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Malaria Transmission Trends with Seasonal Climate Forecast in Different PHCS of YSR District, Andhra Pradesh, India

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A B S T R A C T

Malaria remains a major public health hazard in many low and middle income countries. WHO have endorsed the bold vision of world free of malaria and set the target of reducing the global malaria burden by 90% by 2030. In India, the epidemiology of malaria is complex because of wide distribution of anopheline vectors which transmit mainly two plasmodial species namely P. falciparum and P. vivax. Though India is one of the known endemic countries, incidence of malaria is commonly influenced by environmental factors like climate, season, temperature and socioeconomic status. Objectives of the study were to know the prevalence of different malarial species and to know the seasonal trend of malaria. The present study reveals the prevalence of malaria in different PHCs of kadapa district of Andhra Pradesh, 2013 to 2018 Incidence (API),

Introduction

Plasmodium infection continues to cause significant morbidity and mortality for residents and travellers to endemic areas. This protozoan parasite is transmitted through the bite of an Anopheles mosquito and remains an important public health threat. According to the world malaria report there were estimated 219 million cases and 435000 deaths in 2017. Among the nations with 70%of the world's burden of malaria, only India has managed to reduce its disease burden, registering a 24% decrease between 2016 and 2017 according to world malaria report 2018

The climatic conditions in India favour the transmission of malaria in remote, rural areas, urban areas, forests, and hills and 20 per cent of population is at high risk of malaria mainly in north-eastern states, Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, West Bengal and Karnataka. The risk factors leading to complete reconciliation of cause and effect relationships of malaria were identified in India by GIS based studies (Srivastava *et al.*, 1999 & 2003). In India, 90% of *P. falciparum* cases occur in states below the poverty line (Sharma, 2003). Malaria is the most prominent and problematic of all vector borne

communicable diseases of Andhra Pradesh. Three paradigms of malaria are observed in the state i.e. Tribal, Rural and Urban. Many programmes were implemented for the control of malaria. Many are successful with new Control initiatives as well as promising research initiatives. Even though there is no significant progress in reducing global malaria, its prevalence rose in many parts of the tropics. The Increase in drug resistance of parasites, insecticide resistance of its vectors and human travel and migration have contributed to this resurgence.

According to NVBDCP incidence records, in Andhra Pradesh, annual parasite incidence (API) was 2%. Persistent malaria is the characteristic feature in most of the areas and both *Plasmodium vivax* and *P. falciparum* are prevalent in forest areas of Madhya Pradesh (Singh and Khare, 1999).

Hema Joshi (2003) reported the existence of genetic diversity among the field isolates of P. falciparum and *P. vivax* in India. A hospital based study on assessment of knowledge about malaria among patients indicated that the knowledge about malaria is poor in persons living in urban localities reported with fever (Matta *et al.,* 2004).

Control of malaria is also possible by educating the community to take measures for the non-prevalence of disease (Sharma *et al.,* 2000).

Materials and Methods

Study area

The study, was done in the villages of kadapa district which has more PHCs & CHCs with high population and it contain tropical wet and dry climate which is sufficient for mosquitoes to breed and protozoan to live. We selected 74 PHCs and 10 CHCs to study the prevalence of malaria cases for 6 successive years from 2013 to 2018. In this study we selected who were suffering with fever. They have undergone primary examination and their blood samples were collected by central laboratory.

We used microscopic examination for the diagnosis of malaria by preparing thick and thin smears and stained using field stain. On microscopy we examined for detection of malaria parasite, species identification and different forms of malarial parasites.

Study period

The data regarding malaria cases from 2013 to 2018 was collected from the Malaria Department of KADAPA district.

Results and Discussion

The malaria cases were recorded in all the PHCs. In the year 2013, out of 247 cases, 56 were P. falciparum and 191 were *P. vivax* cases. In the year 2014, out of total 407 cases, 87 were P. f. and 320 were P. v. cases. In the year 2015, out of 352 cases, 72 were P. f. and 280 were P. v. cases. In the year 2016, out of 866 cases, 153 were P. f. and 713 were P. v. cases. In the year 2017, out of 521 cases, 47 were P. f. and 474 were P. v. cases. In the year 2018, out of 204 cases, 41 were P. f. and 163 were P. v. Cases. It was also observed that prevalence was more during the months of rainy season (approx. 15% to 17%) and was more in males compared to females (male: female ratio -2: 1)

In the present study, it was observed that the highest percentage with regard to malaria cases was found in 2016 from 2013-2018. Malaria prevalence is more especially with *P. vivax* which is due to lack of awareness and preventive measures because the people belong to rural areas.

A study by Muddaiah *et al.*, demonstrated the highest infection rate of *Plasmodium vivax* i.e. 52.54%, *P. falciparum* of 33.75% and mixed malarial infection rate was 13.69%. In the study of Pakistan by Ali Bin Zubairi S, *et al.*, showed that *P. vivax* and P. falciparum accounted for 83% and 13% of cases respectively.

Another Study by Panchal *et al.*, (2016) concluded that high prevalence of *P. vivax* as compared to *P. falciparum* infection. And also reported by Hadiya *et al.*, study where 61.41% and 38.56% cases were positive for *Plasmodium vivax* and *P. falciparum* respectively and comparable seasonal trends with our study. According to Park textbook of Preventive and Social Medicine, In India, about 70%reported to be due to *P. vivax*, 25-30% due to P. falciparum, 4-8% due to mixed infection and 1% due to P. malaria. We observed 67% of cases are due to *P. vivax* and 33% of total cases are due to P. falciparum, which correlated with Park textbook of preventive and social medicine.

Males are more frequently exposed to the risk of acquiring malaria. Although malaria affects both men and women gender roles and gender dynamics give rise to different vulnerabilities, such as expose palters (Dept of Gender, women and Health, WHO).

Study of Kumar, *et al.*, showed deaths were more common in men than women across all age groups

In my study it was observed that malaria is a seasonal disease, the maximal prevalence is from July to October. Good rainfall, relative humidity of 60% and temperature between 20 and 30°C favour the spread of malaria (Table 1–2 and Fig. 1–3).

Table.1 Shows Malaria prevalence sex wise ratio

Year	Male	%	Female	%	Total
2013	169	68	78	32	247
2014	261	64	146	36	407
2015	196	55	156	45	352
2016	714	82	152	18	866
2017	283	54	238	46	521
2018	118	57	86	42	204

Table.2 Month wise malaria parasite incidence in Kadapa from 2013 to 2018

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	Total
2013	11	20	20	11	9	17	41	15	12	21	41	29	247
2014	13	18	10	34	19	32	38	42	72	67	44	18	407
2015	8	10	9	11	9	44	49	57	54	57	31	13	352
2016	6	12	21	32	34	47	192	180	160	107	43	32	866
2017	7	15	22	15	26	11	77	75	64	114	63	32	521
2018	7	9	21	27	15	23	45	18	9	10	12	8	204
Total	52	84	103	130	112	174	442	387	371	376	234	132	2597

Seasonal variation of malaria from 2013 to 2018

YEAR	SUMMER (Mar-June)	WINTER (July – Oct)	RAINY (Nov – Feb)	Total cases
2013	57	89	101	247
2014	95	219	93	407
2015	73	217	62	352
2016	134	639	93	866
2017	74	330	117	521
2018	86	82	36	204
Total	519	1576	504	2597

Fig.1 Prevalence of different types of plasmodium infection

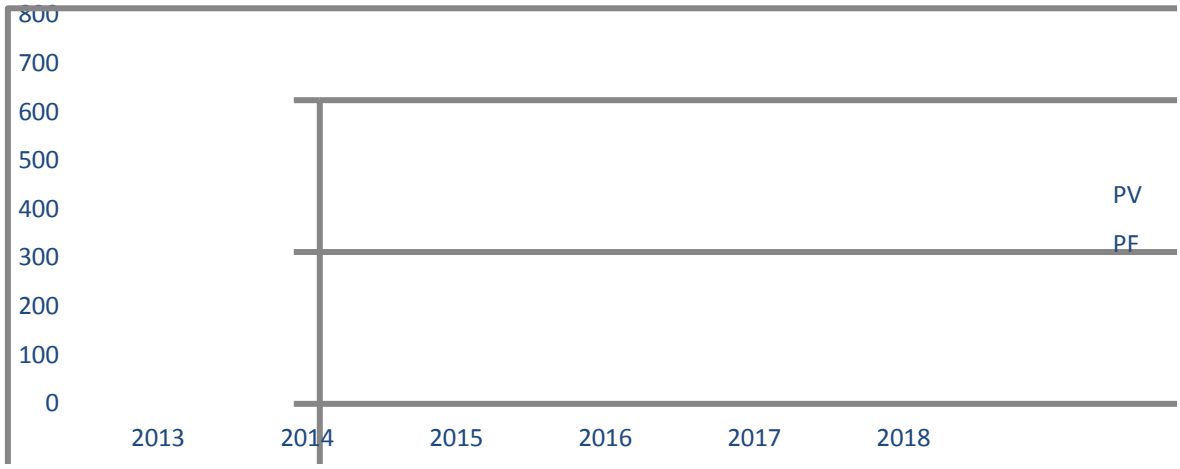


Fig.2 Malaria cases in the focus by sex

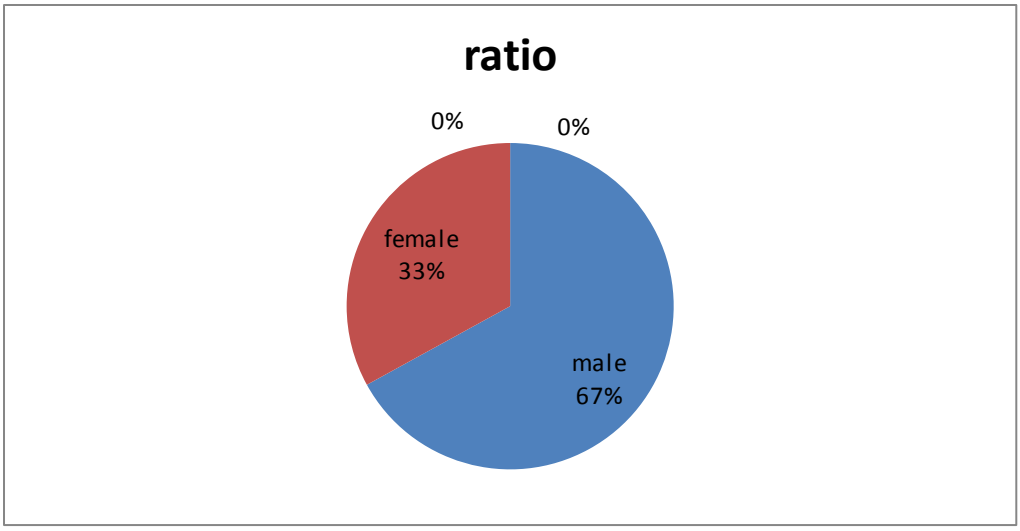
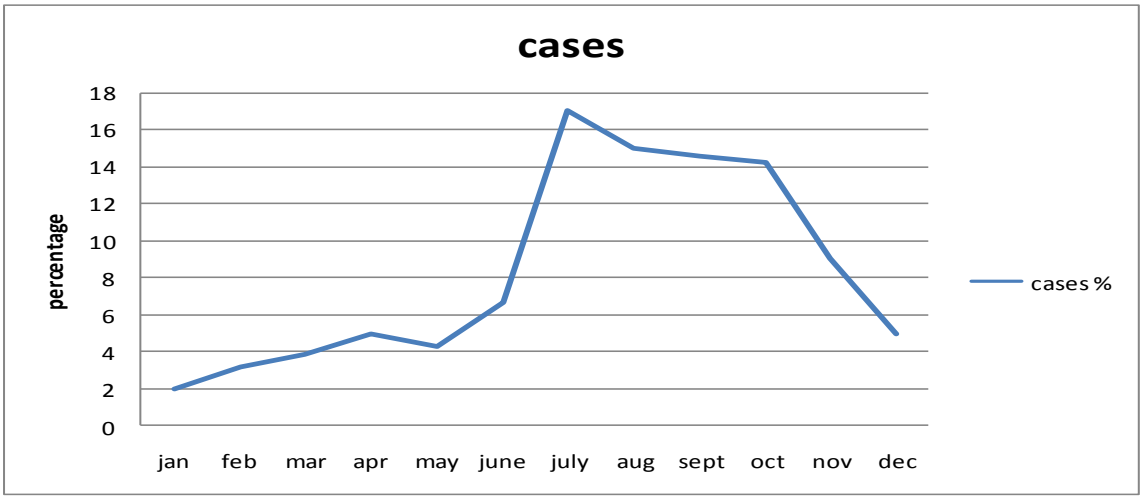


Fig.3 Seasonal variation of malaria



Anjali Singh and Bhagyalaxmi (2010) observed high rate of infection during the monsoon months from July to October and also another study Thomson *et al.,* (2005) and Ayanlade *et al.,* (2010) stated that the seasonality of climate greatly influences the seasonality of malaria transmission

According to Jaydev and Viveka Vardhini, high incidence of malaria cases was reported in august, September, October, November and December 2008 and in January 2009 during the survey period.

Month wise distribution of cases of present study was correlated with study by Prajapati *et al.,*

Vashisht *et al.,* (2009) reported the number of malaria positive cases started increasing from

June and reached peak during September 2001-2006 study.

The department of zoology (2014) study stated that peak transmission was observed during winter season.

From our study, we concluded that there is a high prevalence of *P. vivax* as compare to P. falciparum infection and has also seen more cases in males compared to females and maximum numbers of cases were reported in the month of July to October which concludes that malaria has its peak during the rainy season. There was a substantial reduction in prevalence and incidence rates of both *P. vivax* and P. falciparum thereafter. In order to implement an effective preventive measure, proper surveillance on the incidence and prevalence of malaria is required.

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