : Incidence of TTI amongst voluntary and replacement donors during nine year study period (2009–2018).

Year	Total donors	Seropositive Replacement Donors	Seropositive Voluntary Donors	Total Seropositive Donors
2009	5594	64 (1.14%)	31 (0.55%)	95
2010	8979	153 (1.7%)	72 (0.80%)	225
2011	9156	181 (1.97%)	85 (0.93%)	266
2012	8135	152 (1.86%)	72 (0.88%)	224
2013	9230	168 (1.82%)	79 (0.85%)	247
2014	12065	188 (1.55%)	89 (0.74%)	277
2015	11178	151 (1.35%)	69 (0.62%)	220
2016	11378	144 (1.26%)	68 (0.59%)	212
2017	9160	95 (1.04%)	45 (0.49%)	140
2018	7072	125 (1.76%)	49 (0.69%)	174
Total	92047	1421 (1.54%)	659 (0.71%)	2080 (2.26%)

Table 02: Incidence of HIV, HBV, HCV, Syphilis and Malaria in blood donors during study period (2009- 2018)

register is filled for eligible donors before blood collection. Computerized compilation and coding of collected data was done. All statistical analysis was made by using Stata (version 12, college station, Texas, USA). For comparing various categorical variables we used 'Chi-square' test of significance.

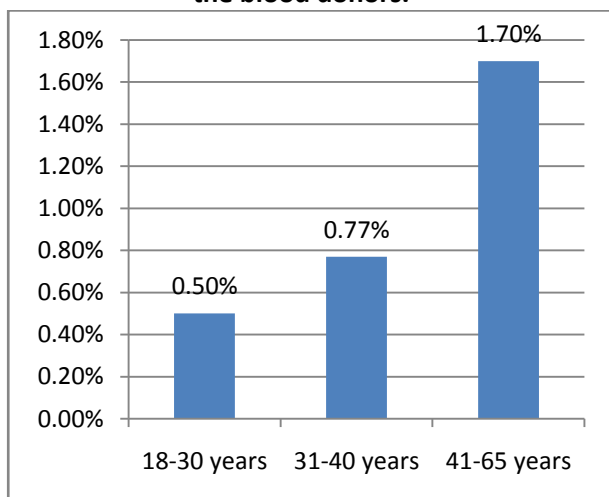
Results : A total of 92,047 donors were enlisted in the study. Of these, 26,275 (28.54%) were voluntary and 65,772 (71.46%) were replacement donors. Males outnumbered females with 85,609 (93%) donations while only 6,438 (7%) donors were females. Among these, 59,661 (64.81%) donors aged from 18 to 30 years, 23,379 (25.39%) from 31 to 40 years and 9,007 (9.8%) were in the 41–60 years age group.

Overall seroprevalence of transfusion transmitted infections was estimated at 2.26%, i.e 2,080 seropositive donors, of these, majority were replacement donors (68.27%). Incidence rates for Transfusion transmitted infections among different blood donors are discussed in Table-01. Prevalence of 5 major Blood transmitted infections were respectively, HIV (I and II) at 0.064% (59 seropositive donors), HBV at 1.38% (1271 seropositive donors), HCV at 0.068% (63 seropositive donors), Syphilis at 0.69% (638 seropositive donors) and Malaria at 0.053% (49 seropositive donors). Annual incidence rates for various Transfusion transmitted infections are depicted in Table-02.

Year	Donors	HIV	HBsAg	HCV	VDRL	Malaria
2009	5594	4 (0.07%)	68 (1.21%)	3 (0.05%)	18 (0.32%)	2 (0.03%)
2010	8979	8(0.09%)	158 (1.75%)	6 (0.06%)	49 (0.54%)	4 (0.04%)
2011	9156	11 (0.12%)	158 (1.72%)	18 (0.19%)	77 (0.84%)	2 (0.02%)
2012	8135	8 (0.09%)	133 (1.63%)	6 (0.07%)	72 (0.88%)	5(0.06%)
2013	9230	4 (0.04%)	145 (1.57%)	7 (0.07%)	87 (0.94%)	4 (0.04%)
2014	12065	6 (0.05%)	172 (1.42%)	8 (0.06%)	84 (0.69%)	7(0.06%)
2015	11178	7 (0.06%)	125 (1.12%)	2 (0.02%)	80 (0.71%)	6(0.05%)
2016	11378	6 (0.05%)	137 (1.20%)	2 (0.02%)	62 (0.54%)	5(0.04%)
2017	9160	3 (0.03%)	88 (0.96%)	6 (0.06%)	35 (0.38%)	8 (0.09%)
2018	7072	2 (0.028%)	87 (1.23%)	5 (0.07%)	74 (1.05%)	6 (0.085%)
TOTAL	92047	59 (0.064%)	1271 (1.38%)	63 (0.068%)	638 (0.69%)	49 (0.053%)

Seroprevalence of Syphilis in blood donors was estimated to be 0.69%, i.e 638 donors, of which 471 (73.8%) were replacement donors and 167(26.2%) were voluntary donors. Distribution of Syphilis according to age among seropositive donors shown 0.5%, 0.77% and 1.7% incidence rates in 18-30, 31-40 and 41-60 years age groups, respectively. (Figure- 01)

Figure 01 : Age specific prevalence of syphilis in the blood donors.

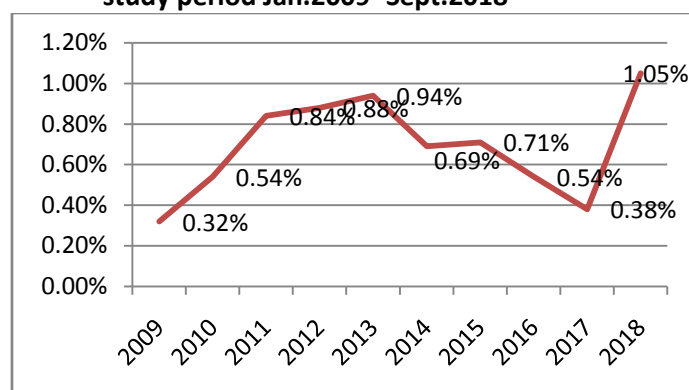


Discussion : Blood transfusion is important for the medical treatment of various patient groups, providing a lifesaving measure in different medical and surgical emergencies. Transfusion medicine has great public health importance. National Blood Policy, adopted by Ministry of Health and Family Welfare in 2002 with major objectives to reiterate firmly the Government commitment to provide safe and adequate quantity of blood, blood components and blood products. ⁷ An important aspect of blood safety is

Transfusion transmitted diseases. To ensure safe blood donation, NACO (National Aids Control Organization) recommends the testing of atleast 5 Transfusion Transmitted Infections. They are HIV, HBV, HCV, Malaria and Syphilis ⁸

Seroprevalence of Syphilis among blood donors in our study was 0.69%, i.e 638 seropositive donors, which is significantly higher than other studies. ^{9, 10, 11-17} The incidence was found to be increasing with age as discussed by Kaur G ¹ and in the study from Israel ¹⁸. (Figure- 01) A fluctuating trend was observed in our series for syphilis during the study period with a mild reduction in syphilis infection in the recent years (Figure- 02).

Figure- 02; Prevalence of Syphilis during the study period Jan.2009- Sept.2018



Overall seroprevalence of transfusion transmitted diseases in this study was 2.26% (2,080 seropositive donors), which is significantly lower than in other published studies. ⁹⁻¹³ Seroprevalence of HIV, HBV, HCV, VDRL and malaria estimated in this study are 0.064%,

1.38%, 0.068%, 0.69% and 0.05% respectively. Hepatitis B and C and HIV units are of major concern due to carrier state and complications associated with these infections. Hepatitis B virus (HBV), Hepatitis C virus (HCV), Human immune deficiency virus (HIV) and Syphilis are the most important lethal agents in transfusion transmitted infections (TTIs) and remains a large health care burden globally. Malaria makes the major cause of transfusion transmitted parasitic infection in tropical countries.

The incidence rates across the world are difficult to calculate given the asymptomatic and often latent nature of the disease prior to clinical presentation. Every blood transfusion therefore carries a potential risk for transmissible diseases. Improvements must be made in donor selection criteria and screening for infectious diseases in order to provide a safe blood supply. Blood can save lives; however, it also carries the potential to transmit life-threatening infections.

Conclusion : There is a fluctuating trend in the seropositivity of syphilis during the study period, with a slight reduction in recent years. Overall syphilis prevalence is high in the study region. Age is an important risk factor. Syphilis is the second most common Blood transmitted disease after HBV. Despite stringent donor screening and testing practices, safe blood free from TTIs remains an elusive goal because the threat of TTIs agents entering the blood supply is not static. With the implementation of strict donor selection criteria, use of sensitive screening tests and establishment of strict guidelines for blood transfusion it may be possible to reduce the incidence of TTI.

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