

**Original Article**

**Occurrence of Transfusion Transmitted Infections Among Transfusion Dependent Thalassemia Patients in A Tertiary Care Hospital in India**

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**Abstract**

**Background:** Blood transfusion is an important treatment modality in the modern health care system; however, transfusion transmitted infections (TTI) could be fatal or life-threatening in some cases. **Objective:** To determine the occurrence of transfusion transmitted infections among transfusion dependent thalassemia patients and to study the socio-demographic characteristics of the recipients. **Methods:** This hospital-based descriptive longitudinal study was conducted between February 2019 and June 2020, on 102 transfusion-dependent thalassaemic patients receiving blood transfusion at Bankura Sammilani Medical College & Hospital, Bankura, West Bengal, India. They were tested for HIV, HBV, HCV, syphilis and malaria by ELISA (Enzyme Linked Immunosorbent Assay) Lisa Scan EM, Merilisa HBsAg, Merilisa HCV, RPR kit and Maleriscan malaria Pf/Pv. **Results:** Out of 102 patients, 5.90% were positive for TTI. The highest occurrence was found to be of HCV 3.90%. HBV and HIV showed similar occurrence of 0.98% and none came out positive for syphilis or malaria. The highest occurrence of TTI was found among females 66.7%. The average age of the participants was 7.97±3.27 years. The average number of blood transfusion received per year was 11.95±2.71 units. Majority of the participants belong to low socio-economic group family 62 (60.8%). In respect to ethnicity 14.7% were tribal, while 85.3% were non-tribal population. **Conclusion:** The cause of high prevalence of HCV may be due to donors being asymptomatic in early stages and failure of detection due to window period of infection. More sensitive screening tests should be done for HIV, HBV, and HCV. All donors must be screened by NAT if not possible the patients must be screened for TTI regularly. Thalassemia patients being the most affected, premarital screening for thalassemia should be done. Every patient should be vaccinated with hepatitis B vaccine.

**Keywords:** transfusion transmitted infections, blood transfusion, thalassemia

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**Introduction**

FDA defines a TTI as a pathogen that is known to be fatal, to be life-threatening, or to cause severe impairment and that is potentially transmissible through the blood supply.<sup>1</sup> Blood transfusion is an important treatment modality in the modern

health care system and though lifesaving but unfortunately it can be one of the sources of infective diseases.<sup>2</sup> A number of blood-borne infectious agents can be transmitted through transfusion of blood and blood products donated by apparently healthy and asymptomatic donors.<sup>3</sup>

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The diversity of infectious agents includes human immunodeficiency viruses 1 and 2, hepatitis A to E (HAV, HBV, HCV, HDV and HEV), malaria, syphilis, human T-lymphotropic virus types 1 and 2 ( HTLV type 1 and 2) and in certain circumstances cytomegalovirus, parvovirus B19, and many more.<sup>4-6</sup> Besides, the established viral, bacterial, and parasitic diseases, novel agents have now appeared and are still emerging as potential threats in transfusion medicine.<sup>7</sup> The most common TTI are due to viral infections. Incidence of bacterial contamination is greatly reduced due to improved collection techniques and use of antibiotics in patients. According to NACO guidelines, all mandatory tests should be carried out on donor's blood samples for HIV, HBV, HCV, syphilis and malaria.<sup>8</sup> In India, it is mandatory to screen donated blood for anti-HIV 1 and 2 (since 1991), anti-HCV (since 2001), HBsAg, syphilis, and malaria.

Blood TTIs mainly occur in patients who are dependent on blood transfusion such as haemoglobinopathies, myelodysplastic syndromes and some haemato-oncology patients, receiving multiple transfusion episodes, either over long periods or over shorter periods.<sup>9</sup> Beta thalassemia major is a hemoglobinopathy also known as Cooley's anemia, is a global health problem characterized by severe hemolysis.<sup>10</sup> Though regular blood transfusion improves the overall survival of patients with  $\beta$ -thalassemia, a definite risk of infection with blood-borne viruses occurs.<sup>11</sup> While in the past it was believed that transfusion transmitted infections were unavoidable, but a low risk of blood supply is expected today.<sup>12</sup> The provision of safe blood for transfusion involves a number of processes, from the selection of blood donors to collection, processing and testing of blood donors by sensitive methods to the testing of patient samples for detection of various infections.

## Methods

This hospital-based descriptive longitudinal study was conducted between February 2019 and June 2020, on 102 transfusion-dependent thalassaemic patients receiving blood transfusion at Bankura Sammilani Medical College & Hospital, Bankura, West Bengal, India.

**Inclusion criteria:** All the seronegative

thalassaemia patients receiving blood transfusion from BSMC&Hospital, Bankura, West Bengal, India during the study period from February 2019 to June 2020 were included in the study by complete enumeration.

**Exclusion criteria:** Seriously ill recipients and seropositive thalassaemic patients

All transfusion dependent thalassaemic patients receiving blood transfusion from the blood bank of the study site hospital were tested for HIV, HBV, HCV, Syphilis and malaria by ELISA (Enzyme Linked Immunosorbent Assay) Microwell Plate, Lisa Scan EM, Merilisa HBsAg, Merilisa HCV, RPR kit and Maleriscan malaria Pf/Pv. History of educational status of the parents, income, address was taken. Then seronegative recipients were approached. After obtaining consent they were included in the study. They were interviewed with the help of a structured questionnaire. Their blood samples were tested at the time of presentation and thereafter every five months for HIV, HBV and HCV, syphilis, and malaria for a period of twelve months.

## Techniques:

- HIV status is detected by ELISA (Enzyme Linked Immunosorbent Assay) Microwell Plate, Lisa Scan EM for the detection of antibodies to HIV1 and HIV 2
- Hepatitis B status is detected by using Merilisa HBsAg for the detection of hepatitis B surface antigen
- Hepatitis C status is detected by using Merilisa HCV for the detection of antibodies to hepatitis C virus
- Syphilis status is detected by Rapid plasma reagin kit test
- Malaria is tested by rapid diagnostic kit (MALERISCAN)

**Statistical analysis:** All data were analyzed through standard statistical methods by using Statistical Package for Social Science (SPSS) software version 22.0 (SPSS Inc., Chicago, USA).

## Results

All the 102 participants were tested for HCV antibodies by Merilisa HCV in February 2019 and all were seronegative for HCV. The patients

were further tested in August 2019 and showed two HCV positive patients. In February 2020, the patients were again tested, and another two new patients were positive as shown in the table 1. The same participants were tested for HIV antibodies by ELISA (Enzyme Linked Immunosorbent Assay) Microwell Plate, Lisa Scan EM on different dates in February 2019 and were seronegative. They were again tested in the month of August 2019 and February 2020 and one patient as shown positive in the table 2. The same patients were tested for HBV antigen by Merilisa HBsAg in February 2019, August 2019, February 2020 and one patient came positive during the last test (Table 3). None of the patients showed double positivity for the infection. The participants were tested for syphilis by (RPR) and malaria (Maleriscan Pf/Pv) in February 2019, August 2019, and February 2020. None were positive for syphilis and malaria. Among 102 patients, 6/102 (5.90%) were positive for TTI (Figure 1). The highest occurrence of was HCV 4/102 (3.90%), followed by HBV and HIV 1/102 (0.98%) (Figure 2). None of the patients were positive for syphilis and malaria during the study. The average age of the participants was  $7.97 \pm 3.27$  years. Out of 102 patient 35 were females and 67 were males, showing ratio of Male:Female=1.9:1, and the average number of blood transfusion received per year was  $11.95 \pm 2.71$  units. Majority of the participants came from low socio- economic group family 62(60.8%), 30(29.4%) from middle group of socio-economic status and 10(9.8%) from high socio-economic group. In respect to ethnicity 14.7% (15) were tribal and 85.3% (87/102) were non-tribal population.

**Table 1:**Result of HCV screening

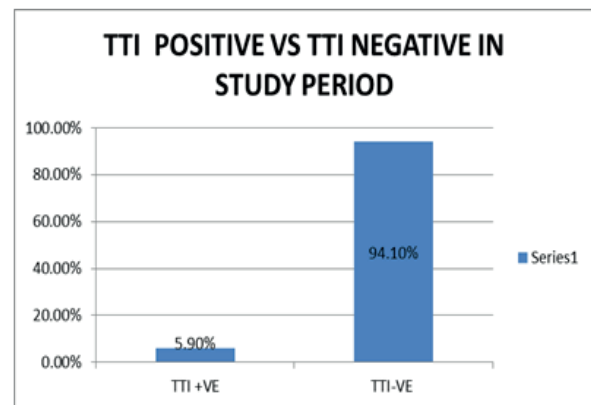
No of patient tested	Date	Report of HCV ELISA
N=102	Feb 2019	All non reactive
N =102	August 2019	2 seropositive
N =102	Feb 2020	2 patient sero reactive
Total		4

**Figure 2:**Result of HIV screening

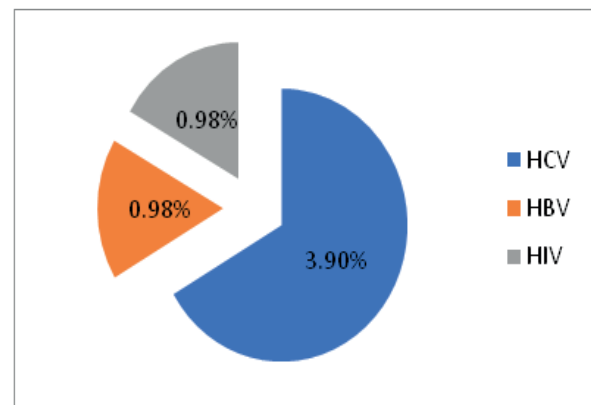
No of patients tested	Date	Report of HIV ELISA
N=102	Feb 2019	All non reactive
N =102	August 2019	All seronegative
N =102	Feb 2020	One patient sero-reactive
Total		1

**Table 3:** Result of HBsAg screening

No of patient tested	Date	Report of HBs Ag ELISA
N=102	Feb 2019	All negative
N =102	August 2019	All negative
N =102	Feb 2020	1 patient sero reactive
Total		1



**Figure 1:** Percentage of TTI positive patient



**Figure 2:**Incidence of HCV, HIV, HBV

**Discussion**

The probability of acquiring TTIs is related to the probability of being exposed to the infected units of blood. The probability of being exposed to infectious units of blood depends on the number of units transfused and prevalence of carriers among the donor population. Variations in the prevalence of TTIs amongst thalassemics could be related to geographical differences in prevalence of the viral infections among blood donors and the nature of blood donors whether replacement or voluntary. The countries with a higher prevalence of HCV in the general population had a higher prevalence of HCV among thalassemia patients too.<sup>13</sup> There

is high prevalence of HCV in thalasseemics in all countries because of the unique profile of HCV with very long window period for antibody development.

Our study showed highest occurrence of HCV infection 4/102 (3.90%). The highest prevalence of HCV was also seen in studies like Gugnani *et al.*<sup>14</sup> of 13.4%, Sidhu *et al.*<sup>15</sup> of 13.04%, Manisha *et al.*<sup>16</sup> of 18.2%. Post-transfusion transmission of HCV has still remained a major health concern in multi-transfused patients. Hepatitis B infection was found in one patient out of 102 patients (0.98%). Gugnani *et al.*<sup>15</sup> found the prevalence of HBV to be 0.79% which was comparable to the present study being 0.98%. Jain *et al.*<sup>17</sup> showed positivity of 1.04% for HBV. The reduction in the prevalence of HBV may be due to hepatitis B vaccination prior blood transfusion. However, only few studies have been done on transfusion transmitted syphilis and malaria.<sup>15,16</sup> Those two previous studies also found no positive cases for syphilis and malaria, which is similar to our study finding.

The highest incidence of TTI was found among females 66.7% (4/6) in our study, although the male participants were in higher number i.e., 65.7% (67/102). Our finding is not congruent with the findings of Ahmed Kiani *et al.*<sup>18</sup>, which showed that male became more TTI positive than in females (73.4% vs. 26.6%). In the present study 60.8% (62/102) participants belong to low socioeconomic status. Yasmee & Hasnain<sup>19</sup> studied that post transfused TTI positivity is more in low socioeconomic status.<sup>19</sup>

The average age of the participants was  $7.97 \pm 3.27$  years. The average number of blood transfused per year  $11.95 \pm 2.71$  units and majority of the recipients 85.3% (87/102) were non-tribal population. Over the decade, TTI magnitude has significantly reduced, but hepatitis C is still a main hazard. HBV vaccination have led to a dramatically decrease in prevalence of TTIs particularly HBV during the last decades in various countries.

TTIs can still occur even after regular screening for the markers for these infections, as found in different Indian and international studies. This risk

of acquiring a TTI from screened blood depends upon the sensitivity of the screening tests used, window-period of the virus, and other reasons, such as mutant strains. Nucleic acid testing (NAT) is widely recommended for the screening of donor blood. It reduces the window period of 2.93 days for HIV, to 10.24 days for HBV, and to 1.37 days for HCV and better chances of detecting false negative cases.<sup>19</sup> Though the cost for NAT testing is considered unaffordable for a medium development country such as India, the burden of TTIs will place an unmanageable cost burden on the society. Now with the introduction of the fourth-generation ELISA test that detects p24 antigen along with antibodies, the window period can be reduced to 2 weeks.

### Conclusion

The highest occurrence was found to be HCV which reflects the unsafe practices. The causes of high prevalence of HCV may be due to donors being usually asymptomatic in early stages, despite being screened for HCV possibly due to missing early window period infections. Awareness about screening should be made so that more patients are diagnosed early. Thalassaemia patients being the most affected, premarital screening for thalassaemia should be done. Screening of all the registered pregnant women for thalassaemia status must be done. Parents should be counselled for prenatal testing of thalassaemia. Every patient should be vaccinated with hepatitis B vaccine. More sensitive screening tests should be used for HIV, HBV, and HCV. All donors must be screened by NAT if not possible the patients must be screened for TTI regularly. Proper precautions for safe transfusion practices should be adhered to.

**Conflict of interest:** None declared.

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**Ethical Clearance:** The study was approved by the Ethical Review Committee of Bankura Sannilani Medical College & Hospital, Bankura, West Bengal, India.

**Authors' contribution:** All authors were equally involved in data collection, analysis, manuscript preparation, revision and finalization.

## References

1. Code of Federal Regulations. Title 21 (Food and Drugs). Washington, DC: U.S. Government Printing Office.; 2017.
2. Fessehaye N, Naik D, Fessehaye T. Transfusion transmitted infections - a retrospective analysis from the National Blood Transfusion Service in Eritrea. *Pan Afr Med J.* 2011;9:40.
3. Jaiswal SP, Chitnis DS, Jain AK, Inamdar S, Porwal A, Jain SC. Prevalence of hepatitis viruses among multi-transfused homogenous thalassaemia patients. *Hepato Res.* 2001;19(3):247-53.
4. Ministry of Health and Family Welfare, Government of India. Voluntary Blood Donation Programme – AnOperational Guideline. New Delhi, India: National AIDS Control Organisation, MOHFW, Government of India; 2007.
5. Kaur P, Basu S. Transfusion-transmitted infections: existing and emerging pathogens. *J Postgrad Med.* 2005;51(2):146-51.
6. Bove JR. Transfusion-transmitted diseases other than AIDS and hepatitis. *Yale J Biol Med.* 1990;63(5):347-51.
7. Murphy HM. The transmission of infectious hepatitis by blood transfusion. *Gastroenterology.* 1945;5:449-56.
8. Brecher ME. Technical Manual. 15th ed. Maryland, USA: American Associations of Blood Banks; 2005.
9. Mishra K, Shah A, Patel K, Ghosh K, Bharadva S. Seroprevalence of HBV, HCV and HIV-1 and Correlation with Molecular Markers among Multi-Transfused Thalassaemia Patients in Western India. *Mediterr J Hematol Infect Dis.* 2020;12(1):e2020038.
10. Khandros E, Kwiatkowski JL. Beta thalassaemia: Monitoring and new treatment approaches. *Hematol Oncol Clin North Am.* 2019;33(3):339-53.
11. Chakrabarty P, Rudra S, Hossain MA. Prevalence of HBV and HCV among the multi-transfused beta thalassaemic major patients in a day care centre of blood transfusion department of Mymensingh Medical College Hospital. *Mymensingh Med J.* 2014 Apr;23(2):235-41.
12. Bihl F, Castelli D, Marincola F, Dodd RY, Brander C. Transfusion-transmitted infections. *J Transl Med.* 2007;5:25.
13. Sinha MK, Raghuvanshi B, Mishra B. Menace of Hepatitis C virus among multitransfused thalassaemia patients in Balasore district of Odisha state in India. *J Family Med Prim Care.* 2019;8(9):2850-4.
14. Gugnani P, Oberoi L, Arora M. Prevalence of transfusion transmitted infections in multiple blood transfused  $\beta$ -thalassaemia patients from a tertiary care centre in North India. *Int JContemp Med Res.* 2019;6(12):L14-L17.
15. Sidhu M, Meenia R, Yasmeen I, Sawhney V, Dutt N. Prevalence of transfusion-transmitted infections in multiple blood transfused thalassaemia patients: A report from a tertiary care center in North India. *Ann Trop Med Public Health.* 2015;8:202-5.
16. Manisha S, Sanjeev K, Seema N, Dilip C, Rashmi D. A cross-sectional study on burden of Hepatitis C, Hepatitis B, HIV and Syphilis in multi-transfused thalassaemia major patients reporting to a government hospital of Central India. *Indian J Hematol Blood Transfus.* 2015;31(3):367-73.
17. Jain R, Perkins J, Johnson ST, Desai P, Khatri A, Chudgar U, et al. A prospective study for prevalence and/or development of transfusion-transmitted infections in multiply transfused thalassaemia major patients. *Asian J Transfus Sci.* 2012;6(2):151-4.
18. Ahmed Kiani R, Anwar M, Waheed U, Asad MJ, Abbasi S, Abbas Zaheer H. Epidemiology of Transfusion Transmitted Infection among Patients with  $\beta$ -Thalassaemia Major in Pakistan. *J Blood Transfus.* 2016;2016:8135649.
19. Yasmeen H, Hasnain S. Epidemiology and risk factors of transfusion transmitted infections in thalassaemia major: a multicenter study in Pakistan. *HematolTransfus Cell Ther.* 2019;41(4):316-23.