

A Comparative Analytical Study of Malaria Fever Cases At A Tertiary Health Care Centre Of Northern-Western Region of Ahmedabad City, Gujarat.

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Abstract: Background: Malaria, the term itself implies mal-bad aria-air. According to the World Health Organization (WHO), Southeast Asia contributed to only 2.5 million cases to the global burden of malaria¹. Of this, India alone contributed to 76% of the total cases¹. Aims And Objectives: The aims and objectives of our study are to serve as indirect help in survey, the distribution of malaria cases, to know the spectrum of rise and fall of malaria from 2009 to 2017 and to increase awareness about seasonal variations and changing epidemiology of malaria. Methods: We have done a nine year, retrospective, cross-sectional hospital based study of fever clinic of tertiary center of Ahmedabad from January, 2009 to December, 2017. 3,35,529 blood samples were evaluated. RDT and microscopic examination of peripheral smears was done. We have compared our data with center of districts like Mehsana, Surat, Himmatnagar, Rajkot. Results: We had collected 3,35,529 samples. 7,155 were microscopically positive. So percentage of positive cases is 2.1% and 5,452(76.1%) were P.vivax, and 1,703(23.9%) were of P. falciparum, ratio of P.vivax : P.falciparum was 3.2. Month wise analysis shows a seasonal peak being July to September. Conclusion: From our study, we see that there has been a rise and fall of malaria from 2009 to 2017, bivalent RDTs and microscopy are needed to quickly identify outbreaks and improve surveillance with the aim of diagnosing and treating more cases. [R Mehta, Natl J Integr Res Med, 2018; 9(4):44-48]

Key Words: P.vivax and P.falciparum, Nine year malaria cases study, RDTs with peripheral smears

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Introduction: Malaria, the term itself implies mal-bad aria-air. According to the World Health Organization (WHO), Southeast Asia contributed to only 2.5 million cases to the global burden of malaria¹. Of this, India alone contributed to 76% of the total cases¹. In 2014, there were 2.14 million cases of P.vivax globally, out of which 18% occurred in India². A Research by Lancet commentary found that in the previous 10 years some 80 papers had reported trends in malaria incidence (Increased in 15%, not changed in 14% and decreased in 71%)³

The Global Malaria Action plan aims at 1) providing universal coverage (prevention plus case management) by 2010; 2) reducing the malaria burden and deaths by 50% in 2010, 75% in 2015, 3) eliminating malaria in 8-10 countries by 2015; and 4) eradicating malaria in the long term.³

National Vector-borne disease control programme (NVBDCP)² was launched in year 2003-04 to control major vector borne diseases like malaria, filaria, kala-azar, Japanese Encephalitis, Dengue/Dengue Hemorrhagic fevers and Chikungunya. Its objective on account of malaria was to reduce the mortality by half by various control measures such as

- Global burden of diseases programme- launched by WHO enumerates the health consequences of malaria infection. Disease burden is estimated by conducting prospective 'active' case detection studies of malaria morbidity, disability and mortality in populations living under different transmission intensity risks.⁴
- Global roll back malaria (RBM) aims at halving burden of malaria within next 6 years.⁴
- The only approved vaccine for malaria is RTS,S. It has a low efficacy of 26-50% only.

The World Health Organization estimates 300-500 million malaria cases annually, with 90% of the burden being in Africa. In addition, the estimated annual mortality attributed to malaria ranges from 700,000 to 2.7 million globally and > 75% of them are African children and expectant mothers.⁵ Malaria imposes great socio-economic burden on humanity, and with six other diseases (diarrhea, HIV/AIDS, tuberculosis, measles, hepatitis B, and pneumonia), accounts for 85% of global infectious disease burden⁶. Increased prevention and control measures have led to a 29% reduction in malaria mortality rates globally since 2010.⁷

Official figures for malaria in India in 2015 available at NVBDCP, indicate 0.7-1.6 million confirmed cases and

400-1,000 deaths annually.⁸ Ten states account for around 89% of P.vivax malaria with 64% cases arising in 5 states: Jharkhand, Madhya Pradesh, Orissa, Uttar Pradesh, and Gujarat. In India, malaria is contributed the most by Orissa state (Source NVBDCP,India).²

The annual parasite index(number of confirmed malaria cases per 1,000 population) has constantly declined from 2.12 per 1,000 to 0.89 in 2014.²

- GUJARAT² has the third highest P.vivax malaria burden in the country, accounting for 9% of the national total. In normal years, the P.vivax/P.falciparum proportion in Gujarat is about 80:20. However the P.falciparum proportion increased from 18% to 30% during two major malarial outbreaks in 2004 and 2011. The highest number of deaths was recorded in 2011 i.e.127 deaths, with 17.9 % of these being P.vivax cases.²
- A study in Ahmedabad found that, although malaria was found to be spatially heterogenous within the city, it was temporarily stable. Thus, data from previous years could be used to predict malaria burden and indicate where targeted control measures should be implemented.²

Aims And Objectives:

- The aims and objectives of our study are :
- Indirect help in survey of profile of malaria in northern-western region of Ahmedabad city
- To know the spectrum of rise and fall of malaria from 2009 to 2017.
- To know the effectiveness of control measures and health programmes initiated by the government.
- To reduce the mortality and morbidity.
- To increase awareness about seasonal variations and changing epidemiology of malaria .

Methods:

Study Design: We have done a nine year, retrospective, cross-sectional hospital based study of fever cases at a tertiary care hospital of northern western region of Ahmedabad city, Gujarat, India. This study was done from January 2009 to December,2017 with consent.

Inclusion Criteria: Blood samples of patients were collected in EDTA vacutainer and evaluated for malarial parasite using two methods: Rapid diagnostic test (RDTs) and peripheral smear. Rapid diagnostic

test(RDT's) was done simultaneously with peripheral smears.⁹ This test is done using kits that are lateral flow immunochromatographic antigen detection tests which rely on the capture of dilabelled antibodies to produce a visible band on a strip of nitrocellulose. The dye labelled antibody first binds to parasite antigen and the resultant complex is captured on the strip by a band of bound antibodies forming a visible line.¹⁰

Field and leishman stained thin and thick peripheral smears^{11,12} were made and microscopically evaluated by two experts . So the sensitivity and specificity of our test is 100%.

We had collected 3,35,529 samples of fever clinic(Both OPD and Indoor) including paediatric unit .

In our study, we have included cases of mixed infection as P.falciparum infections. We have included in our study a comparison of prevalence of malaria at our hospital with prevalence in the center of other districts of Gujarat like Surat, Rajkot, Mehsana, Himmatnagar to study the changing trends of malaria in various parts of Gujarat .

Exclusion Criteria: We have excluded gametocytic phase of P.falciparum ,Grading of malaria, relapse cases, morbidity and mortality due to malaria infection in our study.

Ethical Clearance: Ethical clearance was obtained from Higher Authority of Smt SCL Hospital, Ahmedabad.

Results:

We had collected total 3,35,529 samples in our 9 year study from January, 2009 to December, 2017. Out of these, 7,155 were found to be both RDT and microscopically positive. So the total percentage of positive cases in our area is 2.1% of the total cases.

Out of 7,155 positive cases 5,452(76.1%) were found to be positive for plasmodium vivax , and the remaining 1,703(23.9%) were positive for plasmodium falciparum. So the prevalence of P.vivax was 3.2 times more than that of P.falciparum.

Malaria is a seasonal disease . Malaria cases start increasing gradually from may to september ,peak season being july to september ,after which it tends to fall gradually Good rainfall, relative humidity of 60%

and temperature between 20 and 30 degree celsius favour the spread of malaria.

Table: 1

Year	Total Samples	Total Positive	P.Vivax (%)	P.Falciparum (%)
2009	16386	212 (1.2%)	155 (73.1%)	57 (26.9%)
2010	20579	498 (2.4%)	204 (40.9%)	294 (59.1%)
2011	22090	764 (3.4%)	534 (69.8%)	230 (30.2%)
2012	25844	758 (2.9%)	581 (76.6%)	177 (23.4%)
2013	26309	782 (2.9%)	599 (76.5%)	183 (23.5%)
2014	43754	700 (1.5%)	533 (76.1%)	167 (23.9%)
2015	53976	1046 (1.9%)	787 (75.2%)	259 (24.8%)

2016	73069	1227 (1.6%)	1014 (82.6%)	213 (17.4%)
2017	53522	1168 (2.1%)	1045 (89.4%)	123 (10.6%)
Total	3,35,529	7,155 (2.1%)	5452 (76.1%)	1703 (23.9%)

- In our study, maximum number of cases were seen in 2011, which was 3.4% and minimum number of cases were seen in 2009, which was 1.2%
- The maximum number of P.vivax cases were seen in 2017 which was 89.4% and the minimum number of cases were seen in 2010 which was 40.9%
- The maximum number of P.Falciparum cases were seen in 2010 which was 59.1% and the minimum number of cases were seen in 2017 which was 10.6%

There is rise of malaria from 2009 to 2011 and a gradual fall from 2011 to 2017

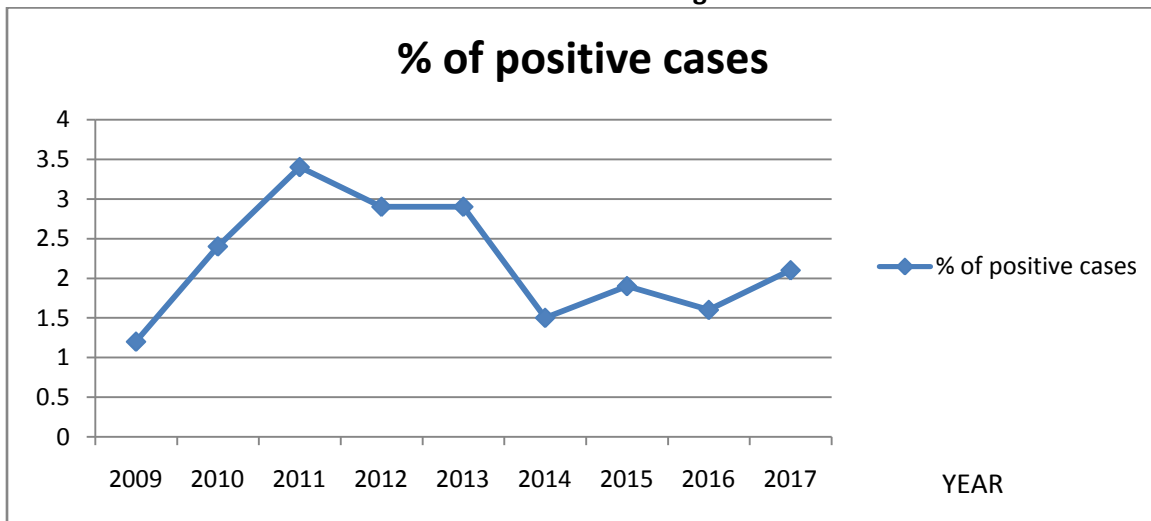


Table II: Month Wise Distribution Of Malaria Cases

Total +ve cases	2009 (%)	2010 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)
January	1(0.4)	0(0)	15(1.9)	12(1.5)	17(2.1)	3(0.4)	12(1.1)	2(0.1)	17(1.4)
February	1(0.4)	0(0)	4(0.9)	10(1.3)	11(1.4)	5(0.7)	4(0.3)	5(0.4)	25(2.6)
March	8(3.7)	1(0.2)	6(0.7)	20(2.6)	29(3.7)	33(4.7)	12(1.1)	19(1.5)	40(3.4)
April	23(10.8)	11(2.4)	16(2.4)	75(9.9)	41(5.2)	65(9.2)	11(1.0)	39(3.1)	89(7.6)
May	13(6.3)	11(2.4)	54(7.0)	109(14.3)	84(10.7)	69(9.8)	46(4.3)	82(6.6)	132(11.3)
June	16(7.5)	8(1.6)	54(7.0)	95(12.5)	58(7.8)	59(8.8)	31(2.9)	53(4.3)	134(11.4)
July	7(3.3)	13(2.6)	44(5.7)	93(12.2)	124(15.9)	30(4.3)	157(15.9)	61(4.9)	98(8.3)
August	53(25)	64(12.8)	178(23.2)	56(7.7)	149(19.0)	109(15.5)	284(27.2)	331(26.9)	282(24.1)
September	48(22.6)	119(23.8)	192(25.1)	144(19.0)	107(13.6)	149(21.2)	283(27.0)	362(29.8)	171(14.6)
October	22(10.6)	65(13.0)	112(14.6)	85(11.3)	80(10.2)	56(8.0)	139(13.2)	128(10.7)	106(9.0)
November	10(4.7)	100(20.0)	57(7.4)	34(4.5)	66(8.4)	77(11)	33(3.1)	131(10.6)	57(4.8)
December	10(4.7)	106(21.2)	32(4.1)	24(3.2)	16(2.0)	45(6.4)	30(2.8)	14(1.1)	17(1.5)

The peak months of occurrence of malaria (July to September) has been calculated by taking only those months in which the percentage of positive cases is more than 25% thus justifying Malaria is seasonal disease

Discussion: The burden of malaria in India is complex because of the highly variable malaria eco-epidemiological profiles, transmission factors, and the presence of multiple Plasmodium species and Anopheles vectors. Gujarat ranks 5th in the total number of malaria cases in the country¹³

In our present study, We have evaluated our study with the studies conducted in tertiary care centres of

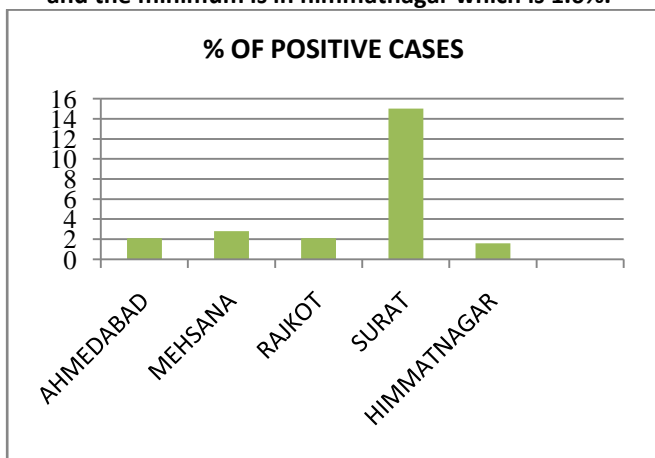
other parts of Gujarat like Mehsana¹⁴, Rajkot¹⁵, Surat¹⁶ and Himmatnagar¹ in the respective years. The total % of positive cases in the same duration have been compared between centres of two districts to show the effect of epidemiological factors and effectiveness of control measures taken in each part of the state. Also, the ratio of P.vivax to P.falciparum has been evaluated and the fall or rise can be depicted.

Table III

	Ahmedabad (Our Study)	Mehsana ¹⁴	Rajkot ¹⁵	Surat ¹⁶	Himmatnagar ¹
Total Positive Cases %	2.1%	2.8 %	2.1%	15.0%	1.6%
Ratio Of PV:PF	3.2	11.8	1.5	1.5	2.3
Peak Months Of Occurence	August-September	August-September	August-October	August-October	July-October

A comparison of study conducted in our hospital with the study conducted in Rajkot from 2011-2013, in Surat in the year 2012, Mehsana in the year 1999-2005 and in Himmatnagar from June-December, 2015.

Figure II: The maximum % of positive cases is seen surat which is 15.0% (most probably due to coastal location) and the minimum is in himmatnagar which is 1.6%.



Summary And Conclusion: Malaria is one of the most deadly and devastating diseases in human history. Disease is of global importance, results in 300-500 million cases yearly and 1.5-2.7 million deaths annually.¹⁷ An attempt to epitomize the decades since 1930 in malaria control¹⁸

Malaria Control	1940
Eradication: attack	1950
Eradication: consolidation	1960
Resurgence	1970
Chaos	1980
Hope	1990

From our study, we see that there has been a rise in malaria from 2009 to 2011 and fall from 2011 to 2017. The peak months of occurrence is more or less from July-September. The maximum number of positive cases of malaria in Gujarat were seen in Surat (15%) mostly due to its coastal location along with other factors. The other cities in comparison had quite a lower percentage of positive cases mostly due to effective control measures initiated by the government i.e. Ahmedabad (2.1%), Rajkot (2.1%), Mehsana (2.8%), Himmatnagar (1.6%).

Environmental changes, the spread of drug resistance, and increased air travel have led to the reemergence of malaria as a serious public health problem.¹⁹ The malaria intervention paradigm is now shifting from malaria control to malaria elimination in many parts of the world. Indeed, malaria eradication was set as an ultimate by WHO²⁰ and Roll-back malaria partnership. We are aiming at near to 0% GRB i.e. global roll back malaria in next 6 years. Early diagnosis and prompt effective treatment is an important step towards it.

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