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Study of Epidemiology of Malaria infections in Valsad region of South Gujarat

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Abstract

Malaria is estimated as one of the top 3 killers among infectious diseases by WHO.The occurrence of malaria is highly influenced by factors related to the parasite, the vector, the human host and especially the environment. Malaria transmission highly depends on climatic conditions that may affect survival of mosquitoes such as rainfall patterns, temperature and humidity. In many places transmission is seasonal with the peak during and just after rainy season. The study on epidemiological pattern of malaria was performed at Valsad region of South Gujarat from January 2010 to July 2012. Out of 1390 blood samples collected from malaria suspected patients, 663 were found positive for malaria. About 405 (61.1%) and 258 (38.9%) cases were detected positive as *Plasmodium vivax* and *Plasmodium falciparum* respectively. Majority of malaria infections occur between months of July to December with peak in August and September. Usually high number of cases of *Plasmodium vivax* malaria found in this region, but greater proportion of *Plasmodium falciparum* malaria was recorded after completion of rainy season in months November and December. Moreover large numbers of cases about 61.7% were found to occur in males and 38.3% in females. The mortality rate was recorded about 0.3%.

Key-Words: Malaria, *Plasmodium vivax*, *Plasmodium falciparum*, Rainy season, Epidemiology, Microscopy

Introduction

Malaria is the most important parasitic disease in tropical areas. Nearly 3 billion people lives with the risk of malaria. Every year 500 million people infected with malaria and 2.5 million people died of it[1]. Malaria has been a major parasitic, communicable tropical disease transmitted by the *Anopheles* mosquito and caused by four *Plasmodium* species namely *Plasmodium vivax, P. falciparum, P. ovale* and *P. malariae*. Among them *P. vivax* and *P. falciparum* are common in India. The reemergence of malaria has been reported in several countries such as India, Peru, China and Korea[2,3]. It has become a serious health problem in these countries. Valsad district of Gujarat state, India is considered as one of the malaria endemic area[4].

Climate change has potential to alter the spread and transmission intensity of malaria. The occurrence of malaria is highly influenced by factors related to the parasite, the vector, the human host and especially the environment.

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Malaria transmission highly depends on climatic conditions that may affect survival of mosquitoes such as rainfall patterns, temperature and humidity. In many places even in India transmission is seasonal, with the peak during and just after the rainy season. Malaria epidemics can occurs when climates and other conditions suddenly favors transmission in areas where people have little or no immunity to malaria. As per the latest estimate given by WHO, 219 million cases of malaria were reported in 2010 with an estimated 6, 60,000 deaths[5].

Increased number of cases of malaria found in Valsad district and even in many districts of Gujarat like Surat, Kheda, Bharuch, Panchmahal, Dang etc., as they contain high moisture and colder climate especially in rainy months. Whereas small number of malaria cases found in districts of Gujarat like Kutch, Rajkot, Jamnagar, Bhavnagar due to low moisture and high temperature, which do not favor breeding of mosquitoes causing malaria. In Valsad District in 2013, 3000 cases were reported from January to June, whereas 1400 cases were reported just in July[6].

To study the impact of environmental conditions on malaria morbidity, we have collectedblood samples

from suspected patients, diagnosis was made and epidemiological pattern of the disease of Valsad region was studied. Microscopic examination of thick and thin blood smears stained with Romanowsky's stain is the most common technique to diagnose malaria since last hundred years[7,8]. We made use of microscopy, as it continues to be the gold standard for identification of *Plasmodium* species in the laboratories[9].

Material and Methods

The study on epidemiological pattern of malaria was performed at Valsad region of South Gujarat from January 2010 to July 2012. 1390 samples were collected from various clinical laboratories and hospitals of Valsad from patients suspected to be suffering from malaria. Approximately 1 ml blood sample was collected from each patient in a vaccutainer containing an anticoagulant EDTA. All samples were tested by microscopy. Thick and thin smears were prepared on slide, stained with Field's stain B and A for 5 and 12 seconds respectively[10]. Thick smears were used to confirm malaria and to count parasites/µl. Smears were considered negative if no parasites were observed in 200 consecutive fields of thick smear in oil immersion objective. Parasites were counted against 200 to 500 leucocytes. For the parasite estimation it was assumed that 8000 leucocytes present in 1 µl of blood[11,12]. Thin smears were used to identify and differentiate parasites. Results of microscopically positive samples were recorded month wise.

Results and Discussion

Out of 1390 blood samples collected from malaria suspected patients, 663 were found positive for malaria. 405 (61.1%) and 258 (38.9%) cases were detected positive as *Plasmodium vivax* and *Plasmodium falciparum* respectively as shown in graph 1. The mortality rate was recorded about 0.3%.The age of malaria positive patients were ranging from 2-80 years with mean age 38.5 years. Patients of all ages were taken into consideration for this study. Graph 2 shows demographic distribution of patients with respect to age and gender. Large number of cases about 61.7% was found to occur in males with 38.3% in females. It was also reported in Hindustan Times newspaper that males are more susceptible to malaria than female. It is due to difference in type and level of hormones found in males as reported by Tata Institute of Fundamental Research (TIFR). This study has shown agreement with reports of TIFR[13].

As shown in graph 3, 4 and 5, from January to June very few cases of malaria were found due to high temperature and low level of moisture found during this time in this area. Mainly in these months malaria infection caused by less fatal species *Plasmodium vivax*. As monsoon gets started, number of malaria infections increases. Majority of cases found to occur from July to December as humidity increases. Cases were observed at peak in August and September months. Usually high number of cases of *Plasmodium vivax* malaria found in this region, but greater proportion of *Plasmodium falciparum* malaria was recorded after completion of rainy season, in months November and December.

It is not possible for man to control climatic conditions like rain and temperature, but efforts can be made for prevention of malaria. Early diagnosis and treatment of malaria reduces disease and prevents deaths. It also contributes to reducing malaria transmission. Vector control is the main way to reduce malaria transmission at the community level, reducing very high levels of malaria transmission to almost zero. For individuals, personal protection against mosquito bites represents the first line of defense for malaria prevention: Insecticide-treated mosquito nets and indoor spraying with residual insecticides[14]. One can also contribute to decrease in malaria transmission by keeping water storage container free of mosquito, elimination of stagnant water surrounding home, school and working places to avoid breeding of it. Antimalarial medicines can also be used to prevent malaria.

Conclusion

Malaria is an extremely climate-sensitive tropical disease. In Valsad region it is found in epidemic form especially in rainy and post rainy season. Throughout the year *Plasmodium vivax* malaria infections are usually recorded in good numbers but in November and December months *Plasmodium falciparum* infections found at peak, which disappear soon at the starting of year up to June. Key interventions to control malaria include: prompt and effective treatment with artemisinin-based combination, use of insecticidal nets by people at risk; and indoor residual spraying with insecticide to control the vector mosquitoes.

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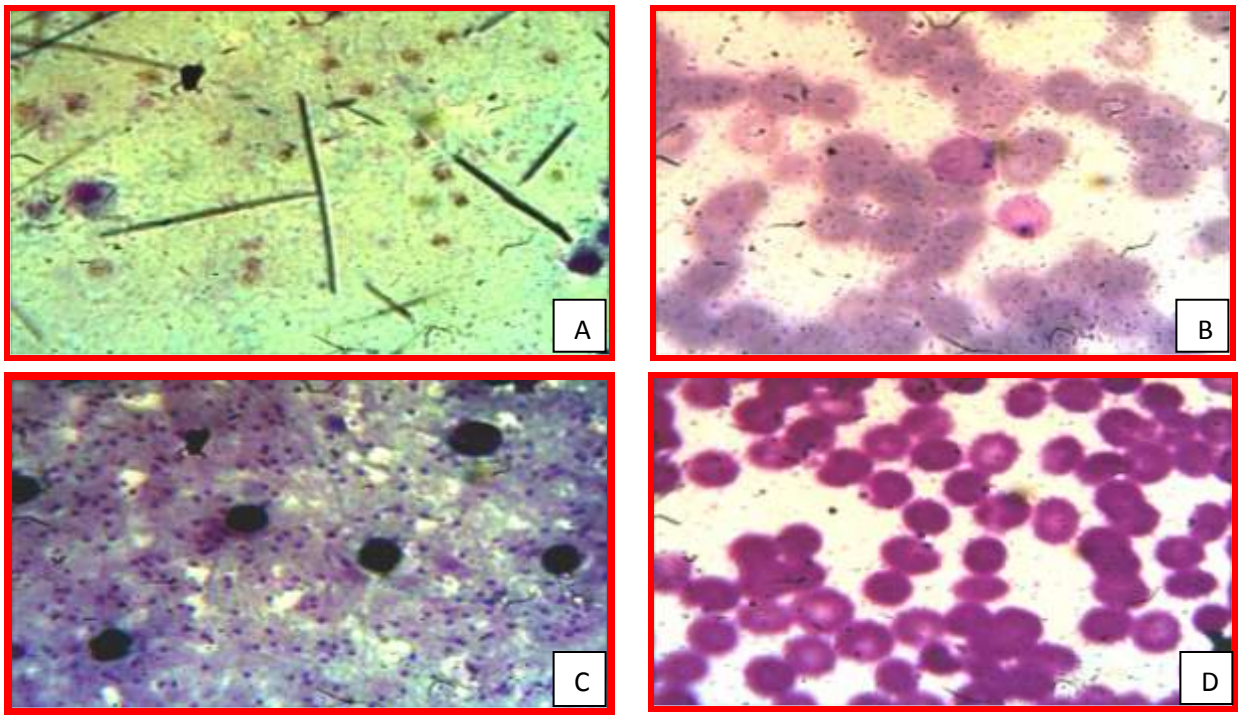
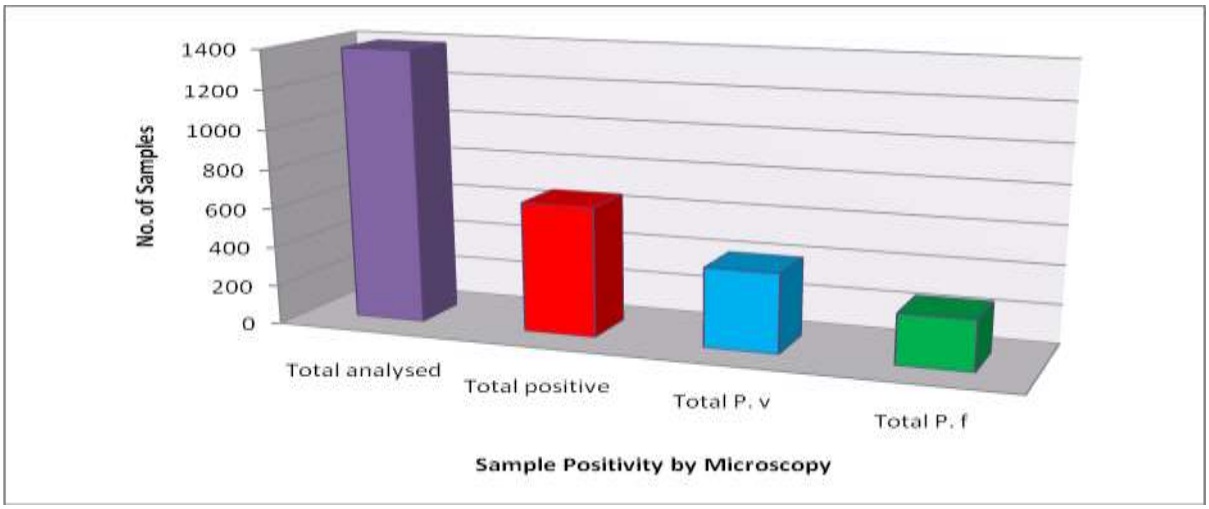
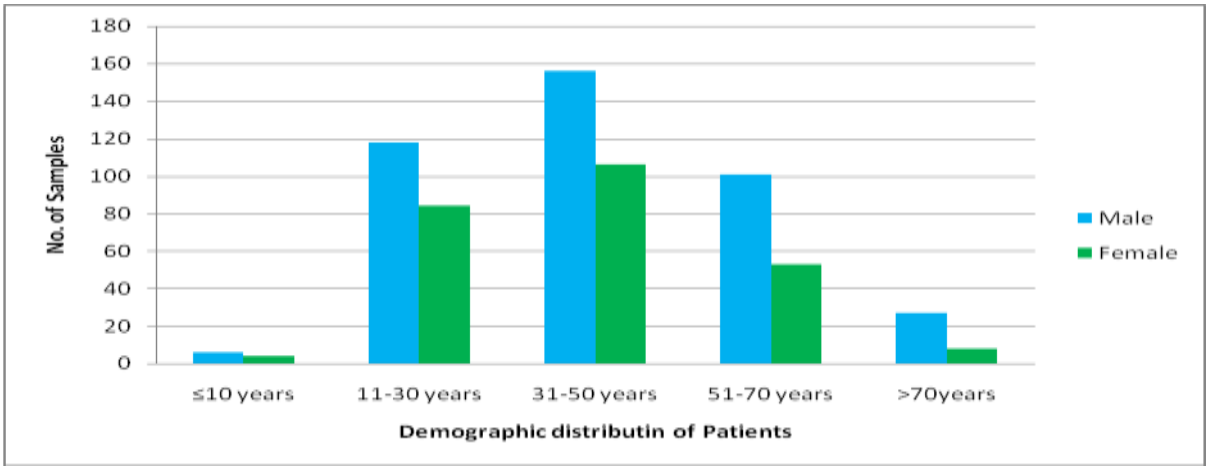


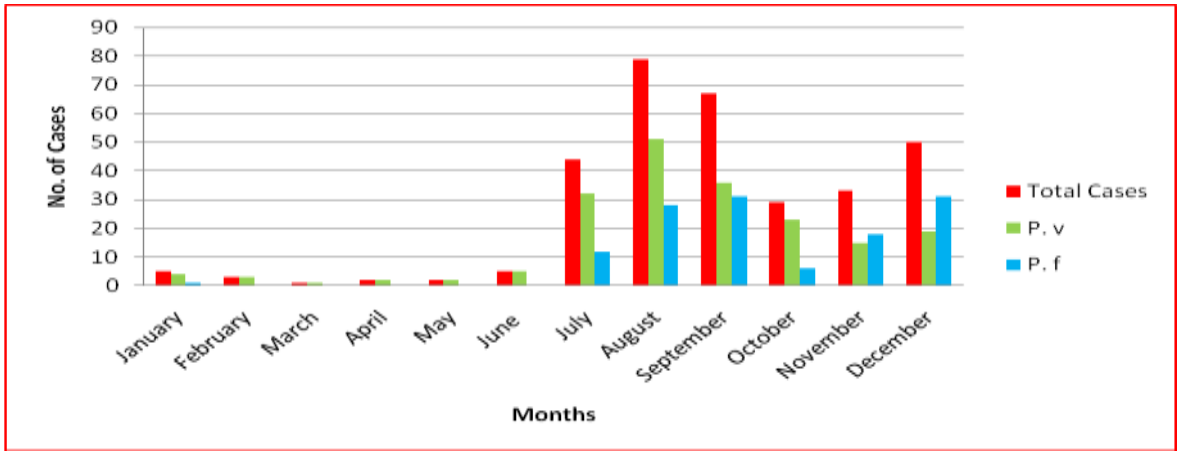
Fig. 1: Microscopic Observation of Parasites in Thick and Thin Smear
A and B: *Plasmodium vivax*, C and D: *Plasmodium falciparum*



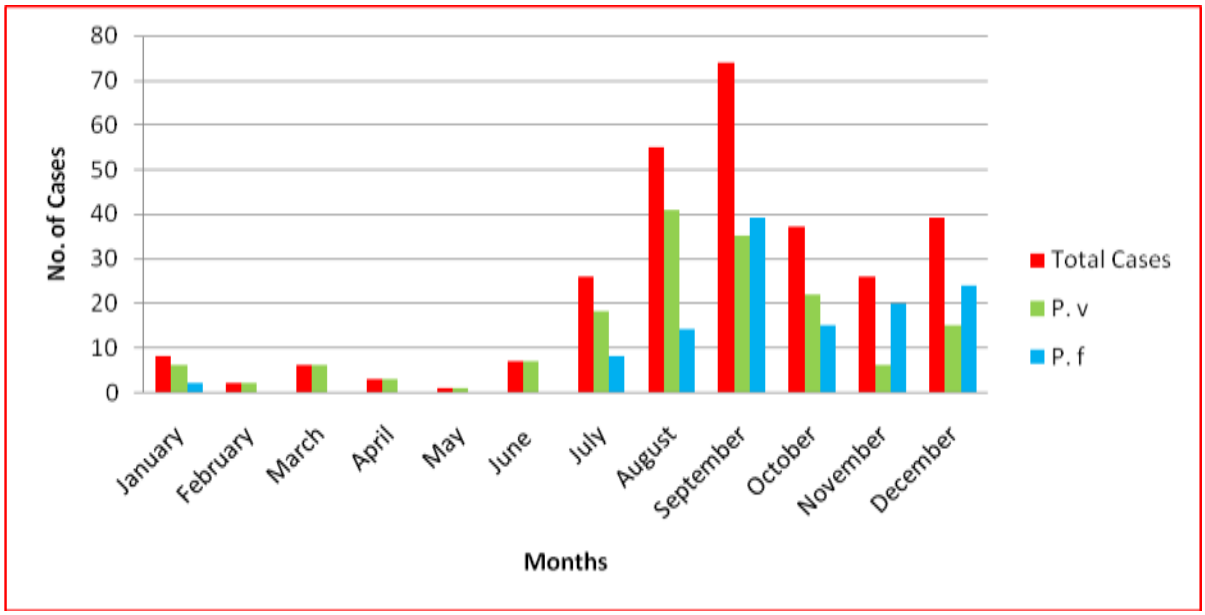
Graph 1: Prevalence of Parasites as per Microscopy



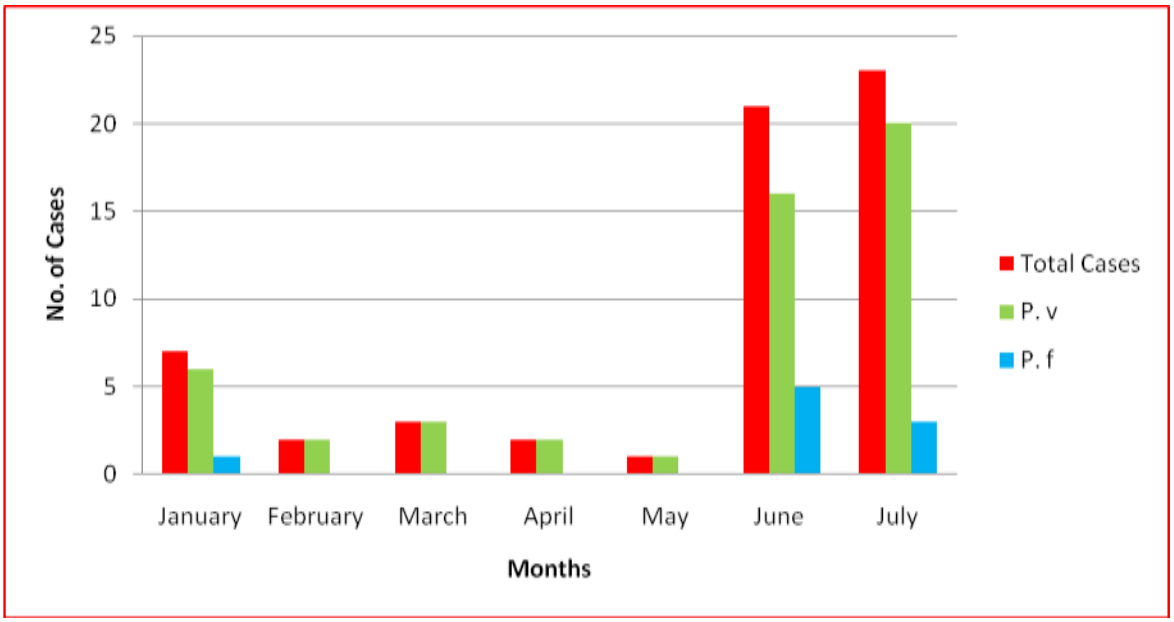
Graph 2: Demographic Distribution of Patients



Graph 3: Month wise Distribution of Malaria Cases-2010



Graph 4: Month wise Distribution of Malaria Cases-2011



Graph 5: Month wise Distribution of Malaria Cases-2012

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