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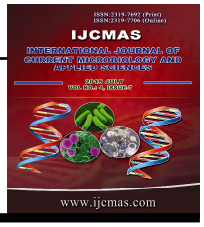

Original Research Article

Prevalence of Malaria in Blood Donors and Risk of Transfusion Transmissible Malaria

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Blood donors, Transfusion transmitted malaria, Immuno-chromatography

A B S T R A C T

Blood safety is one of the important issue of global concern in transfusion medicine especially in developing countries where national blood transfusion policies and services as well as financial resources are lacking or inadequate. Transfusion transmitted malaria is a potential health hazard but often it is neglected. Transfusion transmitted malaria in a non-endemic area is a rare and alarming diagnosis. It should be especially highlighted because of its rarity, delay in diagnosis, treatment and serious complications. This study was done at a tertiary care center in Khammam, Telangana and the study subjects were eligible donors (n=700) and screening of malaria was done by slide microscopy and Immunochromatographic rapid diagnostic test for malaria antigen detection. None of the blood donors were positive for malaria on microscopic examination. But 2 out of 700 donors were found positive on Rapid diagnostic test by immunochromatography for malarial antigen detection test, thereby indicating the need for screening of donated blood for malarial parasite.

Introduction

Malaria is considered to be one of the dangerous diseases that puts the world population at risk. In many of the tropical and sub-tropical countries of the world, malaria remains the most complex and overwhelming health problem facing humanity with 300-500 million cases and 2-3 million deaths per year [1].This shows the global health burden due to malaria. The causative organism Plasmodium species is intra erythrocytic and can be transmitted through any component of blood. Most of the malaria cases in the world (about 90%) occur in Africa[1].This could be due to the tropical climate which is favourable for the breeding of the vector as well as the malarial parasite. The majority of infections in the region are caused by Plasmodium falciparum, the most dangerous of 5 human parasites[2,3,4]. The mosquito vector, Anopheles gambiae is the most difficult to control and is widespread in the tropical region. This could probably be due to favorable conditions for the vector to grow here. Since most tropical countries are developing country so low socieoeconomic conditions compels and makes some of them the professional donors, thereby increasing

the risk of TTM. TTM is particularly common in countries where blood donor come from less affluent class[5,6,7].

Transfusion therapy is a form of treatment based on the use of blood and its product on human. Although this therapy helps to save the life but it is a vehicle for transmission of infections including parasitic diseases. But the benefits of blood transfusion as life saving is so much that it overweighs these diseases. Among them is malarial fever caused by Plasmodium species. The parasite being intra erythrocytic can be transmitted by transfusion of any blood components containing infected cells. Transfusion transmitted malaria (TTM) has a short incubation period and no pre-erythrocytic development and depends on the species of parasite introduced which varies from 10 days in *P.falciparum* to 40 days or longer in P.malariae[6,8]. Malarial parasites of all species can remain viable in stored blood for atleast 1 week and even longer in frozen blood[9]. Blood safety therefore remains an issue of concern in transfusion medicine in developing countries where national blood transfusion policies and services, appropriate infrastructure, trained personnel and financial resources are lacking or inadequate.

With this background this study aims to determine the prevalence of malarial parasitaemia among blood donors in a non-endemic area at a tertiary care blood bank in -Khammam, Telangana, India.

Materials and Methods

Study Area: A cross sectional study was conducted on blood donors in a tertiary health care centre blood bank at Khammam, Telangana, India.

Consent: Informed consents were taken from all blood donors prior to the sample collection.

Study population: The study was carried out for a period of 6 months between August and January 2014. A total of 700 subjects who were apparently healthy individuals and who did not show any signs of malaria, such as fever either in cold or sweating stage, headache and clinical signs of anemia, joint pain, generalized weakness and vomiting.

They were screened for HIV 1and 2 and Hepatitis B virus and confirmed negative. Thus every person who came to donate blood and was asymptomatic and confirmed fit was involved in the study. The blood samples were collected daily through the study period. The blood donors included 684 replacement and 16 voluntary donors. Venous blood containing ethylene diamine tetra acetic acid (EDTA) routinely collected for hematological analysis was used. To ensure anonymity of donors, numbers were used instead of names. Lab analysis was done using direct smear. Giemsa stained thick and thin blood films were performed within an hour of blood collection to identify individuals infected with malaria parasite. Malarial parasites were screened by microscopy and immunochromatography for antigen detection. The ABO/Rhesus phenotypes were performed for all subjects using the slide method with commercially available reagents. Data on age, gender and occupation and address of each donor were documented during blood collection.

Result and Discussion

Out of total of 700 donors majority 694(99.15%) were males while 6(0.85%) were females. Among these 415(59.28%) were urban while 285(40.71%) donors were from rural area. Out of the total, 684(97.71%) were replacement donors

while only 16(2.28%) were voluntary donors. Blood group "O" positive were the highest number of donors 400(57.14%) followed by "B" positive 137(19.57%), "A" positive 128(18.28%), "AB" positive 17(2.42%), "B" negative (1.14%) and "A" negative 1(0.14%), "AB" negative 1(0.14%). None of the donors were positive for malaria on microscopic examination and only(0.285%) 2 out of 700 donor population were positive on Immunochromatographic rapid diagnostic test for malarial antigen detection with standard deviation of 0.4629 and variance of 0.214, with P value not significant at $P<0.05$(study done in a non endemic area).

Transfusion transmitted malaria is one of the dreaded threats to the safety of transfusion services in this malaria endemic world. Presence of *Plasmodium falciparum* in blood may lead to fatalities when the blood is transfused especially in the children under 5 years, pregnant women, and accident victims etc.[10] This may lead to significant morbidity and mortality in transfusion recipients. In our study it was seen that male donor population were the highest in number and maximum number of donors fall between the age group of 23-27.Thus indicating more youngster population as donors and most of them from student population in our study. It was also observed that urban donors were more and were mostly as replacement donors. A recent international forum showed that in Europe, as well as the USA, prevention of transfusion associated protozoa infections depend mainly on selection of donors using questionnaires. A donor is rejected for 3years after their last visit to the endemic area[11]. Persons from the non endemic areas, who visited the malaria endemic area, are rejected for 4-12months[11]. Over the last decade only a few cases of transfusion transmitted malaria were reported in various countries. Among various ABO blood group 'O' positive were the highest number followed by 'B' positive. There is evidence that ABO histocompatibility of blood group is not correlated to the incidence of malaria[12], but it has been linked as a co receptor in parasite and vascular cytoadherence with higher rosette rates among non group O compared to group O erythrocytes[13]. Sensitivity of microscopy for detection of low parasitemia being less, there is no positive peripheral blood smear for malaria. Donors who are implicated as the source of transfusion transmitted malaria cases typically have very low level of parasitemia undetectable even on several thick films[14]. But in our study there are a very few cases found positive on Rapid detection test by immunochromatography indicating it's sensitivity as well as risk of TTM through those blood. Several studies have demonstrated an overall high sensitivity of Histidine Rich Protein (HRP 2) based diagnostic assays and their potential clinical utility for the diagnosis of malaria in symptomatic patients [15,16,17].

The present study could be compared with another similar study by P L Chiodini et al.which had a 0.1% prevalence rate among UK donors where this malaria antibody has been found to be effective in the screening of selected at risk donors [18]. Another study by JA Rajab et al. shows that prevalence rate of transfusion transmitted malaria varies from less than 0.2 cases per million recepients in non endemic countries to 50 or more cases per million in endemic countries [19].A study done by K Shahtaj et al showed a decreasing prevalence of transfusion transmitted malaria which was 0.2% [20].Similar study byTulika Chandra et al had a low prevalence of 0.009% [21]. The donor exclusion criteria have a scientific basis. But despite of the current exclusion guidelines, TTM continue to occur.

Table.1 Malaria parasitemia with respect to age and sex among blood donors

Age group	Males		Females		Total	
	Examined no.	No. Infected	No.examined	No. Infected	No examined	No. Infected
18-22	192	0	3	0	195	0
23-27	338	1	2	0	340	1
28-32	74	1	1	0	75	1
33-37	71	0	0	0	71	0
38-42	8	0	0	0	8	0
43-47	8	0	0	0	8	0
48-52	3	0	0	0	3	0
53-57	0	0	0	0	0	0
TOTAL	694	2	6	0	700	2

Table.2 Malaria infection in relation to blood groups and rhesus factors among blood donors in mamata medical college khammam

Blood group and rhesus factor	No. Examined	Percentage %	No. Infected	Percentage infected%
O+	400	57.14%	2	0.5%
O-	8	1.14%	0	-
A+	128	18.28%	0	-
A-	1	0.14%	0	-
B+	137	19.57%	0	-
B-	8	1.14%	0	-
AB+	17	1.42%	0	-
AB-	1	0.14%	0	-

Table.3 Malaria infection in relation to occupation

Occupation	No. Examined	No. Infected	% infected
STUDENTS	217	1	0.46%
BUSINESSMAN	53	0	0
MOTOR VEHICLE DRIVERS	82	1	1.12%
MEDICAL LAB STAFF	8	0	0
DOCTORS	6	0	0
PAINTERS	2	0	0
FARMERS	58	0	0
OTHERS	274	0	0

The main draw back in prevention through transfusion is that routine donor screening techniques are not very satisfactory. In India though it is mandatory by Drug and Cosmetic Act to screen donated blood for malaria, there is no definite guidelines on

the choice of the test. Since apparently healthy individuals are selected for blood donation density of parasites is usually very low and may be easily missed [22]. Donors who are considered as the source of transfusion transmitted malaria cases typically have very low level of parasitemia undetectable even on several thick smears. Moreover, traditional blood film microscopy involving large number of blood donor samples needs large manpower and high technical skills. Malaria antibody screening is not indicative of active infection and results in unnecessary high discarding of collected blood units as the antibody may persist up to several years after infection. PCR and antigen detection tests have limited availability. Hence most of donated blood across the country is not screened for malaria. Also malaria immunoprophylaxis to all blood recipients is also not feasible practically. Reports on TTM from India are not available as in the absence of awareness, the cases may be attributed to the mosquito acquired malaria. Most of the malaria non endemic countries follow the rule of donor deferral for 3years after malaria infection. Screening for specific anti malarial antibody provides an effective means of minimizing the risk of transmission. More systematic protocols needs to be implemented for blood screening. No matter what strategy is adopted, it is more 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. In as much as blood transfusion is required in severe anemia due to malaria and other illnesses safe blood transfusion should be ensured. This is because post transfusion malaria may not only compound the already deteriorated health condition of recipients but may also be fatal[23]. Conclusion: Though in the above study there is very low prevalance of malaria among blood donors population selected for our study, probably due to our study area khammam being geographically a non endemic area, but there is always risk of TTM even from few thereby spreading the disease from one to another and their related complications. None of the donors were recently affected with malaria as indicated by results of microscopic method of malaria parasite detection and immune-chromatographic method (Rapid diagnostic test). As blood units donated by such donors have high risk potential, special processing may be undertaken to reduce the risk of TTM and more sensitive screening methods are to be employed for their detection.

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