



Original Research Article

Sero-prevalence and trends of transfusion transmissible infections among blood donors in a rural tertiary care centre- A 7 years study

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ABSTRACT

Background: Blood transfusion saves millions of life in emergency situations and is considered has life saving drug. Blood transfusion is associated with several risks which also includes transfusion transmissible infections. With the implementation of strict donor selection, effective and sensitive screening tests can ensure the least reduction risk of acquiring transfusion transmissible infections. The prevalence of transfusion transmissible infections among blood donors reflect the burden of diseases among particular population.

Aim: The aim of this study is: 1. To estimate the prevalence of transfusion transmissible infections among blood donors in a rural tertiary care centre; 2. To analyse the trends of transfusion transmissible infections over study period.

Results: A total of 21,089 voluntary blood donors were studied. There were 20,356 male donors and 733 female donors with ratio of 28:1. The prevalence of HIV, HBV, HCV, Syphilis and Malaria was found to be 0.14%, 0.82%, 0.02%, 0.13% and 0.03% respectively. The prevalence of HBV was highest (0.82%) followed by HIV(0.14%). Our study also showed decrease in trends of HCV and Syphilis over study period. There was strong association of transfusion transmissible infections among O positive blood group.

Conclusion: The prevalence of transfusion transmissible infections has decreased over time, hence implementation of strict donor selection criteria and use of sensitive screening tests has lead to decrease in trends.

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1. Introduction

Blood transfusion is a life saving modality in modern medical practice and is associated with complications which are seen in 1% of all transfusions, these also include the most dreaded, risk of acquiring transfusion transmitted infections(TTI).¹

In India, the main sources of blood for transfusion are voluntary donors and replacement donors. Voluntary donors were preferred over replacement donors.²

The magnitude of the transfusion transmitted infections varies from country to country depending on loads in that particular population. The Indian subcontinent is classified as an intermediate Hepatitis B Virus (HBV) endemic

(HBsAg) zone and has the second largest global pool of chronic HBV infections.³

Despite stringent donor screening and testing practices, the problems of ‘window period’, false-negative results, prevalence of asymptomatic carriers, genetic variability in viral strains and technical errors remains.⁴ Transfusion transmissible infections can be a risk for health care workers, according to World Health Organization(WHO) 3million workers are getting exposed to these infections every year.⁵ The overall prevalence of transfusion transmitted infections ranges from 2.79% to 18.7%.⁶

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.

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This study is undertaken to assess the trends and prevalence of transfusion transmissible infections among voluntary blood donors.

2. Materials and Methods

2.1. Study setting

The data were retrieved from records in Blood Bank, Tertiary care hospital.

2.2. Study period

Total of 7years retrospective study from January 2012 to December 2018.

2.3. Study population

All voluntary donors who would donating blood at our blood bank from 2012 to 2018. A total of 21,089 blood donor records were reviewed and included in the study.

2.4. Inclusion criteria: according to NACO guidelines

1. Age between 18 and 65 years
2. Hemoglobin more than 12.0 gm/dl or the packed cell volume (haematocrit) more than 36%
3. Weight 45-55 Kg
4. Systolic blood pressure between 100 and 160 mm of mercury and the diastolic pressure between 60-90 mm of mercury.
5. Temperature below 37.5⁰ C/ 99.5⁰ F
6. Pulse between 60 to 100 beats per minute and regular
7. Absence of any illness
8. More than 6months of any surgical procedures
9. Not under medications
10. More than 6months history of vaccination
11. History of alcohol, smoking more than 24hrs.

2.5. Exclusion criteria: according to NACO guidelines

1. Age less than 18 and more than 65 years
2. Haemoglobin less than 12.0 gm/dl or the packed cell volume (haematocrit) less than 36%
3. Weight less than 45 Kg
4. Systolic blood pressure more than 160 mm of mercury and the diastolic pressure less than 60 mm of mercury.
5. Temperature above 37.5⁰ C/ 99.5⁰ F
6. Pulse less than 60 beats per minute
7. Presence of any illness
8. Recent 6months history of surgical procedures
9. Under medicationsn
10. Recent 6months history of vaccination
11. History of alcohol, smoking within 24hrs.

2.6. Study tools

All the serum samples were tested for HIV(Human Immunodeficiency Virus), HBV(Hepatitis B Virus), HCV(Hepatitis C Virus), Syphilis and Malaria.

The HBV and HCV antigen detection tests were performed using Enzyme Linked Immunosorbent Assay-third generation (ELISA) method manufactured by Qualpro diagnostics (Qualisa).

HIV antigen detection test were performed using Enzyme Linked Immunosorbent Assay – fourth generation(ELISA) method manufactured by Qualpro diagnostics(Qualisa).

Test for Syphilis were done by Rapid Card tests manufactured by Carbogen (Coral clinical systems).

Malaria antigen test were performed by Pan Malaria Card test manufactured by BioLine SD.

2.7. Method of collection of data

A written informed consent were taken from all donors. Strict donor selection criteria were followed by asking questionarie according to National Aids Control Organization (NACO) guidelines 2007.

In the blood bank each donor blood sample were screened for five infections - HIV, HBV, HCV, Syphilis and Malaria. Socio-demographic particulars of the donors and serological results would be documented and analysed.

2.8. Ethical approval

The study involves analyses of available data for which informed consent had been obtained at the time of collection of blood. The study maintains confidentiality of patient who are sero-positive. The current study was approved by ethical committee of hospital.

3. Results

A total of 21,089 voluntary blood donors were analyzed. Among them 20,356 were male donors and 733 were female donors, with a ratio of 28:1. Our studied had predominance of male donors. There were 246 seropositive male donors and one seropositive female donor (Table 1).

Of 21,089 donors the sero-prevalence of transfusion transmissible infections is 1.14% (247). The prevalenc HIV, HBV, HCV, Syphilis and Malaria were found to be 0.14%, 0.82%, 0.02%, 0.13%and 0.03% respectively (graph 1).

Our study showed highest prevalence of HBV, followed by HIV. The least prevalence was of HCV and Malaria (Table 2).

Our study showed decreasing in trends of HCV and Syphils over 7years study period. Malaria prevalence among donors showed increasing trends. HIV and HBV showed no change (Table 3).

Our study showed association of O positive blood group with transfusion transmissible infections 105 cases (Table 4).

Table 1: Distribution of sero-positive cases in relation to sex

Infection	Male	Female	Total
HIV	31	0	31
HBV	174	1	175
HCV	05	0	05
Syphilis	29	0	29
Malaria	07	0	07
Total	246	01	247

Table 2: Sero-prevalence of transfusion transmissible infections

Transfusion transmissible infections	Number of sero-positive donors	Percentage
HIV	31	0.14%
HBV	175	0.82%
HCV	05	0.02%
Syphilis	29	0.13%
Malaria	07	0.03%
Total	247	1.14%

4. Discussion

Blood is an essential therapeutic need, as there is no genuine substitution. Blood transfusion saves many lives in cases of emergency, and is of more concern to transfuse safe blood to avoid further complications mainly TTI's.¹⁰

In existence of WHO approved national hemovigilance protocols in different regions, blood transfusion carries a high risk for both patients and healthcare workers.¹¹

Its 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.

Therefore, evaluation and monitoring trends of TTI's in donor groups remain an valuable indicator for evaluating effectiveness of donor selection and screening procedures.

The sero-prevalence of transfusion transmissible infections in our study is 1.14%. Other studies within Andhra showed prevalence of 2.42%,⁶ 1.42%¹² and 2.72%¹³ respectively, which is higher compare to our study. In other states, prevalence of TTI's was 1.59%,³ 4.32%,⁹ 0.8%⁷ respectively.

4.1. HIV

Globally, the prevalence of HIV was estimated to be approximately 37.9millions and there are 1.7millions people newly infected with HIV every year.¹⁴

Prevalence of HIV in India is found to be 0.3% as per National Aids Control Organization.¹⁵ In India, the overall highest prevalence is in Nagaland (0.88%) followed by Andhra Pradesh (0.59%).¹⁶

The seroprevalence of HIV in our study is 0.14% and is the second common TTI. These findings were compared with study done in different regions of Andhra Pradesh, which showed 0.1%,⁶ 0.21%¹² and 0.39%¹³ prevalence rates respectively and our result was concordance with their findings. Other studies in India, Seema A et al showed prevalence of 0.17%,¹ Bodarya Om et al concluded 0.16%¹⁰ of prevalence, Shah R et al. study showed 0.09%¹⁷ prevalence, and result was concordance.

HIV infection were common in B positive and O positive groups, this might accounts for commonest group to be B and O positive in general population.

Our study showed no significant change in trend over the 7yrs study period. A study by Rawat A et al., showed similar findings in there 7yr study period.⁹

4.2. HBV

WHO estimates that in 2015, 257million people living with chronic hepatitis B infection. The African and Western Pacific regions accounted for 68%. There were 1.34million deaths due to hepatitis virus.¹⁸ The prevalence of chronic hepatitis B in India ranges from 2-10%.¹⁹

Our study showed prevalence of HBV to be 0.82%. Within Andhra, studies Vankadari S et al. (1.9%),⁶ and Bhawani Y et al. (1.41%)¹³ showed slightly higher prevalence.

Our study showed HBV to be most common TTI, this was in corcondance with previous studies by Raksha S et al.,¹² Vankadari S et al.,⁶ and Bhawani Y et al.¹³

In Southern India, the HBV prevalence varies from 0.34 to 3.20%.⁷ Studies from Karnataka shows 0.50%,⁷ 0.47%²⁰ seroprevalence.

HBV infection were common in O positive group. Our study showed no significant change in trend over the 7yr study period. The findings compares favourably to a previous study by Rawat A et al.⁹

4.3. HCV

WHO estimates that in 2015, 71 million people living with HCV infection. The Eastern Mediterranean had highest prevalence (2.3%) followed by European (1.5%).¹⁸

In our study HCV prevalence is 0.02%, however increase prevalence was reported in Vankadari S et al (0.24%),⁶ Raksha S et al. (0.25%)¹² and Bhawani Y et al. (0.84%)¹³ within Andhra.

Comparatively with Southern Indian, Nothern Indian studies reported prevalence of 0.55%,¹ 0.14%³ and 0.16%.¹⁰

There was decrease in trends of HCV in our study period.

Table 3: Year wise distribution of transfusion transmissible infections

Year	No. of donors	Hiv	Hbv	Hcv	Syphilis	Malaria	Total
2012	3240	5	29	2	13	0	49
2013	2945	10	30	1	10	0	51
2014	2426	2	26	1	4	0	33
2015	3012	6	26	1	2	2	37
2016	2876	5	19	0	0	0	24
2017	3653	2	26	0	0	4	32
2018	2937	1	19	0	0	1	21
Total	21089	31	175	05	29	07	247

Table 4: Blood group association with transfusion transmissible infections

Blood group	HIV	HBV	HCV	Syphilis	Malaria	Total
A positive	4	30	1	6	0	41
B positive	11	49	3	9	3	75
AB positive	3	10	0	2	0	15
O positive	9	79	1	12	4	105
A negative	1	1	0	0	0	2
B negative	2	2	0	0	0	4
AB negative	0	0	0	0	0	0
O negative	1	4	0	0	0	5

Table 5: Comparison of prevalence of TTI's in different regions of India

Studies	Place	HIV	HBV	HCV	Syphilis	Malaria
Present study	Andhra	0.14%	0.82%	0.02%	0.13%	0.03%
Hulinaykar et al ⁷	Karnataka	0.08%	0.50%	0.11%	0.11%	0%
Rupal et al	Gujarat	0.09%	0.73%	0.09%	1.65%	-
Sushama A et al	Maharashtra	0.26%	1.30%	0.25%	0.28%	-
Karmakar P et al ⁸	Kolkata	0.60%	1.41%	0.59%	0.23%	-
Sunderam S. et al ³	Ranchi	0.08%	1.01%	0.14%	0.03%	0.33%
Rawat et al ⁹	Delhi	0.32%	1.16%	0.73%	1.62%	0.06%

4.4. Syphilis

Syphilis affects 12 million people in a year.²¹ The overall prevalence of syphilis in this study is 0.13%. The value obtained from this study is similar to 0.18%, 0.06% and 0.08% reported in Anantapur (Vankadari S et al.)⁶, Visakhapatnam (Raksha S et al.)¹² and Vikarabad (Bhawani Y et al.)¹³ respectively within Andhra.

Shah R et al.(1.65%)¹⁷ and Rawat A et al. (1.62%)⁹ observed higher prevalence and most common TTI's in there study.

4.5. Malaria

The prevalence of malaria in our study is 0.03%, was in concordance with study by Rawat A et al. 0.06%.⁹ However, higher prevalence compared to our study was 0.33% reported by Sunderam S et al.³

Table 5 shows a comparison of prevalence of TTI's in different regions of India.

The reason for variation of prevalence of HIV, HBV, HCV is due to geographical distribution, socio-cultural activities, use of different generation ELISA kits.

Inspite of HBV vaccine, the prevalence of HBV among donors remains high, this may be due to undetectable level of tests done during window period. Thus use of sensitive testing method is crucial.²² Nucleic acid testing (NAT) for HIV, HBV, HCV are major advances in donor blood screening and can eliminate false negative blood units²³. Implications of these tests have the advantage of reducing serological window period.²³ In western countries NAT have reduce the risk of TTIs.^{2,9}

TTI's to some extent can be reduced by selecting donors from low risk targeted public area.²²

The reason for the disparity in prevalence of syphilis may be due to geographical differences, socio-economic status and mainly methodological difference. Studies have shown that T. pallidum agglutination assay and Fluorescent treponemal antibody absorption test are more sensitive methods for detection of organism than rapid plasma reagin.²¹

In our study and studies by Vankadari S et al.⁶, Raksha S et al¹² and Bhawani Y et al¹³ used rapid plasma regain method, whereas study by Shah R.et.al¹⁷ and Rawat A.et al⁹ used T.pallidum agglutination assay and hence there

detection rate (prevalence) might be on higher side. This suggests that detection of syphilis by using more sensitive methodology is necessary for detection of asymptomatic donors and carrier donors.

To lower the seroprevalence, Firstly, there should be strict donor selection, proper educational activities, creating public awareness about infectious nature of the disease and mode of transmission which helps donors to eliminate himself from donating blood. Secondly, the use of more sensitive test methodology for screening of voluntary donors.

Thirdly, to encourage female donation by educational programmes.

5. Limitations

1. Donor pool was majority of male population, so prevalence cannot be generalized to female population.
2. The use of Card method for syphilis and malaria may give false negative results (seroprevalence).

6. Conclusion

The present study reflects 21,089 voluntary blood donors with predominance in male donors. The sero-prevalence of transfusion transmissible infections were 1.14%. The prevalence HIV, HBV, HCV, Syphilis and Malaria were found to be 0.14%, 0.82%, 0.02%, 0.13% and 0.03%. Our study showed highest prevalence of HBV and least prevalence were HCV and Malaria. This study showed association of O positive blood group with transfusion transmissible infections.

There is a need for stringent donor selection and encouragement of female donation.

Implementation of more sensitive testing methodology like NAT, helps to detect infection in donors during their window period.

7. Source of Funding

Nil.

8. Conflict of Interest

There are no conflicts of interest.

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