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RETROSPECTIVE ANALYSIS OF MALARIA CASES IN A TERTIARY HEALTH CARE CENTER IN KARNATAKA, SOUTHWESTERN INDIA

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ABSTRACT

Malaria is a major health problem in many parts of the world, including India. The present study is based on available records in a tertiary healthcare center in Mangalore city, an endemic area in Dakshina Kannada district of Karnataka state, India. The prevalence, seasonal variation and morbidity pattern during the year 2016 has been compiled and analyzed. The incidence of malaria in Dakshina Kannada district is on the rise during recent years with peak infection rate in rainy season. Prime parasite of infection in this region is *Plasmodium vivax* contributing to more than 80% of the total cases. Incidence of malaria in this region is high in adult males compared to children, unlike sub Saharan Africa. *P. vivax* infection accounts for high rate of mortality in adult males compared to females and children. Migrant workers involved in various construction activities are more affected than the native population mainly because of their exposure status and lack of awareness towards the disease. Thus, there is an urgent need to create awareness about the disease by conducting educational programs and to reduce the risk by adopting personal protective measures and environmental hygienic measures.

KEYWORDS: Malaria infection, *Plasmodium vivax* and *P. falciparum*, Prevalence, Infection.

INTRODUCTION

Malaria is a most common life threatening parasitic infection in most parts of the tropical and sub-tropical regions of the world.[1] An estimated 3.2 billion people globally are at risk of contracting malaria every year.[2] Approximately 40% of the world's population lives in the tropical and sub-tropical regions where malaria is endemic. It is a major contributor to the political, social and economic instability in the developing countries, particularly sub-Saharan Africa and South Asia.[3] Although majority of malaria cases are reported from Africa and sub-African countries, a substantial number of fatalities are also found in South-East Asia. In this region, India accounts for the highest malaria burden with an estimated 70% of total malaria cases followed by Indonesia and Myanmar.[4] In India, about 82% population is at risk of malaria and an estimated total number of clinical cases are in the range of 1-1.5 million every year, more than half of the cases are due to *Plasmodium falciparum*.[5] Moreover, in India, malaria morbidity represents a major health crisis because of its enormous burden on the socioeconomic progress of the population.

Mangalore, the coastal headquarter of Dakshina Kannada district of Karnataka has been endemic for malaria for over two decades with annual parasite incidence [API] in the range of 10-12. After the success of the National Malaria Control Programme in the 1960s and 70s, malaria was relatively unknown in Mangalore till 1990 with only few sporadic cases. Since 1990, with increased urbanization and migration of population from the malaria endemic regions for employment opportunities, malaria has increased again, and the transmission has remained high until now. The spikes in the incidence of malaria have also led to deaths, mostly attributed to *P. falciparum*.

Despite high endemicity and huge health burden, to date no systemic research studies have been conducted in this region. Most malaria studies that have been undertaken so far in India are confined to central, northern and northeastern parts of the country. In efforts to gain insight into the extent of malaria morbidity in this region, we analyzed the malaria related data collected from the government Wenlock district hospital, Mangalore.

MATERIALS AND METHODS

This is a descriptive record based retrospective analysis of medical records of confirmed cases of malaria reported during 1st January to 31st December 2016. This study was conducted in Wenlock district hospital,

Mangalore, which is a government operated tertiary care hospital in the heart of the city. The patients tested positive for malaria parasite either by blood smear test or rapid diagnostic test were included in this study.

The majority of malaria cases (>65%) reported from Mangalore city are from this hospital. A dedicated malaria diagnostic and treatment center is integrated within the hospital along with well-trained certified malaria microscopist. All patients received treatment based on National Vector Borne Diseases Control Programme (NVBDCP) recommendations for antimalarial chemotherapy. Confirmed uncomplicated *P. vivax* cases were treated with chloroquine in full therapeutic dose of 25 mg/kg body weight for 3 days along with primaquine (0.25 mg/kg body weight) daily for 14 days to avoid relapse of *P. vivax* infection. In addition, confirmed cases of uncomplicated *P. falciparum* infections are treated with Artemisinin Combination Therapy (ACT) of artesunate (4 mg/kg body weight) daily for 3 days and sulfadoxine (25 mg/kg body weight)-pyrimethamine (1.25 mg/kg body weight) [AS+SP] on Day 0 followed by single dose of primaquine (0.75 mg/kg body weight) on Day 2.[6]

The data was compiled and analyzed by using Graph pad prism 7 and Microsoft excel 2016 programmes.

RESULTS

This retrospective study found that in the year 2016, a total of 17,296 blood smears were examined and 3144 confirmed cases of malaria were treated. Of these cases, 2613 (83.1%) were *P. vivax* infections, 340 (10.8%) were *P. falciparum* infections and 191 (6.1%) were mixed infections indicating an overall slide positivity rate (SPR) of 18.2% (Fig.1, Table.1). Highest rate of infection was found in adult males 2698 (85.8%) compared to females 446 (14.2%) and the overall male to female ratio of infection is 6:1 (Fig.2). Further, highest number of infections, 3008 (95.6%), was found in the age group of >14 years, as compared to 87 (2.7%) in the age group of 5-14 years and 42 (1.3%) in the age group of below 5 years and 7 (0.2%) in the age group of below 1 year (Fig. 3). The data analysis showed that *P. vivax* was predominant malaria species in all the age groups.

As shown in Table 1, we also observed that highest number of cases were found during the months of July (515, 16.3%) and August (598, 19.02%) and lowest rate of infections during the months of April (105, 3.3%) and May (120, 3.8%). The total number of positive cases was in the increasing order gradually from June to August and in the decreasing order from September to November. Rainy season from June to August lead to increased water logging in the surrounding areas providing favourable conditions for mosquito breeding and transmission of infection in the locality.

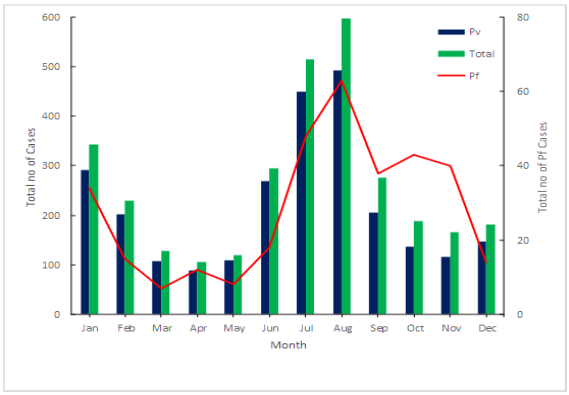

Fig. 1: Distribution of cases and infection among different seasons of the year.

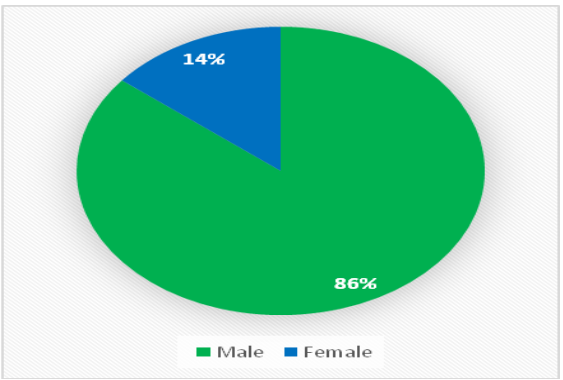

Fig. 2: Ratio of infection among the genders.

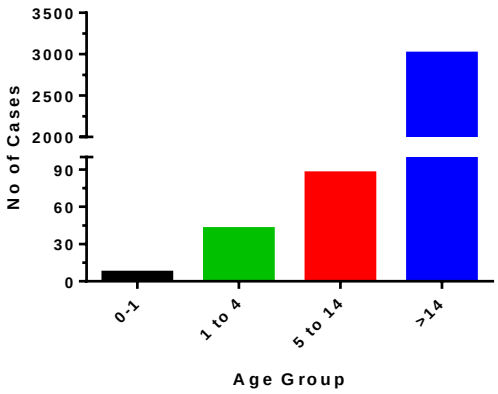

Fig. 3: Distribution of infection across different age groups.

Table 1: Total number of infections during the year 2016.

	Total Blood Smears	No of Pv Cases (%)	No of Pf Cases (%)	No of Mixed Cases (%)	Total	Slide positivity rate % (SPR)
Jan	1344	291 (84.8%)	34 (9.9%)	18 (5.2%)	343	25.5
Feb	968	202 (87.8%)	15 (6.5%)	13 (5.7%)	230	23.8
Mar	833	108 (84.4%)	7 (5.5%)	13 (10.2%)	128	15.4

Apr	811	88 (83.8%)	12 (11.4%)	5 (4.8%)	105	12.9
May	848	109 (90.8%)	8 (6.7%)	3 (2.5%)	120	14.2
Jun	1840	269 (91.2%)	18 (6.1%)	8 (2.7%)	295	16.0
Jul	2545	449 (87.2%)	48 (9.3%)	18 (3.5%)	515	20.2
Aug	2440	492 (82.3%)	63 (10.5%)	43 (7.2%)	598	24.5
Sep	1902	206 (74.6%)	38 (13.8%)	32 (11.6%)	276	14.5
Oct	1499	136 (72.3%)	43 (22.9%)	9 (4.8%)	188	12.5
Nov	1198	116 (70.3%)	40 (24.2%)	9 (5.5%)	165	13.8
Dec	1068	147 (81.2%)	14 (7.7%)	20 (11%)	181	16.9

DISCUSSION AND CONCLUSION

Malaria is a significant public health problem in Mangalore city of Dakshina Kannada district, with majority of cases observed during monsoon and post monsoon seasons (Sep-Dec). Mangalore is located on the basins of two rivers and numerous backwater estuaries of the Arabian Sea spreading over large areas, providing natural breeding ground for mosquitoes. Further, the climate in and around the city is warm and humid throughout the year and as such, it is conducive for the breeding of mosquitoes and thus malaria transmission.

Of the total 3144 malaria reported cases, 83.1% cases were due *Plasmodium vivax*, 10.8% due to *P. falciparum* and 6.1% were due to mixed malaria infections. Similar studies conducted in this region also reported the predominance of *P. vivax* infection compared to *P. falciparum*.[7] Our results show that the majority of positive cases were males in the age group of >14 years, which is consistent with previous studies.[8,9] Majority of cases reported positive for malaria are among non-native migrant construction workers migrated to this locality in the recent past for their livelihood. Rapid urbanization and increased construction activities in the locality accompanied by poor management of sanitation at construction sites provides ideal breeding conditions for mosquitos and transmission of the disease.[10] In addition, frequent travel between high-malaria endemic regions puts migrant workers at increased risk for acquiring the disease. Rainfall is the most important factor that influence the transmission and distribution of malaria infection. The number of positive cases were more prevalent in rainy season (June-Sept) with a steady increase in the number of cases starting in June, the highest number of cases was reported in August (598, 19 %), and then declined gradually during dry seasons.

It can be concluded that due to rapid growth and urban development in this area, there has been an increase in the incidence of malaria over the years. This has created a major challenge for maintaining the public health in this area. In spite of intensive control interventions, there are increased numbers of cases every year and resulting in deaths too. Thus, there is a need to create public awareness about the disease by conducting educational programs, to reduce the risk by adopting personal protective measures and environmental hygienic practices.

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