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**RESEARCH ARTICLE**

# PREVALENCE OF MALARIA AMONG BLOOD DONORS AT THE BLOOD BANK OF A TERTIARY CARE REFERRAL TEACHING HOSPITAL IN ANDHRA PRADESH, SOUTHERN INDIA

**Sindhuja, K., *Sreedhar Babu, K. V., Anitha, M. and Suresh, B.**

Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati

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**ABSTRACT**

**Back Ground:** Blood can save lives but it can be a source of other problems like risk of immunological adverse reactions and transmission of blood borne pathogens. Malaria remains one of the most common transfusion transmitted infections and it has serious consequences especially with Plasmodium falciparum which is rapidly fatal. The present study was done to know the prevalence of malaria parasite among blood donors in our institute.

**Materials and Methods**: It is a retrospective cross sectional analytical study conducted at the blood bank of tertiary care referral teaching hospital from January 2010 to December 2014 i.e. for a period of 5 years. A total of 36,331 donors were included in the study. Pan Malaria card based on Immuno-chromatographic technique was used for detection of malaria parasite.

**Results**: The prevalence of malaria among blood donors is 0.03% (n=10). Among the 10 malaria positive donors 80% (n=8) were voluntary donors and 20% (n=2) were replacement donors. All the 10 donors were males.

**Conclusion**: Though Tirupati being an endemic area, the prevalence of malaria in blood donors of our blood bank is more or less comparable to other studies. Proper donor selection and screening prior to donation might reduce the transmission of malaria parasite through blood transfusion.



## INTRODUCTION

Blood transfusion is a life saving procedure, but it poses problems such as risk of immunological adverse reactions and transmission of blood borne pathogens (Cheesbrough, 1998). Malaria remains one of the most common transfusion transmitted infections and it has serious consequences especially with Plasmodium falciparum which is rapidly fatal (Krogstad, 1995). The malaria parasites can survive in red blood cells at refrigerator temperatures (+2$^{o}$C to + 6$^{o}$C) for days or weeks making it potential to get transmitted through blood (Uneke *et al*., 2006). However prevalence of malaria is scantily reported with the rate ranging between 0% to 28% in some studies (SriKrishna *et al*., 1999 and Agboola *et al*., 2010). Hence this study was conducted to know the prevalence of malaria in donor population at the blood bank of a tertiary care referral teaching hospital in Andhra Pradesh.

## MATERIALS AND METHODS

It is a retrospective cross sectional analytical study conducted at the blood bank of tertiary care referral teaching hospital in Tirupati from January 2010 to December 2014 i.e. for a period of 5 years. All the healthy donors who were eligible to donate blood as per Drugs and Cosmetic Act, 1940 & Rules, 1945 (Malik, 2011) were included in the study. The demographic details like donors age, gender, locality, category of donor such as voluntary or replacement, blood group, Rh type of blood donation were recorded. Pan Malaria card (J.MITRA & CO.PVT.LTD, OKHLA INDUSTRIAL AREA, PHASE -1, NEW DELHI, INDIA), is used for malaria detection. It is an immunoassay based on the "Sandwich principle". The method uses monoclonal anti-pan specific pLDH (plasmodium lactate dehydrogenase) antibody conjugated to colloidal gold and another monoclonal anti-pan specific pLDH antibody immobilized on a nitrocellulose strip in a thin line. The test sample is added in the sample well 'A', followed by addition of assay buffer in buffer well 'B'. If the sample contains plasmodium species, the colloidal gold conjugate complexes the Pan specific pLDH in the lysed sample. This complex migrates through the nitrocellulose strip by capillary action. When the complex meets the line of the corresponding immobilized antibody, the complex is trapped forming a purplish pink band which confirms a reactive test result. Absence of a colored band in the test region indicates a non-reactive test result. Manufacturer's instructions were followed scrupulously while performing each assay. The blood units which were found to be positive for malaria parasite were discarded as per National biomedical waste management policies (Chitnis *et al*., 2003).

***Corresponding author: Sreedhar Babu, KV.***
*Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati*

### Statistical Analysis

The various variables studied include donors' age, gender, blood group, Rh type, category of blood donation (voluntary or replacement) and donors who were positive for malaria. Descriptive statistics for categorical variables were performed using Microsoft office excel spread sheet. Statistical analysis was be carried out using Windows Program for Epidemiologists (WinPepi, version 11.15). The association between two categorical variables was evaluated by Chi square test. By this test a P- value of less than 0.05 was considered significant.

## RESULTS

Among the total donors (n=36,331) 24,862 are voluntary donors and 11,469 are replacement donors (Table 1). Out of the total donors that were screened, 10 (0.03%) donors were positive for malaria (Table 2). Among the 10 malaria positive donors, 8 (0.02%) were voluntary donors and 2 (0.01%) were replacement donors. There was no statistical significant difference between malaria positivity among voluntary and replacement donors ($p>0.05$). Out of the 10 malaria positive blood donors, all are males only (Table 3) and no statistical significance was observed between the prevalence of malaria among males and females. Out of the total blood donors (n=36,331) screened 15,188(42%) belonged to blood group O; 11,826(32 %) donors were blood group B; 7,120 (20%) were blood group A and 2,197(6%) were of AB group. Among the ten malaria positive donors, four donors (40%)belongs to blood group O, three donors (30%) belongs to B, two donors(20%) blood group A and one donor (10%) is AB group (Table 4). Among the 10 malaria positive donors, seven (70%) were in the age group of 20-29 years, two (20%) were in age group 30-39years and one donor (10%) in the age group 40-49 (Table 5). The mean age distribution of all the malaria positive donors is 29.5 years. Of the ten malaria positive donors 6 were from Chittoor district and 2 from Kadapa and Nellore districts each.

**Table 1. Number of voluntary and replacement donors (2010 to 2014)**

| Total donors | Voluntary donors N(%) | Replacement donors N(%) |
|---|---|---|
| 36,331 | 24,862(68%) | 11,469(32%) |

**Table 2. Prevalence of malaria among voluntary and replacement donors**

| Sl. no | Status of malaria | Voluntary donors N (%) | Replacement donors N (%) | Total N (%) |
|---|---|---|---|---|
| 1 | Positive | 8(0.02%) | 2(0.01%) | 10(0.03%) |
| 2 | Negative | 24,854(99.97%) | 11,467(99.9%) | 36,321(99.97%) |
| *3* | *Total donors* | *24,862* | *11,469* | *36,331* |

**Table 3. Gender-wise prevalence of malaria**

| Gender | Number examined N(%) | Number infected | % infected |
|---|---|---|---|
| Males | 35,268(96.25%) | 10 | 0.03% |
| Females | 1,093(3.75%) | 0 | 0% |
| *Total* | *36331(100%)* | *10* | *0.03%* |

**Table 4. Blood group wise prevalence of malaria among blood donors**

| Blood group | No. of donors positive for malaria N(%) |
|---|---|
| O Positive | 4(40%) |
| B Positive | 3(30%) |
| A Positive | 2(20%) |
| AB Positive | 1(10%) |
| *Total* | *10(100%)* |

**Table 5. Age wise prevalence of malaria among blood donors**

| Age group | No of donors positive for malaria N(%) |
|---|---|
| 20-29 | 7(70%) |
| 30-39 | 2(20%) |
| 40-49 | 1(10%) |
| *Total* | *10(100%)* |

**Table 6. Year-wise prevalence of malaria (2010 to 2014) in the present study**

| Year | No. of donors | No. of malaria positives |
|---|---|---|
| 2010 | 5421 | Nil |
| 2011 | 5505 | 01 |
| 2012 | 6953 | 08 |
| 2013 | 8494 | Nil |
| 2014 | 9958 | 01 |
| *Total* | *36,331* | *10* |

## DISCUSSION

Blood serves as a vehicle for transmission of blood-borne pathogens and transfusion-associated malaria is a potentially serious complication. Malaria can be transmitted by transfusion of blood from infected donor to patient (Bruece-Chwatt 1963). On a global scale malaria remains one of the most common transfusion-transmitted infections and it was first reported in 1911 (Kitchen and Chiodini, 2006). Transfusion transmitted malaria is particularly common in countries where blood donation has become a commercial transaction (Kitchen and Chiodini, 2006). One possible option for reducing transfusion-transmitted malaria is lucid laboratory screening (Chauhan *et al*., 2009). The simple deferral of donors may be wasteful and can eventually erode the donor base. More systematic care needs to be directed towards blood screening. In our study all the donors positive for malaria are males only. The nil prevalence among females might be due to the low number of female donor population (3.75%).

This is similar to some studies (Pallavi *et al*., 2011 and Hoque *et al*., 2008) where the donor group comprised of predominantly of males with females accounting for less than 4%. The high prevalence was among blood group O (40%) donors as it was the dominant blood group encountered during the study which is similar to a study conducted by Agboola *et al.* (2010). In our study there is no statistical significant difference ($p>0.05$) in relation to gender and blood groups which is similar to the study conducted by Agboola *et al*. (2010) in Lagos hospital, Nigeria. Majority of the donors in our study were predominantly of O group which is in contrast to a study conducted by Hoque *et al*. (2008) where the donors were predominantly of B group. In our study 80% of the malaria positive donors were voluntary donors in contrast to the studies done by Dubey *et al*. (2012), Chandra *et al*. (2009)

**Table 7. Prevalence of malaria in various studies**

| Study | Place | Study population | No. of positives | Percentage prevalence |
|---|---|---|---|---|
| Agboola TF et al [5] | Nigeria, West Africa | 200 | 56 | 28% |
| Leena M etal[12] | Karimnagar, Andhra Pradesh | 6939 | 9 | 0.129% |
| Pallavi etal[13] | Mysore, Karnataka | 39060 | 0 | 0% |
| Hoque MM etal[14] | Dhaka, Bangladesh | 400 | 3 | 0.76% |
| Dubey A et al[1] | Lucknow, Uttarpradesh | 100 | 1 | 0.09% |
| Chandra T et al[16] | Lucknow, Uttarpradesh | 192348 | 19 | 0.009% |
| Negi G et al[17] | Dehradun, Uttarakhand | 53069 | 3 | 0.002% |
| Sastry JM etal[18] | Pune, Maharashtra | 13078 | 0 | 0% |
| Present study | Tirupati, Andhra Pradesh | 46778 | 10 | 0.03% |

and Negi *et al*. (2014) where majority were replacement donors because most of them are replacement donors only. The prevalence of malaria is nil in voluntary donors. In our study prevalence of malaria is more in the age group of 20-29 years. This is similar to a study conducted by Agboola *et al*. (2010) where the highest prevalence of malaria was recorded in similar age group. This is in contrast to a study conducted by Leena *et al*. (2012) where the prevalence of malaria is more in the age group of 31-40 years. In the present study majority of malaria positive cases were seen in the year 2012 (Table 6).This is in contrast to a study conducted by Leena *et al*. (2012) where majority of cases was seen in the year 2010 due to outburst of mosquito breeding places and simultaneous epidemic of dengue fever in their region. In our study Pan Malaria card based on immunochromatographic method was used for detection of malaria parasite. Similar assay technique was used for the detection of malaria parasite in studies conducted by Chandra *et al*. (2009) and Negi *et al*. (2014). Microscopic examination for the detection of malaria parasite was used in an Indian study conducted by Leena *et al*. (2012). This method was also used in studies conducted in Nigerian country of Africa[5] and Dhaka city of Bangladesh (Dubey *et al*., 2012) as microscopic examination is the gold standard test for the detection of malaria parasite.

The seroprevalence of malaria in our study is 0.03% and its prevalence in different studies is depicted in Table 7. In non-endemic countries, donor deferral can be effective, but clear guidelines are needed. In endemic countries the problem is far greater as the majority of donors may be potentially infected with malaria parasites. In both situations, the simple deferral of donors may be wasteful and can eventually erode the donor base. Thus, other strategies are needed to ensure safety with sufficiency. However, the screening of donations for evidence of malaria is not without its problems. Although the examination of peripheral blood films is still the basis and gild standard for diagnosing acute malaria, in most situations it is not sufficiently sensitive for blood bank screening. In non-endemic countries, donor deferral in combination with screening for specific antimalarial immunoglobulin provides an effective means of minimizing the risk of transmission. In endemic countries, more specific donor questioning, consideration of seasonal variation and geographical distribution may help to identify the population of donors who are most likely to be infected. In addition, the administration of antimalarials to transfusion recipients may help to prevent transmission. Nonetheless, no matter what strategy is adopted, it is likely that cases of transfusion-transmitted malaria may still occur, so malaria must always be considered in any patient with a febrile illness post-transfusion. Though Tirupati being an endemic area, the prevalence of malaria in blood donors at our blood bank is more or less comparable to other studies (Pallavi *et al*., 2011 and Sastry *et al*., 2014). Proper donor selection and screening prior to donation might reduce the transmission of malaria parasite through blood transfusion.

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