Original Research Article

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Clinical profile and geographical distribution of malaria patients attending a tertiary care centre in Mangaluru, South India

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ABSTRACT

Background: Around 0.84 million people contracted malaria in India in the year 2017 and it resulted in 194 deaths. This study was conducted to describe the demographic and clinical profile as well as the geographical distribution of malaria patients attending a tertiary care hospital in Mangaluru.

Methods: It was a record based descriptive study. All the malaria cases which were admitted from 1st May 2017 till 30th April 2018 were included in the study. OGIS software was used to plot the cases geographically.

Results: A total of 97 malaria cases were present, of which 74.2% were males. The mean age of the participants was 33.4 years. Fever and chills were the most common presenting complaints (94.8% and 85.6% respectively) and thrombocytopenia was the foremost complication. Diagnosis was done using blood smear in 45 cases and rapid diagnostic kit in 59 cases. 8 patients were detected positive by both the tests. *Plasmodium vivax* (69%) was the most common infection. QGIS plotting of address showed that 61.4% were from Mangaluru block. Rest of the cases were from other parts of Karnataka, Kerala and Bihar.

Conclusions: Malaria has a male preponderance and usually affects the economically productive age group. Thrombocytopenia was a common complication, thus necessitating close vigilance on platelet counts in malaria patients. Thick and thin blood smear is recommended to be performed to every case irrespective of their rapid diagnostic kit results. Mangaluru block accounted for 60 cases out of 97 cases which necessitates intensification of preventive measures in the block.

Keywords: Malaria, Clinical profile, QGIS, Geographic distribution

INTRODUCTION

Malaria is a life threatening mosquito borne disease caused by Plasmodium parasite and transmitted by bite of female anopheles mosquito. Plasmodium has 4 species: *Plasmodium vivax*, *Plasmodium falciparum*, *Plasmodium malariae* and *Plasmodium ovale*, of which *P.falciparum* is the most fatal type. Apart from its medical effects such as fever, chills and body pain, it also causes increase in the premature mortality, causing an impediment to the economic development of the community affected.

Approximately 2,020 million people are exposed to the risk of contracting malaria, which accounts for 36% of the world population. According to World Malaria Report, in the year 2017, 219 million cases of malaria occurred worldwide accounting for 4,35,000 deaths. Nearly 80% of these deaths were contributed by 17 countries of WHO African region and India. India accounts for about 70% of malaria cases in South East Asia (SEA) followed by Indonesia and Myanmar. In the year 2017, 0.84 million people were diagnosed with malaria in India and 194 deaths were reported.

Malaria is highly endemic and persistent throughout the year in several parts of South Western regions of India, including a substantial portion of the Karnataka state. Dakshina Kannada district is a coastal district of Karnataka state and is endemic to malaria, as it receives high rainfall and has humid tropical environment. The construction sites, suburban slum areas and consistent showers provide with stagnant water and breeding places for the vector, resulting in high vector density creating malaria hotspots. A total of 4,741 cases were reported in Dakshina Kannada in the year 2017.⁵

Geographic information system (GIS) is a software that lets users to visualize, analyze and interpret geographical data and helps in understanding and solving the issues regarding the relationships and patterns. The advantages are that, it acts as a tool of instant retrieval of information and has the ability to pinpoint areas requiring immediate attention. Hence, it would be a brilliant tool to locate the clustering of malaria cases in the prone areas.⁶

As malaria continues as a major public health problem in Dakshina Kannada district, it is imperative to control the disease by identifying the pattern of the clinical profile of the patients and the endemic areas of malaria. Finding out the pattern of symptoms and complications will help us to make better diagnosis and provide efficient treatment. This study was thus conducted with the objective to describe the demographic and clinical profile as well as to describe the geographical distribution of malaria patients attending Yenepoya Medical College Hospital, Mangaluru.

METHODS

This was a record based descriptive study conducted at Yenepoya Medical College Hospital among patients admitted with malaria. The hospital is located in the Southern part of Mangaluru city, Dakshina Kannada District, Karnataka State. Malaria cases which were admitted from 1st May 2017 till 30th April 2018 were included in the study. The medical records department of the hospital was requested to provide case reports of these patients. All the laboratory confirmed cases were included in the study. Incomplete or missing records were excluded from the study. The details regarding ID number, age, sex, residence and occupation along with clinical profile including, signs and symptoms, method of diagnosis, treatment and complications were obtained.

Data was entered in predesigned Microsoft (MS) excel sheet. Data was analyzed using Statistical package for social sciences (SPSS) (23.0 IBM, New York, USA). Descriptive analysis was carried out and qualitative data is presented as frequencies and percentages whereas quantitative data is presented as mean and standard deviation. QGIS (2.18, QGIS Development Team) was used to plot the address of patients and the distribution of cases was analysed. Each taluk from which the patient

hailed from, was considered as a block of QGIS while plotting the address.

Institutional ethics committee approval was obtained for conducting the study. Permission to carry out the study was taken from hospital authorities. No personal identifiers of the patients were collected and confidentiality and anonymity of the data was maintained throughout the study.

RESULTS

A total of 97 confirmed cases of malaria that were reported from the hospital from 1st May 2017 till 30th April 2018 were included for the study. No case was excluded as all the case files provided by MRD had adequate data. Among the malaria cases, 72 were males (74.2%) and 25 (25.8%) were females. The mean age of the participants was 33.4 years (±15.4 years) with minimum age being 3 years and maximum being 71 years. 94.8% study participants had fever and 85.6% had chills as the symptom of malaria. It was observed that 25.8% of the patients had cough along with the other symptoms of malaria (Table 1).

Table 1: Profile of symptoms of malaria among the admitted patients (n=97).

Signs and symptoms	Number of patients (%)
Fever	92 (94.8)
Chills	83 (85.6)
Headache	51 (52.6)
Vomiting	43 (44.6)
Cough	25 (25.8)
Jaundice	05 (05.2)
Diarrhoea	03 (03.1)
Gastritis	02 (02.1)

Table 2: Peripheral smear results with species differentiation among the malaria cases (n=97)

Species of plasmodium	Number of patients (%)
P. vivax	67 (69.0)
P. falciparum	17 (17.5)
Mixed infection	13 (13.5)

Table 3: Complications due to malaria among the admitted patients (n=97)

Complications	Number of patients (%)
Thrombocytopenia	18 (18.6)
Liver impairment	06 (06.2)
Renal impairment	01 (01.0)

The diagnosis of malaria was done using peripheral smear and rapid diagnostic kit. Out of 97 patients, 45 were smear positive cases and 59 were diagnosed with rapid diagnostic kit. 8 patients were detected to be positive by both the tests. Among the patients, *P. vivax* was the most common infection followed by *P. falciparum* (Table 2). Regarding resistance, it was noted that only 1 case of *P. vivax* infection had chloroquine resistance. A total of 19

patients out of the 97 admitted with malaria reported with complications and thrombocytopenia was the most common being present in 18 patients (Table 3).

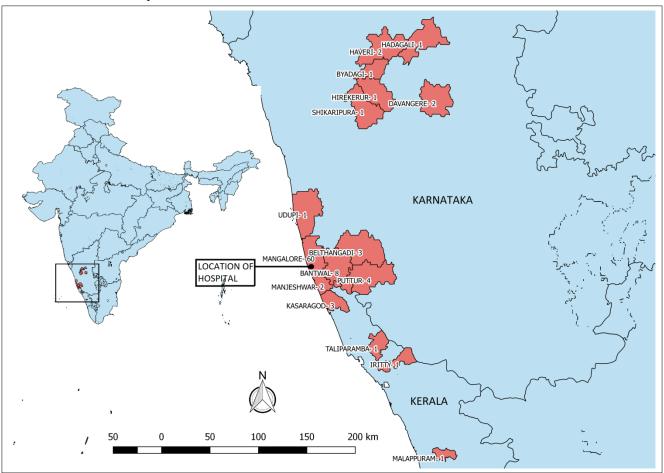


Figure 1: Distribution of malaria cases according to the QGIS blocks (n=97).

The distribution of malaria cases was displayed blockwise using QGIS (Figure 1). Out of total 97 patients that have reported to our tertiary care hospital during the study period, 60 were from Mangalore block, followed by 8 from Bantwal block, both these blocks belonging to Dakshina Kannada district of Karnataka state. Puttur and Belthangady blocks, also in to the same district, accounted for 4 cases and 3 cases respectively. We also identified 2 cases each from Davangere and Haveri blocks. Udupi, Byadagi, Hadagali, Shikaripura and Hirekerur blocks of Karnataka had 1 case each. From the neighbouring state Kerala, Kasargod block accounted for 3 cases, Manjeshwar block had 2 cases, Iritty, Taliparamba and Mallapurram block had 1 case each. Far off state like Bihar accounted for 5 cases where the migrant workers from Bihar got infected in Mangalore, rather than importing the disease from Bihar.

DISCUSSION

Among the 97 malarial cases studied, the mean age of the patients affected was about 33 years with 3 years and 71

years being the minimum and maximum age respectively. Thus malaria was seen to be affecting all the age groups. A similar study conducted in Mangalore city by Dayanand et al, found out that the mean age of the affected patients was around 36 years, which is comparable with our study.⁵ It is important to note that the people in the working age group are getting affected with the disease which will have a financial impact on the family, especially of the lower income class.

Out of all the cases we reviewed, 74.2% of the cases were males and 25.8% were females. This male preponderance observed can be co-related to the increased exposure to males related to their occupation. Similar trend is observed when these findings are compared with the study conducted by Dayanand et.al, which mentioned the male proportion as 73.3% and female as 26.7%.⁵

Among the signs and symptoms of malaria, 94.8% presented with fever, 85.6% with chills, 52.6% with headache and 44.6% with vomiting. Cough and jaundice were noted among 25.8% and 5.2% respectively. This can

be very well compared with the findings obtained from a study done in KMC Attavar, Karnataka by Chowta et al, where all the malarial cases presented with fever followed by 51.55% with headache, 31.55% with vomiting, 20.37% with jaundice and 7.4% with cough. It is interesting to note that 1 in 4 malaria cases had cough as a symptom. Thus history of cough may be considered as one of the symptoms of malaria which will aid towards the disease diagnosis.

The symptoms can be attributed to the pathophysiology of malaria disease, which involves the lysis of the erythrocytes infected with plasmodium and further release of hemozoin pigment and other toxins including glycosylphosphatidyl inositol into the blood. This further leads to activation of macrophages and endothelial cells to release cytokines and inflammatory mediators such tumour necrosis factors, interferon gamma, interleukins, lymphotoxins and free radicals which are responsible for the various symptoms of malaria.

The guidelines for malaria diagnosis mention that, RDTs can be used in diagnosis and treatment of malaria, in areas where microscopy results are not available in 24 hours. However, peripheral smear microscopy is still the gold standard test for the diagnosis. The sensitivity and specificity of rapid diagnostic tests with respect to the Leishman stain thick smear is 98.2% and 100%. The diagnosis of malaria in our study was done by thick and thin smears in 45 cases and by rapid diagnostic tests (RDTs) in 59 cases. Both tests were done in 8 patients. Thick and thin smears are done for the direct walk in cases in the study hospital. Patients who are already diagnosed by RDT and referred to the hospital may not be again investigated by thick and thin smear.

Out of the 97 cases studied, majority (69.0%) were infected by *P. vivax*. Further, 17.5% were infected by *P. falciparum* and 13.5% had mixed infections. These findings are comparable with a retrospective study was conducted in Hiriadka, Udupi to determine the burden of Malaria and to assess the morbidity patterns. In the study it was found that 84.9% had *P. vivax* infection, 14.6% had *P. falciparum* and 0.5% had mixed infections. ¹¹ A multicentric study conducted in India by Siwal et al found that, 52% were *P. vivax* infections, 42% were *P. falciparum* infections and 6% were mixed infections. ¹² *P. vivax* infection has always been shown to have higher prevalence and has accounted for 98% of all malaria cases within urban malaria scheme in India in the year 2014. ¹³

Complications are frequently associated with malaria. According to our data thrombocytopenia was the most common complication with incidence if 18.6%. This was followed by liver impairment among 6.2% of the total cases and renal impairment among 1% being the least. The other complications like cerebral malaria and pancreatitis were not found. As 1 in 5 malaria patients

had thrombocytopenia, it is advisable to keep a check on platelet count in all malaria cases.

In another study done in Mangaluru, liver impairment was found to be with highest frequency (9.3%) followed by thrombocytopenia (3.7%), renal impairment, pancreatitis and cerebral malaria with 1.9% each. A study done by Muddaiah et al in Dakshina Kannada district showed that thrombocytopenia accounted for 8.42% of the complications and liver impairment was found in 14.73% of the cases. The overall complications are found to be comparatively less in our study and may be attributed to the adequate healthcare measures at the tertiary care hospital.

On QGIS plotting, 3 clusters of malaria cases were found on the map. The first cluster consisted of those blocks which are in close proximity to the hospital (both Karnataka and Kerala blocks). Some cases from Kerala might have been diagnosed there and would have been referred to the study hospital for treatment purposes. In the other cases from Kerala, the symptomatic patients themselves would visit the study hospital for reasons such as close location of a tertiary care hospital and availability of Government benefit schemes (including some Kerala Government Schemes such as RSBY).

The second cluster had blocks from middle part of Karnataka like Davangere, Haveri, Shikaripura and Hirekerur. The reasons for patients coming from such long distances include the health camps conducted in these regions by the study hospital, provision of health facilities at subsidized rates and also the apt implementation of government schemes by the institution. The third cluster had cases from Bihar, who are immigrants for job, contracting the disease in Mangaluru and visiting the study hospital for health services.

The strengths of this study are that there is complete capture of the data of patients admitted with malaria and block wise plotting of data was done using GIS which has given representation of the geographical distribution of cases. The weakness of the study is that, the study results may not be generalisable as the study was conducted in a single tertiary care hospital.

CONCLUSION

The study observed malaria as a disease which has a male preponderance and usually affects the economically productive age group. Most of the patients presented with the classical symptoms of fever and chills. Vomiting and cough were fairly common complaints in significant number of cases; hence the physicians can consider these symptoms towards the diagnosis of malaria. The overall complications were less in the study participants except thrombocytopenia which was found to be common, thus necessitating close vigilance on platelet counts in malaria patients.

Only about half of the malaria cases were diagnosed by examination of thick and thin blood smear. As it is the gold standard for diagnosis of malaria which also aids in identification of falciparum species, it is recommended to be performed to every case irrespective of their rapid diagnostic kit results.

Geographic mapping of the cases revealed that most cases were from in and around the study hospital. Mangaluru block accounted for 60 cases out of 97 cases which necessitates intensification of preventive measures in the block. Cases which were observed from other parts of India like Bihar can be attributed to the immigration of workers to Mangalore city.

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Institutional Ethics Committee

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