SPECTRUM OF MALARIA IN HAJJ PILGRIMS IN THE YEAR 2000

Abdus Salam Khan, Fayaz Qureshi, Arif Hussain Shah* and Salman Akbar Malik**

Women Medical College, Abbottabad, *Central Laboratories, Riyadh Medical Complex, Riyadh, Saudi Arabia,

and **Quaid-i-Azam University, Islamabad.

Background: This study was carried out to investigate the country wise distribution of malarial parasite in Muslim pilgrims. **Methods:** This study was conducted at Ajyad Hospital, Makkah Al-Mukarmah, Saudi Arabia during peak Hajj season, from February to March 2000. The peripheral blood smears for malarial parasites were examined from one hundred and thirty patients suspected to be suffering from malaria. **Results:** A positive identification of malarial parasite was possible in 19.2%. Seventy-six percent patients were suffering from Plasmodium falciparum infection, while 24% had Plasmodium vivax infection. Fifty percent of patients from Sudan and Saudi Arabia had P. vivax malaria while in the rest of the countries only P. falciparum infection was found. The patients presented with protean clinical manifestations. **Conclusions**: Malaria is prevalent in many Muslim countries and the frequency of falciparum species seems to increase as compared to vivax malaria. The majority of falciparum malaria patients develop haematological complications.

Key Words: Muslim countries, pilgrims, malaria, plasmodia, hemolysis

INTRODUCTION

Malaria attacks about 300–500 million people each year mostly in the tropical and subtropical countries and cause 2.7 million deaths annually [1]. Almost half of the world population is at risk from this disease. Falciparum malaria is responsible for almost two million or more deaths attributed to malaria each year worldwide[2].

Millions of pilgrims from all over the Muslim world perform Hajj each year in *Makkah Al-Mukarramah* (Saudi Arabia). There is a huge aggregation of these pilgrims in the holy places such as *Kaaba*, *Mina*, *Muzdalfa*, *Arafat* and *Madina Munwarah*. There is very close contact amongst the pilgrims in various camps and in the holy mosques. The pilgrims might import various diseases from their countries of origin and the risk of spread of infectious diseases is high. The present descriptive case series study was, therefore, designed to investigate the relative frequency, symptomatology, haematological parameters and complications of malaria in patients from different countries of the Muslim world performing Hajj during the year 2000.

MATERIAL AND METHODS

This study was carried out in Ajyad Hospital, *Makkah Al-Mukarramah* for a period of one month (February to March 2000). Ajyad Hospital is located in front of the holy *Kaaba* and provides free treatment to all pilgrims.

All patients suspected to be suffering from malaria were included in the present study. Mostly the patients were referred to the Hospital Laboratory from out-patient department, emergency, wards and intensive care units for the film for peripheral blood smear for malarial parasite. Thick and thin blood films were made and slides were stained by Giemsa stain. The hospital record register was checked and from the old record the haematological findings requested for 14 patients are presented. The haematological parameters like haemoglobin, RBC count, total leucocyte count and platelet count were done on Sysmex-800 coulter machine.

RESULTS

During this study the peripheral blood smears of 130 patients suspected to be suffering from malaria were examined. The age, sex, place of referral and species of malarial parasites are shown in Table 1, 2 and 3. Majority of the patients (13/25, 52%) included in the present study were referred from the out-patient department while 28% (7/25) were referred from emergency department. Two patients each (8%) were from the medical and surgical wards while one patient was referred from the Intensive Care Unit of the hospital. The positive identification of malarial parasite was possible in 19.2%. Of the positive peripheral smears 19 (76%) were positive for P. falciparum while 6 (24%) were positive for P. vivax.

Table-1: Mean age and sex of pilgrims

Mean age (Years)	Sex		Total
	M	F	
36.88 ± 7.21	23 (92%)	2 (8%)	25

Table-2: Place of referral pilgrims

Place of Referral	No.	Percentage
OPD	13	52
Emergency	7	28
Male Medical Ward	2	8
Male Surgical Ward	2	8
ICU	1	4

Table-3: Species of parasites found in pilgrims

Species	No.	Percentage
Falciparum	20	80
Vivax	5	20

The haematological parameters are shown in Table 4.

Table-4: Haematological complications in patients with falciparum malaria in pilgrims at Ajyad Hospital, Makkah Al-Mukaramah.

Complications	No.	Percentage
Leucocytosis	3	21
Leucopenia	1	7
Severe anaemia	5	36
Moderate anaemia	3	21

Thrombocytopenia	7	50

The results of the haematological parameters of 14 patients from hospital record showed that 57% (8/14) patients had anaemia while 50% (7/14) patients were having thrombocytopenia. Three patients (29%) were having leukocytosis.

The country wise distribution of malarial parasite is shown in Table 5.

Table-5: Country wise distribution of malarial parasites.

Country	No. of Patients	Species	
		Falciparum	Vivax
Pakistan	5	5	-
Sudan	6	3	3
Saudi Arabia	2	1	1
Yemen	5	4	1
India	3	3	-
Kenya	1	1	-
Indonesia	1	1	-
Malawi	1	1	-
Nigeria	1	1	-

In the current study it was noticed that malaria existed in pilgrims from nine different countries. Plasmodium vivax was found only in patients from Sudan, Yemen and Saudi Arabia. Among the Sudani patients 50% (3/6) were infected by P. vivax.

DISCUSSION

Although the current study was conducted for only one month during peak Hajj season and the number of patients was limited however, it is very interesting as it includes data on malaria from a number of countries. This study showed that the predominant species in most of the countries was P. falciparum except in Sudan and Saudi Arabia where 50% of the patients were infected by P. vivax. It seems that P. falciparum is becoming the predominant species in most of the areas. Earlier similar observations were made by Khan and Malik from Pakistan [3, 4]. Based on the results of the present study the relative frequency of malaria in different countries could be calculated if the exact number of pilgrims from each country is known. However, it is evident from the present study that malaria is predominant in the tropical and subtropical regions of the world. It is worth mentioning that the two patients from Saudi Arabia were from Gizan province where malaria is endemic[5].

The age, sex, country of origin and species distribution of malarial parasites is shown in Table 1, 2 and 3. Two patients out of 25 (8%) were found to be suffering from cerebral malaria. Both of these patients survived after appropriate therapy. Two patients included in the present study were admitted in surgical wards presenting with acute abdominal pain and vomiting simulating acute appendicitis. Three other patients admitted had bleeding problems. These findings are in accordance with the previous reports where P. falciparum malaria was reported to have protean clinical manifestations [6].

The results presented in Table 4 clearly demonstrate that P. falciparum malaria was associated with a number of haematological changes such as anaemia, thrombocytopenia and leukocytosis. Similar observations

were made by other workers as well [7, 8]. It was recently confirmed that increased production of tumour necrosis factor alpha (TNFα) was responsible for the changes in brain and haematological parameters of patients with P. falciparum malaria. TNFα causes rosetting and cytoadherance of infected red blood cells in brain capillaries. Moreover, it causes upregulation of receptors in the brain capillaries for malarial parasites. The pathogenesis of above findings is that P. falciparum produces a malarial toxin which is chemically confirmed to be glycosyl phosphatidyl inositol (GPI). GPI stimulates the production of high levels of TNFα and interleukin I by macrophages. These mediators are responsible for the production of changes in brain capillaries and morphological changes in red blood cells and platelets [9].

The major cause of anaemia in malaria is the depression of erythrocyte production and phagocytosis of intact erythrocytes which are exacerbated by TNF [10]. Several ultra structural changes have been reported in non-parasitized erythroblasts and erythrocytes in the blood of patients who are anaemic and suffer from acute falciparum malaria. These changes are suggested to be due to dyserythropoesis and ineffective erythropoesis. Numerous haemoglobin-like particles are liberated from erythrocyte plasma membrane indicating severe haemolysis which is considered to be one of the major factors producing anaemia during malarial infection. Platelet survival is reduced to 2–4 days in severe falciparum malaria. An increase in the number of large abnormal megakaryocytes in the marrow and the bigger size of circulating platelets have been found in patients suggesting dyspoietic thrombopoiesis [11]. Anti TNFα antibodies and synthetic TNF are currently under trial for the treatment of cerebral malaria and acute rheumatoid arthritis in children.

Based on the results of the present study it is concluded that the pilgrims in addition to importing several infections may also cause spread of malaria in the host country. Since the vector for malaria is female anopheles mosquito, the maintenance of standard hygiene, cleanliness and the use of insecticide sprays during Hajj season is advocated. Moreover, the pilgrims should be given prophylactic anti malarial therapy at the airport before entering Saudi Arabia. It is further suggested that due to the availability of great number of pilgrims from different parts of the world during Hajj a study may be initiated to understand the genetic characteristics of parasites and species differentiation. Such work may have epidemiological and diagnostic implications.

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Address for correspondence:

Prof. Dr. Abdus Salam Khan, Head of Pathology Department, Women Medical College, Abbottabad, Pakistan.

URL: http://www.wmc.edu.pk