

ORIGINAL RESEARCH

Incidence Of Different Transfusion Transmitted Infections And Effectiveness Of Screening Methods - A Study Of Tertiary Care Blood Bank

¹Dr. Urvashee Dwivedi, ²Dr. Mustafa Ali, ³Dr. Fatima Bhopalwala Ali, ⁴Dr. Avinash Balraj

¹Assistant Professor, Department Of Immunohematology and Blood Transfusion, Government Medical College, Jalaun, U.P. India

²Assistant Professor, Department Of Pathology, DLNP Medical College, Ratlam, M. P. India

³Assistant Professor, Department Of Anatomy, DLNP Medical College, Ratlam, M. P. India

⁴Assistant Professor, Department Of General Medicine, DLNP Medical College, Ratlam, M. P. India

Corresponding Author

Dr. Avinash Balraj

Assistant Professor, Department Of General Medicine, DLNP Medical College, Ratlam, M. P. India

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ABSTRACT

Background: Transfusion transmitted infections (TTIs) remain a major threat to the patients receiving blood. Accurate estimates of risk of TTIs are essential for monitoring the safety of blood supply and evaluating the efficacy of currently employed screening procedures.

Objectives: Aim of this study is to estimate the incidence of transfusion transmissible infections (TTIs) among blood donors and analyse the effectiveness of screening methods for its prevention and control strategies.

Methods: This was a cross-sectional observational study, enrolled 600 blood donors who donated blood during the study period. All the received blood units were screened and analyzed for TTIs. Socio-demographic data were also collected from all the participants. Screening of HIV, HBV, HCV, Syphilis and malaria in all blood units was done by appropriate methods.

Results: Out of total donors, 250 (41.6%) were 18-30 years of age group and predominantly were males (65%). The voluntary blood donors were 55% and those who donated blood for the first time were 63.3%. Highest number 277 (46.2%) belonged to blood group "O positive", followed by 138 (23%) with "B positive" blood group. The overall sero prevalence of TTIs was 2.83%. In sero-reactivity donors, maximum 8 (1.3%) cases were reactive for HBsAg, 5 cases (0.83%) for anti-HCV, 2 cases (0.33%) for syphilis and HIV. There was no cases positive for malaria parasite.

Conclusion: The study reported a moderate prevalence of TTIs among blood donors, hence routine screening of all blood donors are crucial for the prevention and control of TTIs.

Keywords: Transfusion transmitted infections (TTIs), Blood donors, Screening methods.

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INTRODUCTION

Blood transfusions are transfusions of whole blood or its components. This is important to save millions of patients worldwide from morbidity and mortality each year. There are reports that a quarter of a million mothers dies globally due to obstetric bleeding, particularly in developing countries where there is a high number of maternal mortality, motor accidents and populations non-immune to malaria [1, 2]. All the above mentioned cases require blood transfusions that can aid in correcting the different conditions of patients, such as anemia, plasma clotting factor deficiency, thrombocytopenia and hypoalbuminemia [3]. In India, the main sources of blood transfusion

are voluntary donors and replacement donors. Voluntary donors are preferred over replacement donors [4]. Transfusion transmitted infections (TTIs) are a major problem associated with blood transfusions. Accurate estimates of the risk of TTIs are essential for monitoring the safety of blood supply and evaluating the efficacy of the currently employed screening procedures [5]. Transfusion transmitted infections (TTIs) are a great concern of safety for patients. The magnitude of the TTI varies from country to country depending on TTIs' loads in that particular population from where blood units are sourced. Multiple measures are taken to minimize TTIs transmission in the respective population. 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. Concealing of medical history by captive, paid, or professional blood donors, who widely exist in developing countries, also poses a great threat to safe blood supply. There is a long list of viruses, parasites, and bacteria, which can be transmitted through blood transfusions. Among them, important transfusion transmitted viruses are human immunodeficiency virus (HIV-I/II), hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis infection by Spirochaetes, and transfusion associated malaria infection [6-7]. Transfusion transmissible infections can be a risk for health care workers, according to World Health Organization (WHO), 3 million workers are getting exposed to these infections every year [8]. The overall prevalence of transfusion transmitted infections ranges from 2.79% to 18.7% [9]. Thus monitoring and understanding the magnitude of transfusion transmissible infections among blood donors is essential to assess the effectiveness of screening tests and directly reflect the epidemiology in the particular study population.

AIMS & OBJECTIVES

This study is undertaken to assess the trends and incidence of transfusion transmissible infections among voluntary blood donors and effectiveness of screening methods for prevention of transfusion transmitted diseases.

MATERIALS AND METHODS

This was a cross sectional observational study carried out in blood bank under the department of pathology in a tertiary care centre, western India. The data of 600 voluntary, non remunerated blood donors who were accepted and donated blood (whole blood and apheresis) at the blood bank of tertiary care hospital in western India were analyzed as part of the study population.

INCLUSION CRITERIA

- Participants of age group of 18-60 years, with both gender
- Weight \geq 45 kg
- Hemoglobin \geq 12.5 g/dl or packed cell volume (haematocrit) $>$ 36%
- Normal hemodynamic parameters (pulse, blood pressure, temperature and SP_{O_2})

EXCLUSION CRITERIA

- Participants of $<$ 18 or $>$ 60 years of age
- Weight less than 45 kg
- Hemoglobin less than 12.5 g/dl
- Abnormal hemodynamic parameters (pulse, blood pressure, temperature and SP_{O_2})

All the data regarding Socio-demographic characters including age, gender, type of donations (voluntary/replacement blood donations), type of donors (first time/repeat blood donors), frequency of donations, geographical regions (urban/rural), occupation, and religion were collected from the records and analyzed.

All the donated blood units were tested for HIV (Human Immuno-deficiency Virus), HBV (Hepatitis B Virus), HCV (Hepatitis C Virus), Syphilis and Malaria for detection of Transfusion Transmitted Infections (TTIs). Quantitative determination of antibodies to HIV 1 and HIV 2 and the determination of p24 antigen of HIV 1 in the human serum or plasma by using DCGI approved 4th generation enzyme linked immune sorbent assay (ELISA) kits or rapid assays. HBsAg and HCV antibody was tested by using third generation ELISA kit. Testing of syphilis was done by VDRL determination rapid plasma regain card test and malaria was detected by using rapid malaria antigen card test. The strategy of screening blood units was followed and screened units were marked as reactive and non-reactive by one time assay.

STATISTICAL ANALYSIS

Epi Info7 and SPSS software (SPSS version 20) were used to analyze the blood donor data. The seroprevalence of TTI markers among different demographic groups was evaluated by using Pearson's Chi square (χ^2) test. P value less than 0.05 was considered statistically significant.

RESULTS

A total of 600 blood donor donated blood over the study period in our blood bank. All the received blood unit were analyzed for TTIs in this study. Majority of the donors 250 (41.6%) were 18-30 years of age group followed by 31-40 years age group having 160 (26.6%). Most of the donors were males (65%). The proportion of the voluntary blood donors were higher 55% than replacement donors and first time donors were 63.3%. Approximately 66.7% of donors came from urban regions and 58.3% subject were employed [Table 1].

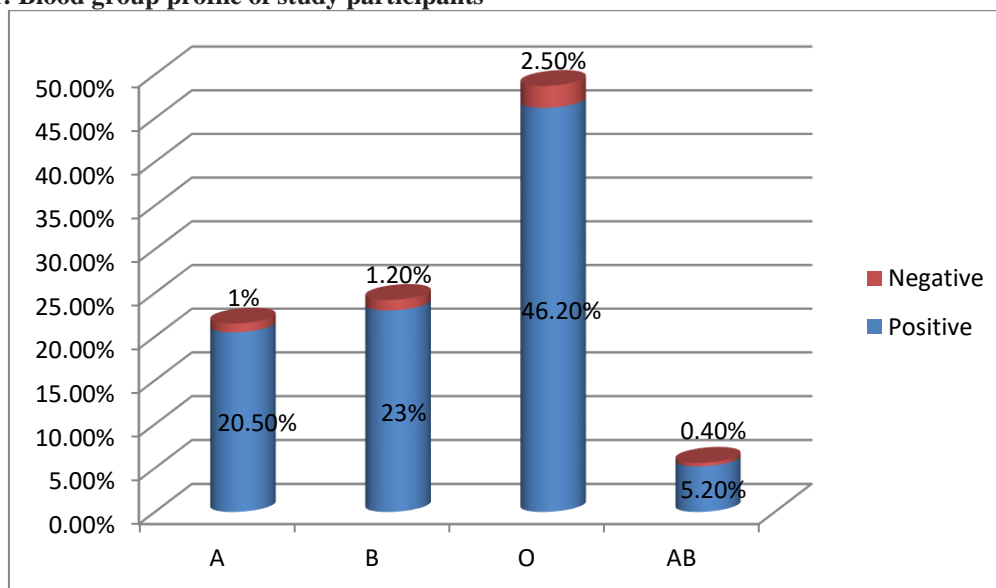
Table 1: Socio-demographic characteristics of blood donors participated in the study

Socio-demographic characteristics		Frequency	Percentage
Age group (in years)	18-30	250	41.6%
	31-40	160	26.6%
	41-50	120	20%
	51-60	70	11.7%
Gender	Male	390	65%
	Female	210	35%

Type of donation	Voluntary Donation	330	55%
	Replacement	270	45%
Geographical area	Rural	200	33.3%
	Urban	400	66.7%
First time/Regular donors	First time	380	63.3%
	Repeated	220	36.7%
Occupation	Employed	350	58.3%
	Unemployed	130	21.7%
	Students	120	20%

Among the total donated units, highest number 277 (46.2%) belonged to blood group “O positive”, followed by 138 (23%) had “B positive” and 123 (20.5%) had “A positive” [Figure: 1].

Figure 1: Blood group profile of study participants



The overall sero prevalence of transfusion transmitted reactions was 2.83% (17/600). In sero-reactivity donors, maximum 8 (1.3%) cases were reactive for HBsAg, 5 cases (0.83%) for anti-HCV, 2 cases (0.33%) for syphilis and HIV. There was no cases positive for malaria parasite [Table 2].

Table 2: Sero-prevalence of transfusion transmissible infections

Transfusion transmissible infections	Number of sero-positive donors	Percentage
HIV	2	0.33%
HBV	8	1.3%
HCV	5	0.83%
Syphilis	2	0.33%
Malaria	0	00%
Total	17	2.83%

Table 3: The prevalence of infectious serological markers by ELISA/Rapid card test in the blood units

Parameters	Frequency	Percentage
HBsAgs	Reactive	6 1%
	Non-reactive	594 99%
HBsAbs	Reactive	47 7.8%
	Non-reactive	553 92.2%
HBcAbs	Reactive	55 9.2%
	Non-reactive	545 90.8%
HCV antigens	Reactive	2 0.33%
	Non-reactive	598 99.7%
HIV antigens	Reactive	1 0.16%
	Non-reactive	599 99.9%
HIV antibodies	Reactive	2 0.33%
	Non-reactive	598 99.7%

Syphilis antibodies	Reactive	2	0.33%
	Non-reactive	598	99.7%
Malaria antigen	Reactive	0	00%
	Non-reactive	600	100%

DISCUSSION

The efficacy of blood screening is a major concern regarding the safety of blood transfusions. TTIs place major burdens of health care systems worldwide, leading to significant morbidity and mortality. Screening of blood units prior the blood transfusion may prevent the TTIs. In existence of WHO approved national hemovigilance protocols in different regions, blood transfusion carries a high risk for both patients and healthcare workers [10]. It's important to understand the magnitude of a disease transmission in the community for its control and prevention, thus the assessment and study of TTIs' prevalence is crucial [11]. The overall incidence of sero-positivity of TTIs in current study was 2.83%, in concordance to Shrivastava, et al [12] and Abdallah TM, et al [13], who reported prevalence of TTIs as 2.7% and 3.5% respectively. This finding was higher than that of studies conducted by Teo KS, et al [14] and Chaurasia R, et al [15] who reported prevalence of TTIs as 1.4% and 1.8% respectively. Whereas, this finding was lower than those of studies conducted by Leitch F, et al [16] and Ataro Z, et al [17] who found prevalence of TTI as 6.2% and 7.1% respectively. The differences observed among the Indian studies are based on factors such as the type of donor, life style, and risky health behaviors of the donors in a given geographical region. It is also noteworthy to state here that the prevalence rate of TTIs may be an underestimate or overestimate in lieu of the different gender, geographical location, age, and other characteristics [18]. Among all the sero-reactivity donors the incidence of HBV infection (1.3%) is relatively higher than the other two viruses HIV and HCV. Very low incidence of syphilis and there were no cases positive for MP, similar findings observed by Soldan K, et al [19], Tyagi S, et al [20] and Dean CL, et al [21]. The reason for variation of prevalence of HIV, HBV, and HCV is due to geographical distribution, socio-cultural activities, use of different generation ELISA kits. In developing countries, the overall prevalence of syphilis has drastically come down due to advance health care treatment methods and safe sexual practices. Thus, there are no data available much for syphilis based transmission in developed countries. In developing countries due to poor medical care methods, syphilis is still transmitted by transfusion. Malaria is highly endemic disease. It is restricted mainly to African and Asian continents. In our study the highest number of donated units belonged to blood group "O positive" followed by blood group "B positive", comparable with the many other studies: Nigam JS, et al [22] and Evan M et al [23]. In the present study majority of the donors were younger age groups (18-30 years) and

predominantly males. This is in agreement with study done by Divyashree BN, et al [24] and Alqeer A, et al [25]. In current study, maximum sero-prevalence of TTIs was found in blood group "O positive" and lowest sero-prevalence of TTIs was seen in blood group "AB positive" and results were similar to the study by Sinha D, et al [26] and Omar et al [27]. In this study most of the donors were voluntary and those who first time donated blood, correlating with study the T Chandra, et al [28] and Francine L, et al [29]. Various studies have observed that voluntary non-remunerated blood donors who are regular help in decreasing the incidence of TTIs. Due to repeated blood donation by such donors the overall risk of transmission is reduced and thus the donor can be easily accepted or rejected. Voluntary blood donors should be promoted and the goal of 100% voluntary non-remunerated blood donors should be achieved. Secondly, the use of better screening kits and equipment along with the training of technical staff plays a crucial role in improving the status of blood donors donating blood in terms of TTIs and safe blood transfusion. There has been development of screening methods that are highly sensitive, rapid, and fast to interpret. As per World Health Organization (WHO) guidelines, the sensitivity should be 100% and specificity should be at least 98%. Thus, the available methods need to be optimized such that WHO criteria can be met easily.

CONCLUSION

It is important to understand the magnitude of a disease transmission in the community for its control and prevention, thus the assessment and study of TTI's prevalence is crucial. Screening of the donated blood is a very essential mandatory step in ensuring safety of transfusion, careful donor selection is the most vital step. Voluntary and non-replacement donors are most ideal. Therefore, evaluation and monitoring trends of TTIs' in donor groups remain an valuable indicator for evaluating effectiveness of donor selection and screening procedures.

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