RESEARCH ARTICLE

FREQUENCY OF MALARIAL PARASITE INFECTION IN HEALTHY BLOOD DONORS OF PAKISTAN

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ABSTRACT

Malaria transmission through blood transfusion is although rare but clinically imperative. Certain parts of the world are at high risk of malarial infection that includes African sub-Sahara and South-East Asia. Pakistan falls in the region where prevalence of malaria is very high. Consequently in malaria endemic region like Pakistan, malarial parasite (MP) transmission through transfusion can occur. In this study, 87,600 healthy blood donors were screened for MP. MP was detected using two common methods i.e. peripheral blood morphology and immunochromatographic test (ICT). Out of 87,600 individuals, 38 (0.04%) were found to be infected with MP using peripheral blood microscopy while 32 (0.037%) were found positive by immunochromatographic test. This study concludes that the incidence of MP is low in Pakistani population but its prevalence cannot be neglected especially in blood donors.

Keywords: Malarial parasite, transfusion, peripheral blood morphology, immunochromatographic test.

1. INTRODUCTION

The occurrence of malaria is common in the sub-continent and Pakistan has a persistently high burden of this disease. According to World Health Organization (WHO) in 2010, 20% of the Pakistani population was at high risk of acquiring malarial infection1. Malaria can be caused by one of the protozoan parasites of genus Plasmodium that are Plasmodium malariae, P. vivax, P. ovale and P. falciparum. P. falciparum being the most notorious; causes millions of deaths per year2. Plasmodium vivax is predominant in Pakistan but frequency of malarial infection through P. falciparum is not negligible as well. During the years 2006 and 2010, almost 30% cases were confirmed with P. falciparum infection1.

Malaria can be fatal if left untreated or undiagnosed. It is reported that malaria causes 1.5 to 2.7 million deaths annually around the globe3. Malaria is responsible to affect a huge number of individuals each year worldwide, and that is why it is a major health concern. According to WHO figures of 20101, the number of individuals at high risk of malaria were more than 1 billion, worldwide. Out of them, 47% were from Africa while 37% from South-East Asia. Approximately, 176 million cases were reported positive for malaria in 2010, among which almost 81% were from Africa and around 13% from South-East Asia. Around 600,000 deaths were reported with more than 90% happenings in Africa, followed by South-East Asia4-6.

The major route of transmission of malaria from an infected person to a healthy person is through a mosquito bite. The other medium reported for its transmission is the blood transfusion of an infected donor to a non-infected receiver2. Occurrence of transfusion-transmitted malaria (TTM) is not surprising. Malaria infection through blood transfusion is the earliest noted as well as the most common transfusion-transmitted infection in the world2,5. In Pakistan, more than 1 million units of blood are transfused per year, where one-half of the transfusions take place in private sector. Currently, public sector blood banks especially rural areas of Pakistan do not usually screen for malaria routinely. The public health importance of TTM necessitates research in this part of the world6. Keeping these facts and views in mind, the present study has been designed to detect the prevalence of malarial parasite in blood donors in Karachi, Pakistan.

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2. MATERIALS AND METHOD
This study was conducted at Muhammadi Institute of Hematology and Transfusion Medicine, Muhammadi Blood Bank, Karachi from May 2008 to March 2014.

A total of 87,600 healthy blood donors were included in this study. A pint of blood was collected from each donor after taking a comprehensive history according to the inclusion and exclusion criteria of American Association of Blood Banks (AABB). Malarial parasites (MP) were detected by two different methods. In the first method, thick and thin blood smears were prepared within an hour of collection of blood and stained with Field’s stain. MP were detected using light microscope (100×). In the second method, immunochromatographic test (ICT) was performed using PL-P MAL (Humasis, Anyang, Korea).

3. RESULTS
Out of 87,600 healthy blood donors, 38 (0.04%) blood donors were found to be infected with the MP using peripheral blood morphology whereas immunochromatographic method was able to detect only 32 (0.037%) among them.

<table>
<thead>
<tr>
<th>Total number of blood donors</th>
<th>Frequency of P. falciparum</th>
<th>Frequency of P. vivax</th>
<th>Frequency of mixed infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>87,600</td>
<td>20 (0.02%)</td>
<td>18 (0.02%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

4. DISCUSSION
Ever since the ABO blood group system has been discovered, blood transfusion (BT) has helped billions of individuals to overcome the need of blood. It has played a leading role in therapeutic medicine and since then has saved many lives. BT is mainly used in the management of emergencies involving patients with life-threatening anemia or bleeding. Although it is considered to be a life-saving practice, still BT can pose problems for the recipient if not well managed. There is always a risk of immunological adverse reactions and transmission of blood-borne pathogens. Blood must be transfused cautiously in order to maintain patient’s safety. Careful identification of the patient, patient’s blood specimen and blood unit for transfusion is essential. By doing this practice, major causes of transfusion related deaths could be prevented. Transfusion related deaths and acute hemolytic transfusion reactions are major complications related with BT. They could be caused either by ABO incompatibility or clerical errors. To avoid such complications, careful identification should be carried out in the laboratory. Clerical checks should be performed before issuance of blood from the blood bank as well as at the patient’s bedside before transfusion. Furthermore, initial transfusion should be started at a very low rate for few minutes in order to check any adverse reactions that may occur. Blood to be transfused should be made safe and protected from every aspect. It can be lethal if it is contaminated or contains any infection as it can easily be transmitted to the recipient.

One of the rare transfusion-transmitted infections is malaria. Its history heads back to the early 20th century where the first ever case was reported in 1911. In tropical and sub-tropical countries including Pakistan, malaria is a common infection found in general population. The high percentage of malarial infection in general population increases the risk of asymptomatic and healthy looking blood donors. The MP can survive in red blood cells at temperatures between 2-6°C for days or weeks leading to a potential risk for recipients. Regulations on blood transfusion criteria to this effect are already operational in affluent parts of the world such as Canada, USA and Switzerland, where malaria has long been eradicated.

Our study depicts that TTM has a very low
prevalence (0.04%) among blood-donating individuals in Pakistan. Although it seems to be a negligible risk through transfusion but its presence is alarming. In a country like Pakistan, where malaria is endemic, the screening of every blood donor for MP is essential to minimize the chances of post transfusion malaria. The most important factor for low frequency of MP is a sound history from blood donors which is the most important part of hemovigilance program. This study also revealed that peripheral blood morphology is still a best method for MP detection but certain additional tools like LCD or LED projection through attached camera on the microscope will enhanced its quality. The ICT was unable to detect all cases especially those with low level of parasitemia indicating lesser sensitivity of this technique as compared to peripheral blood morphology. Pakistan is a country where a small number of voluntary blood donors donate blood every year. There are a large number of replacement donors who only donate their blood when their relatives or close friend requires a blood transfusion. There is also a small pool of commercial donors in Pakistan especially in rural areas. Most of the commercial donors belong to a poor socio-economic class, where the prevalence of malaria is at a much higher rate. This is possibly because these donors live in areas where basic facilities are scarce and malaria vector transmission is prevalent.

Transfusion of MP through blood transfusion is clinically significant because only a small number of infected red cells from donor are sufficient to cause disease in the recipient. Asymptomatic and healthy looking carriers are generally the source of TTM. Since healthy blood donors are selected for blood donation, it is very easy to miss the presence of MP in a donor that looks healthy and asymptomatic. TTM can prove to be fatal in some cases, especially, if the transmitted malarial species is P. falciparum. To avoid such fatal condition, blood banks and transfusion centers should work on sound hemovigilance programs. Blood donors should be motivated to increase the pool of volunteer blood donors.

5. CONCLUSION
This study revealed that the incidence of MP is low in Pakistani population but its prevalence is not negligible. Peripheral blood morphology is the gold standard method for the detection of MP. Blood borne infection through blood transfusion is one of the leading causes of post-transfusion complications that can have different effects ranging from simple adverse reactions to mortality. In order to reduce these complications, blood banks and transfusion centers should work on sound hemovigilance programs, as this study showed that the sound history taking from blood donors can reduce the frequency of MP infection even in endemic areas of this disease. Blood donors should be motivated to increase the pool of volunteer blood donors.

REFERENCES
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