

Original Research Article

Prevalence of Transfusion Transmitted Malaria at a Rural Based Secondary Level Care Hospital, Chamarajanagara

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Abstract

Background: Transfusion transmitted Malaria remains a potential risk for blood transfusion recipients especially among the vulnerable patients like children, pregnant women, elderly and immuno-suppressed individuals. This study aims to determine the prevalence and associated risks factors among Voluntary and Replacement donors in a Blood Bank at a Secondary level care Hospital

Methods and Material: During blood donation samples were collected by standard venepuncture procedure. All samples were screened for Transfusion Transmitted infections including Malaria. Malarial parasites were screened by Rapid Antigen Test and positive cases were confirmed by Peripheral blood smear examination. Hemoglobin estimation was done using standard methods among Voluntary and Replacement donors

Results: The prevalence of Transfusion transmitted Malaria was 0.06% in our study. Out of total 1500, Transfusion Transmitted infections were seen in 2.06% (31/15000) of donors and only one donor was found positive for Malaria accounting for 3.22% of Transfusion Transmitted infections. Prevalence of anaemia was more among Replacement Donors (95.23%).

Conclusions: Transfusion transmitted Malaria is of a great concern among vulnerable groups of transfusion recipients. Voluntary blood donation, implementation of proper screening methods and combination of different diagnostic approaches is necessary especially in low levels parasitemia to ensure safety in blood transfusion services.

Keywords: Transfusion; Transmitted; Malaria; Blood; Donors; Anaemia; Plasmodium

Introduction

Blood transfusion is a rapid and very effective therapeutic intervention widely used for condition associated with massive blood loss like accidents, major operative procedures, life threatening anaemias (like haemophilia, thalassemia, etc.), severe burn victims and cancer patients. Blood donors are of two types: Voluntary donors and Replacement donors.¹

In India, it is mandatory to test every unit of donated blood for Transfusion transmitted infections like Hepatitis B, Hepatitis C, Syphilis, HIV I and II and Malaria.² Malaria is usually transmitted by Plasmodium parasites, vector being female Anopheles mosquitoes.^{3,4} It can also be transmitted through blood transfusion, organ transplantation and needle-stick injury.^{5,6}

Transfusion Transmitted Malaria (TTM) is one of the first recorded incidents of Transfusion



transmitted infections.⁷ Incidental TTM is of a significant concern especially among vulnerable recipients like immuno-compromised individuals, elderly patients, children and pregnant women which can lead to fatal consequences⁸

Plasmodium species are known to survive from 18-28 days with lower infectivity rate.^{9,7} Asymptomatic donors with low levels of parasitemia goes undetectable even on microscopic examination.¹¹ In recent years molecular methods like PCR provide increased sensitivity^{11,12} but due to higher costs and expertise involved, these methods cannot be easily implemented in every health care services.⁸

Hemoglobin assessment is one of the important criteria for donor selection and it has a great implication in recovery rate of transfusion recipients.¹

This present study is undertaken to determine the prevalence Transfusion Transmitted Malaria and other Transfusion transmitted infections among Voluntary donors and Replacement donors along anaemic status.

Materials and Methods

This study was carried out for a period of three years at a blood bank associated with secondary care hospital, rural setup.

All transfusion transmitted infections records, donor registers (which includes pre donation questionnaire, counselling, clinical examination, type of donation –voluntary/replacement), clinical condition and risk assessment of transfusion recipients were noted down.

Malarial parasite screening was done by rapid antigen card test and all positive cases were confirmed by Field’s stained peripheral blood smears (thick and thin smears)

Other infections like HIV 1 and 2, syphilis, hepatitis B and hepatitis C, along with haemoglobin estimation was done using standard methods.

All data collected were analysed statistically.

Results

out of 1500 total donors, Voluntary donors were 280 (18.66%) and Replacement donors were 1220 (81.33%) were noted (Fig. 1)

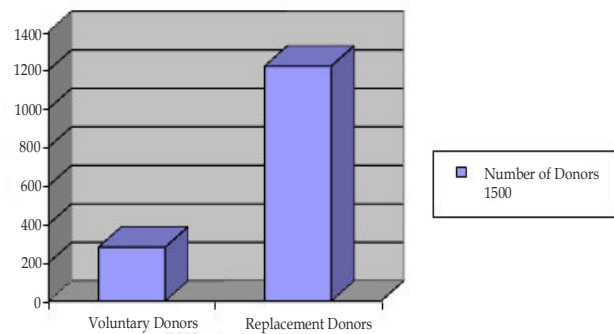


Fig. 1: Type of Blood Donors.

Male donors were more (73.3%,1110/1500) when compared to female donors (26.7%,390/1500) (Fig. 2)

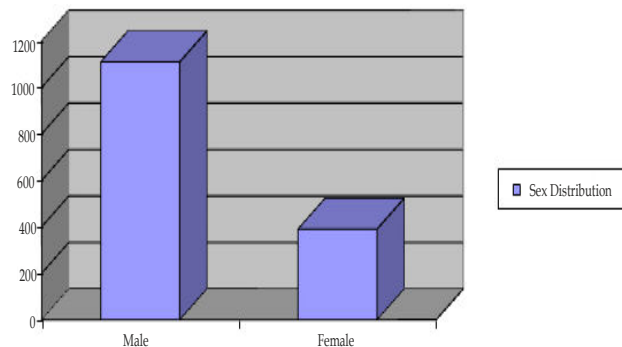


Fig. 2: Sex Distribution Among Blood Donors.

Transfusion transmitted infections accounted for total of 2.06%(31/1500)donors,out of which hepatitis B was more common (80.6%), and only one case of malaria was noted among 31 donors of transfusion transmitted infections. (Table 1)

Prevalence of transfusion transmitted malaria among total numbers of blood donors was 0.06%.

Table 1: Transfusion Transmitted Infections (Tti) Among Blood Donors.

TTI (31)	Voluntary donors (5)	Replacement donors(26)	Total donors (1500)
Hepatitis B	4	21	25
Hepatitis C	1	2	03
HIV 1and 2	0	2	02
Syphilis	0	0	00
Malaria	0	1	01

Anaemia was noted in 4.2% (63/1500) out of which 95.23% (60/1500) was present in replacement donors and only 4.76% (3/1500) in voluntary donors. (Table 2)

Table 2: Anaemia Among Blood Donors.

Anaemia (63)	Voluntary donors	Replacement donors
Males (25/1110)	1	24
Female (38/390)	2	36

Discussion

Asymptomatic blood donors pose a potential threat in Transfusion transmitted infections. Transfusion of Malaria adversely affects prognosis of transfusion recipients especially immunosuppressed individuals which necessitates the proper screening of blood donors. All the five Plasmodium species are known to cause TTM.^{12,13}

World Health Organization (WHO) guidelines on blood donor selection emphasize the importance of implementing screening tools tailored to the local context for all transfusion transmissible infections including Malaria.¹⁴

Microscopic detection of Malarial parasite in peripheral blood smears remains Gold standard for TTM.^{8,15} It is highly sensitive and specific, can detect as low as 5 parasites/ul of blood in expert hands.^{16,17} It is labour intensive and time consuming procedure for examination of large number samples in Blood Bank.^{12,17}

Many studies have demonstrated good sensitivity with rapid turn around time of HRP -2 (Histidine Rich Plasmodium antigen) based Rapid Antigen assays and its clinical utility for diagnosis Malaria in Symptomatic patients.^{18,19,20}

The real caveat is to detect low level of parasitemia in TTM and there is very evidence to inform which malarial screening methods are effective for use by blood transfusion services.⁸ Though newer diagnostic techniques like ELISA and PCR provide improved sensitivity in detecting low levels of parasitemia, they are very expensive and need expertise hand.¹² Therefore a combination of different diagnostic approaches should be considered to diagnose TTM and to ensure safe blood transfusion.

In our study only one positive case of TTM was detected with prevalence of 0.06%, which is similar to the study conducted by Rajesh Kumar et. al.²¹ Prevalence of 0.03% was documented by studies conducted by Manish Kumar et al²² and Bahadur et al²³, where a large number of donors were included compared to our study. None of TTM cases were

detected by studies conducted by Pallavi et al²⁴ and Yadhav et al²⁵, which might be due to low endemicity. Few studies conducted at high endemic areas like Nigeria, very high prevalence rate of TTM was documented (30.2%- 55%).^{26,27}

A positive association was observed between Transfusion transmitted infections and Replacement donors (26/31 cases of total TTI) which is similar to study conducted by Bankole et. al.¹

Prevalence of anaemia was also more among Replacement donors (95.23%) when compared to Voluntary donors (4.76%). An important factor to consider here is Anaemia among Blood donors is multi-factorial and various underlying medical conditions are to be considered. Repeated Blood donations have been associated with depletion of Iron stores.²⁸

Conclusion

The risk of transfusion transmitted malaria is a potential risk for blood transfusion recipients.

Low levels of parasitemia necessitates adequate screening methods combining different diagnostic approaches (rapid antigen test, microscopic diagnosis and molecular methods like PCR) to ensure safety blood transfusion.

Voluntary blood donations are safe and to be encouraged to minimise transfusion transmitted infections including Malaria.

Conflict of Interest: None

References

1. Bankole Henry Olandeinde, Richard Omoregie, et. al. Asymptomatic Malaria among Blood Donors in Benin City Nigeria. Iranian J Parasitol 2014;9(3):415-22.
2. Choudhury N, Desai P. Blood Bank regulations in India. Clin Lab Med 2012;32(2):293-9.
3. Mardani A, Keshavarz H, Pourfathollah AA, Maghsudlu M. Transfusion transmitted malaria in Iran: a narrative review article. Iran J Parasitol 2016;11:136-43.
4. Meibalan E, Marti M. Biology of malaria transmission. Cold Spring Harb Perspect Med 2017;7:a025452.
5. Verra F, Angheben A, Martello E, et. al. A systematic review of transfusion transmitted malaria in non-endemic areas. Malar J 2018;17:2743-9.
6. Farrar J, Hotez PJ, Junghanss T, et. al. Manson's Tropical Diseases E-Book.

- Elsevier Health Sciences; 2013. <https://www.elsevier.com/books/mansons-tropical-infectious-diseases/9780702051012>
7. Kitchen AD, Chiodini PL. Malaria and blood transfusion. *Vox Sang*. 2006;90(2):77-84.
 8. Ehsan Ahmadpour, Masoud Foroutan- Rad, et. al. Transfusion Transmitted Malaria: Systematic Review and Meta-analysis. *Open Forum Infectious Diseases* 2019: 1-8.
 9. Chattopadhyay R, Majam VF, Kumar S. Survival of *Plasmodium falciparum* in human blood during refrigeration. *Transfusion* 2011;51:630-5.
 10. FDA (2006). Workshop on Testing for Malarial Infections in Blood Donors. FAD/CBER-FDA Workshop. <http://www.fda.gov/cber/blood/malaria> July 12, 2006.
 11. Schoone GJ, Oskam L, Kroon NC, et. al. Detection and quantification of *Plasmodium falciparum* in blood samples using quantitative nucleic acid sequence-based amplification. *J Clin Microbiol* 2000;38:4072-5.
 12. Wylie BR. Transfusion transmitted infection: viral and exotic diseases. *Anaesth Intensive Care*. 1993;21(1):24-30.
 13. Tebit Emmanuel Kwenti, Longdoh Anna Njunda, et. al. Comparative evaluation of a rapid diagnostic test, an antibody ELISA, and a pLDH ELISA in detecting asymptomatic malaria parasitaemia in blood donors in Buea, Cameroon. *Infectious Diseases of Poverty* (2017) 6:103.
 14. WHO. Blood Donor Selection: Guidelines on Assessing Donor Suitability for Blood Donation. WHO; 2012. <https://apps.who.int/iris/handle/10665/76724>
 15. Moody A. Rapid diagnostic tests for malaria parasites. *Clin Microbiol Rev*. 2002;15:66.
 16. Wongsrichanalai C, Barcus MJ, Muth S, Sutamihardja A, Wernsdorfer WH. A review of malaria diagnostic tools: microscopy and rapid diagnostic test (RDT). *Am J Trop Med Hyg*. 2007;77(6):119-27.
 17. Schindler HC, Montenegro L, Montenegro R, Carvalho AB, Abath FG, Jaureguiberry G. Development and optimization of polymerase chain reaction-based malaria diagnostic methods and their comparison with quantitative buffy coat assay. *Am J Trop Med Hyg*. 2001;65:355-61.
 18. Reesink HW. European strategies against the parasite transfusion risk. *Transfus Clin Biol*. 2005;12(1):1-4.
 19. Beadle C, Long GW, Weiss WR, et. al. Diagnosis of malaria by detection of *Plasmodium falciparum* HRP-2 antigen with a rapid dipstick antigen-capture assay. *Lancet*. 1994 Mar 5;343(8897):564-8.
 20. Humar A, Ohrt C, Harrington MA, et. al. Parasight F test compared with the polymerase chain reaction and microscopy for the diagnosis of *Plasmodium falciparum* malaria in travelers. *Am J Trop Med Hyg*. 1997 Jan; 56(1): 44-8.
 21. Rajesh K, S Gupta, A Kaur, A Jindal, H Sharma. Seroprevalence and Changing Trends of Transfusion Transmitted Infections among Blood Donors in a Tertiary Care Hospital. *Indian J Comm Health*. 2015; 27(1): 25-29.
 22. Manish Kumar, Shakyawal B., Madan Y. Prevalence of malaria among blood donors in blood bank, Jhalawar Hospital and Medical College Society, Jhalawar, Rajasthan. *Tropical Journal of Pathology and Microbiology* 2019;5:83-86.
 23. Bahadur S, Pujani M, Jain M. Use of rapid detection tests to prevent transfusion-transmitted malaria in India. *AJTS* 2010; 4:140-141.
 24. Pallavi P, Ganesh CK, Jayashree K, et. al. Seroprevalence and trends in transfusion transmitted infections among blood donors in a university hospital blood bank: a 5 year study. *Indian J Hematol Blood Transfus*. 2011 Mar;27(1):1-6.
 25. Yadav BS, Varma AV, Singh P, Kumar R, Bandi PK. Seroprevalence of transfusion-transmitted infections (TTIs) in blood donors: a study from central India. *Int J Med Sci Public Health* 2016;5:1158-1162.
 26. Okocha EC, Ibeh CC, Ele PU, Ibeh NC. The prevalence of malaria parasitaemia in blood donors in a Nigerian teaching hospital. *J Vector Borne Dis*. 2005;42:21-4.
 27. Owusu-Ofori AK, Betson M, Parry CM, et. al. Transfusion-transmitted malaria in Ghana. *Clin Infect Dis*. 2013 Jun;56(12):1735-41.
 28. Abdullah SM. The effect of repeated blood donations on iron status of male Saudi blood donors. *Blood Transfus* 2011;9:167-71.

