



ISSN (P): 2617-7226
ISSN (E): 2617-7234
www.patholjournal.com
2021; 4(2): 123-126
Received: 02-02-2021
Accepted: 05-03-2021

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Study of malaria cases in central laboratory at tertiary care hospital, Vadodara, India

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DOI: <https://doi.org/10.33545/pathol.2021.v4.i2c.367>

Abstract

Introduction: Malaria is an endemic disease with high degree of severity in certain geographic areas of India. Gujarat is amongst one of them. The symptoms of Malaria ranges from mild to severe depending on the type of the plasmodium species, age of the patient, parasite load in the body of the host, season in which the infection occurs as well as endemicity of that region. These symptoms include fever, headache, nausea, vomiting. In case of *P. Falciparum* malaria, patient may develop convulsions, coma and death if cerebral malaria develops. In *P. Vivax*, there are high chances of relapse. So in such cases patient requires treatment after completion of routine treatment. That is why it is important to know the type of malaria and treat them accordingly.

Aims and Objectives: To evaluate prevalence of various plasmodium species in clinically suspected cases of malaria and their demographic study.

Material and Methods: Total 113 positive malaria cases were included in this study between June 2019 to May 2020 at the Central Laboratory, Department of Pathology, Medical College, Baroda. The samples included all age groups and both the gender of the patients. Routine hematological investigations including peripheral smear examination, thick and thin smear, rapid test whenever needed and complete hemogram were performed.

Results: Two types of malarial parasites were found, *Plasmodium vivax* (68.1%) and *Plasmodium falciparum* (31.9%). The prevalence of malarial infection exhibited seasonal pattern with most of the cases in the month of September, October and November with peak in October. Infection prevalence in male patients was higher (71.68%) than in female (28.32%) patients. Age group ranged from 7 years to 75 years with 21-30 years had greatest risk. These findings compared with other findings of malaria endemic populations in India that a hospital-based diagnosis and surveillance for malaria reflects seasonal malaria transmission underlying demographic and geographic distribution.

Conclusion: This study gives useful information regarding prevalence of malaria in Gujarat which can be useful at national level for National Malaria Prevention and Control Program, to minimize the cases, complications and fatality related to malaria.

Keywords: Malaria, *P. Vivax*, *P. Falciparum*, COVID-19

Introduction

Malaria is a major cause of morbidity and mortality in the tropics. Disease is of global importance, results in 300-500 million cases yearly and 1.5-2.7 million deaths annually. Approximately 2.48 million malarial cases are reported annually from South Asia, of which 75% cases are from India alone^[1, 2]. The annual parasite incidence (API) is a malariometric index to express malaria cases per thousand population. As per the National Vector Borne Disease Control Program (NVBDCP) incidence records, in most parts of India the API was <2, whereas 2-5 API was in scattered regions, while regions with >5 API were seen in the states like Rajasthan, Gujarat, Karnataka, Goa, southern Madhya Pradesh, Chhattisgarh, Jharkhand and Orissa, and in the Northeastern states.

Human malaria is caused primarily by 4 different species of Plasmodium namely; *P. Falciparum*, *P. vivax*, *P. malariae* and *P. ovale*. The high mortality rate from *P. Falciparum* is due to its ability to induce severe malaria, and in some cases, multiple organ failure^[3]. In case of *P. Vivax* type malaria there are chances of relapse. So patient need extra treatment in form of Primaquine or Mefloquine drugs to recover in addition to routine anti-malarial treatment.

A typical attack of malaria comprises three distinct stages: Cold stage, hot stage and sweating stage. The clinical features of malaria vary from mild to severe, and complicated, according to the species of parasite present, the patient's state of immunity, the intensity of infection and also the presence of concomitant conditions such as malnutrition and other diseases [6].

Malaria is typically diagnosed by the microscopic examination of blood using blood films, or with antigen-based rapid diagnostic tests. Methods that use the polymerase chain reaction to detect the parasite's DNA have been developed, but are not widely used in areas where malaria is common due to their cost and complexity [5]. Several medications are available to prevent malaria in travellers to areas where the disease is common. Occasional doses of the combination medication sulfadoxine/pyrimethamine are recommended in infants and after the first trimester of pregnancy in areas with high rates of malaria [6]. Despite a need, no effective vaccine exists, although efforts to develop one are ongoing. It is recommended that in areas where the disease is common, malaria is confirmed if possible before treatment is started due to concerns of increasing drug resistance. Resistance among the parasites has developed to several antimalarial medications; for example, chloroquine-resistant *P. Falciparum* has spread to most malarial areas, and resistance to artemisinin has become a problem in some parts of Southeast Asia [5].

Material and method

The study was conducted in Central laboratory, Department of Pathology, Baroda Medical College S.S.G Hospital, Vadodara. The studied blood samples consisted of patients

investigated at S.S.G. Hospital between all age group between June 2019 to May 2020 time period. The blood collected in Ethylene Diamine Tetra Acetate (EDTA) vacutte was sent to central laboratory and reporting was done based on readings from peripheral smear, rapid card test, thick and thin smear preparation.

Sample

A sample population of 113 patient was included in our study. As these cases were found having malaria in our laboratory.

Observation and analysis

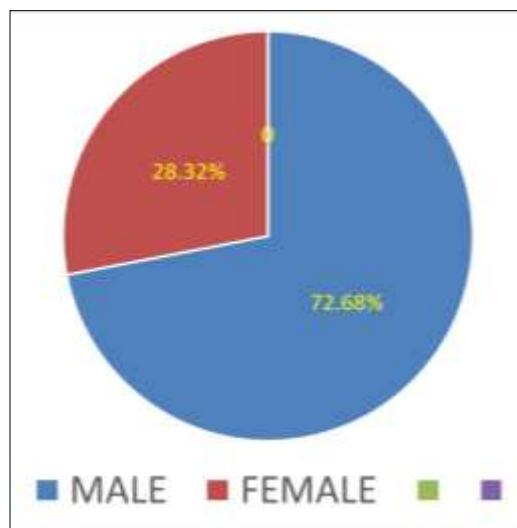


Fig 1: Gender wise distribution of malaria cases

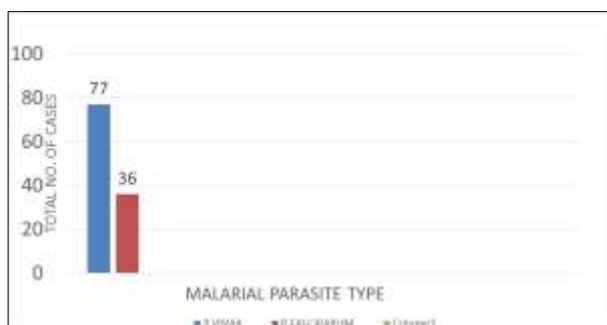


Fig 2: P. Vivax and P. Falciparum Cases

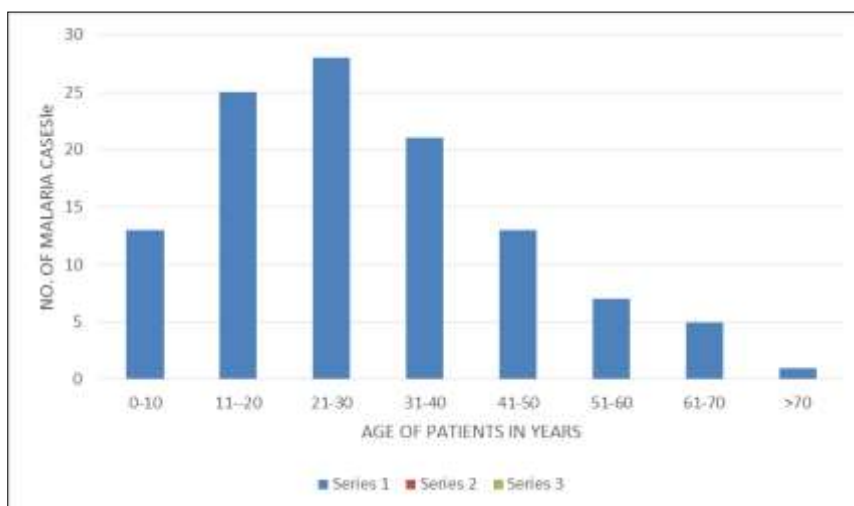


Fig 3: Age Wise Distribution of Malaria Cases

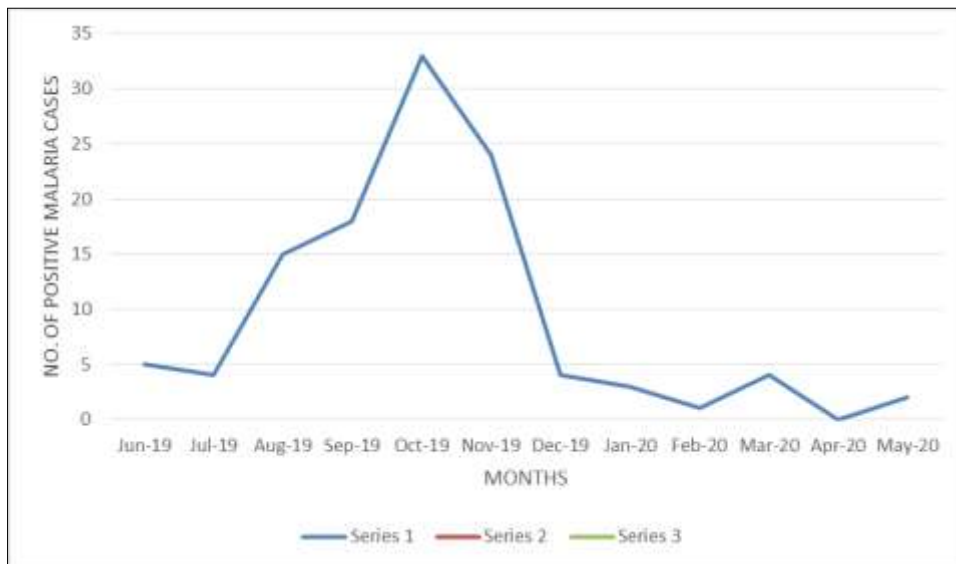


Fig 4: Month wise distribution of malaria

Result

A sample population of 113 malaria positive patient were included in our study. The majority of patient were males (81=71.68%) while 32 patients were females (28.31%). 21-

30 years age group was affected maximum, and above 70 years were minimum reported cases. Out of the total 113 malaria positive cases, 77 cases were of *Plasmodium vivax* and 36 cases were of *Plasmodium falciparum* infestation.

Discussion

Table 1: Comparative Study of Different Malaria Cases

Study	<i>P.Vivax</i>	<i>P.Falciparum</i>	Mixed Infection
Paltial Palat <i>et al.</i> Rising Incidence of Malaria in Ahmedabad (2013) [7]	73.8%	26.2%	0%
Epidemiological study of malaria cases in North East region of India (2011-2014) [9]	84.44%	10.56%	5%
Retrospective study of malaria cases attending at tertiary care level hospital in Rajkot city, Gujarat (2011-2013) [10]	61.4%	38.56%	0%
Prevalence of Malaria in a tertiary care hospital in Navi Mumbai, India (2015) [11]	54.76%	17.80%	27.44%
Manifestation of Malaria in Mangalore, southern India (2018) [8]	69.6%	9.0%	21.3%
Study of Malaria cases in a tertiary care hospital at Rajkot (2018-2019) [12]	88.57%	11.43%	0%
Present study	68.1%	31.9%	0%

In our study and the other studies in different region of India show higher number of *P.Vivax* positive cases compare to *P.Falciparum*. In study done at Rajkot [12] and in our study there was pure *P.Vivax* or *p.falciparum* infection with no mixed infection which is comparable to data from North East India while study from Navi Mumbai [11] as well as Mangalore [8] show high rate of mixed infection in addition to routine malarial infection.

Idris *et al.* [13] from Pakistan reported prevalence of 72.47% for *Plasmodium vivax*, 24.1% *Plasmodium falciparum* and

3.44% mixed species, which is similar to our findings. Igbeneghu *et al.* [14] from Nigeria reported much higher prevalence of *Plasmodium falciparum* 93.3%, Abdallah *et al.* [3] from Sudan reported *Plasmodium falciparum* 81.3% which explains high mortality in these areas, as *Plasmodium falciparum* infection is associated with many complications. The difference in prevalence of *Plasmodium vivax* and *Plasmodium falciparum* in different areas can be due to presence of endemicity of particular type and higher relapses in *vivax* type.

Table 2: Comparative study of Gender Wise Distribution of Malaria Cases

Gender	Paltial Palat <i>et al.</i> Rising Incidence of Malaria in Ahmedabad (2013) [7]	Prevalence of Malaria in a tertiary care hospital in Navi Mumbai, India (2015) [11]	Manifestation of Malaria in Mangalore, southern India (2018) [8]	Study of Malaria cases in a tertiary care hospital at Rajkot (2018-2019) [12]	Present Study (June 2019-May 2020)
Male	58.14%	64%	93%	81%	71.68%
Female	41.86%	36%	7%	19%	28.32%

In all the studies shown above has male preponderance

Maximum number of cases of malaria occurred in the age group 21-30 years (24.8%), followed by age group 11-20 years (22.1%). Similar findings have been noticed in the study carried out at Navi Mumbai, India where the age group affected the most was 21-30 years (31.52%) [11]. Study taken place at Rajkot in 2018-2019, the age group

affected was 21-40 years (50%) [12]. The reason of higher prevalence in this age group could be due to movement in wider areas possibly endemic, more chances of exposure to mosquito bites and most of carefree behavior.

Conclusion

In the present study incidence of malaria was higher in post

monsoon phase i.e. in the months of October and November though it has started rising during monsoon only i.e. in September month, in comparison to other seasons. But throughout the year incidence of malaria was observed. *P. vivax* malaria was more commonly observed in our study with peak incidence in month of October while incidence of *P. Falciparum* was observed increased after monsoon. Prevalence of malarial cases were more in months of rains and winter which corresponds to period of mosquito breeding and tendency of people to stay indoors. In the month of December, January and February the cases were decreased due to winter season and after that because of COVID 19 Pandemic and Lockdown throughout nation, probably the cases recorded in the month of March and April were 01 and 00 respectively. These findings will be helpful for various National programs for prevention and control of Malaria.

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