Trans. Inst. Indian Geographers
Vol. 33, No. 2, 2011

Epidemiology of Malaria in Jalgaon District, Maharashtra, India (2004-2009)

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Abstract

Malaria is the most deadly vector-transmitted human disease in the developing countries. It is a serious, acute and chronic infectious disease. This paper attempts to understand the incidence and patterns of its distribution of malaria in high risk district : Jalgaon District in Maharashtra. Data were collected *about malaria cases, Plasmodium falciparum malaria and other background information Primary Health Centers of 15 tahasils of Jalgaon District, which forms study area. Results revealed that majority of positive blood slides were Plasmodium falciparum. The incidences of malaria positive cases were unevenly distributed in the district. Despite many control interventions, malaria transmission was perennial and persistent in most parts of the district mostly transmitted by female Anopheles. Reasons for this variations and causes have been identified and discussed. Preventive measures for control of malaria have been suggested.*

Introduction

Malaria is the most deadly vector-transmitted human disease in the developing countries (WHO, 2005). It is caused by protozoan called *Plasmodia* and is transmitted by the bite of the female *Anopheles* mosquito. Victims of malaria suffer attacks of chills and fewer. There are four types of malaria, each of which is caused by a different species of *Plasmodium*. The four protozoans that cause malaria are – *P.falciparum, P.Vivax, P.Ovale and P.Malariae* (Park, 2007). A malaria attack lasts two or more hours and is accompanied by headache, muscular pain and nausea. The life cycle of the Plasmodium protozoan includes three basic stages. The first stage begins when the mosquito bites someone who has malaria. The second stage occurs after the mosquito bites another person. Plasmodium from the mosquito's saliva enters the person's blood. They travel to the liver, where they multiply and form clumps of parasites. After several days, cell burst and releasing a new form of Plasmodium. During the third stage, each Plasmodium invades a liver cell and multiplies. Sometimes Plasmodium develops further in human blood and are able to reproduce in a mosquito's body (Lal Sunder 2007).

Malaria is a complex disease and various factors influenced by human activities and natural calamity like excessive rainfall, flood, drought and other diseases have great bearing on mosquitogenic conditions leading to increase potential for malaria transmission (Briet and Oliver, 2008). Like any other disease, natural transmission of malaria depends on the presence of and relationship between the three basic epidemiological factors: the agent, the host and the environment (Gupta and Mahajan, 2005). This study is focused on high risk district to understand the Epidemiology of Malaria.

Scenario in India

Malaria is the most common infectious disease in India and one of the important public health problems too (Akhtar and Dutt, 2010). As a result of intervention of National Malaria Control Programme (NMCP) between 1953-1958 and National Malaria Eradication Programme (NMEP-1958 onwards) burden was reduced to 0.1 million cases per year and 1965 and no deaths due to malaria (MAR, 1993). During 1976, India reported 6.47 million cases of malaria. With the Modified Plan of Operation (MPO) in 1977, the incidence of malaria declined to 2.18 million cases per year (1984). Since then annual malaria incidence has been contained between 2-3 million per year. Below Table-1 shows the continuous decline of total and Pf malaria cases, deaths and API in India from 1996 to 2005.

Table-1 Malaria Situation in India

Year	Cases (in million)		Deaths	API
	Total	*Pf*		
1996	3.04	1.18	1010	3.48
2000	2.03	1.05	932	2.09
2001	2.09	1.01	1005	2.06
2002	2.84	0.89	973	1.80
2003	1.64	0.70	943	1.62
2004	1.90	0.89	949	-
2005	1.80	0.79	940	-

Source: Textbook of Preventive and social Medicine by K. Parks

Study Area

Jalgaon District, (one of the important districts in *Khandesh*) lies in the northern part of Maharashtra (Fig.1). It consists of 15 Tahsils, 77 Primary Health Centers. The district has 20^0 22' N. to 21^0 23' N. Latitude and 74^0 55' E. to 76^0 28' E. Longitudinal extension. The mean sea level (MSL) of the district is 175 m. to 325 m. The district population according to the 2001 census is 36 79 936. The climate of the district is hot and dry. In winter season the minimum average annual temperature is 10^0 C. and in summer season maximum average temperature is 42.5^0 C. Sometimes it goes more than 45^0 C. The average annual rainfall is 74 cm. Jalgaon city itself showed 12.62 API in 1978, declined to 3.68 in 1993 and varies during current period. Estimation of true incidence of malaria and mortality is necessary for a number of reasons, such as planning prevention/control operation, resource allocation, and upgrading medical facilities in hospitals to treat serve and complicated cases.

Objectives

Keeping above concepts in view an attempt is made to understand the incidence and patterns of its distribution in malaria prone district in India. The specific objectives are:

1) To know the incidence and distribution of malaria and analyze the geographical distribution, trends of P.*falciparum* malaria in study area.
2) To identify the positive cases of malaria and its tahsil wise distribution.
3) To suggest measures for control of the outbreak of malaria in study area.

Data Methodology

This study is mostly based on the secondary data. Some observations of experts who are working in the field of Public Health were also taking into consideration. The secondary data were collected from the Malaria records available at the District Malaria Office,

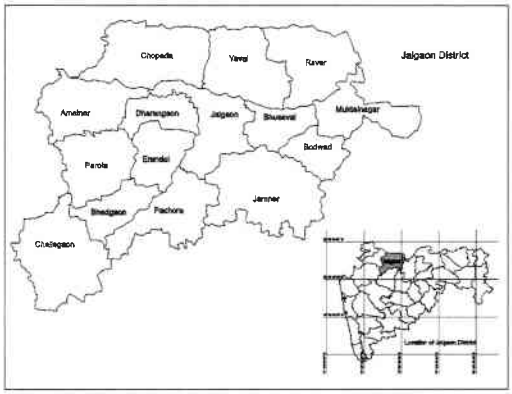

Fig.1: Location Map of Jalgaon District

Jalgaon (Table-2). Information about malaria cases, P.*falciparum* malaria and other background information has been collected for the years (2004-2009), from 77 Primary Health Centers (PHCs) of 15 tahasils of Jalgaon District. Most commonly parameters for endimicity of malaria are: The Annual Blood Examination Rate (ABER). The Annual Parasite Incidence (API), The P.falciparum Percentage (Pf %), and The Slide Positivity Rate (SPR) and in this study all these measures were used to understand Epidemiology of Malaria in Jalgaon District.-

Results

I) The Annual Blood Examination Rate (ABER)

ABER is expressed in percentage of people suffering from fever and from whom blood smears are collected. It should be minimum of 10% per year population, because on this depends the statistical validity of parasite incidence. ABER is calculated as follows:

The ABER depends upon the fever rate in the community and it varies from month to month and from area to area. It is an index of operational efficiency..

ABER was found (Table 2) to be above 10 in thirteen tahasils, during the years 2004 to 2009. Only in Bhusawal during 2007, 2008 and 2009 and Jalgaon tahsil during 2004, 2005, 2007, 2008 and 2009 it was observed ABER was below 10. In the year 2004 to 2009 the ABER was above 20 in Muktainagar and in the same tahsil it was recorded highest (27.17) in year 2006. Year wise ABER of the Jalgaon District were – in 2004 it was 15.12, in 2005 it was 15.04, and 14.15, 13.40, 13.44 and 13.84 for the years 2006 to 2009 respectively.

II) The Annual Parasite Incidence (API)

The most common index used at present is API. It is defined as the number of confirm malaria cases per thousand persons during the year in the area. The API is an important indicator to measure the incidence of malaria in the area. Further decisions of selective spray were based on API. Areas with API more than 2 were covered by insecticidal spray. It is however important to note that accuracy and reliability of API depends upon annual collection of blood smears which should not be less than 10% of the population under surveillance (Lekweiry and Khadiijetou, 2009).

API was found below 1 (Table 2) in all tahsils for the years 2004 to 2009. In some cases it was recorded above 1, viz: Chopda (1.69), Erandol (1.07), Muktainagar (1.53) and Parola (1.74) during 2004 and in Muktainagar (1.14) for the year 2005, Parola (1.19) in 2007. In 2007 API in Muktainagar were recorded highest in the district i.e. 3.89 and also year wise found high among all tahsils.

III) The P.falciparum Percentage (Pf %)

P.falciparum percentage is calculated as under: P.falciparum detects proportion of Pf cases out of total cases of malaria. It gives disease load due to killer malaria i.e. Pf malaria. If the proportion of Pf is unduly high (more than 30% and slide positivity is more than 3% in previous year(s) the area in under considered to high risk area.

Total malaria positive cases were recorded highest in Muktainagar, Jalgaon and Parola tahsil in every year because of local "labour in-migration", while it was recorded lowest in Bodwad, Pachora and Yaval tahsil. In 2007 it was highest total malaria positive cases in Muktainagar.

The P. falciparum cases were recorded high in some tahasils (Table 2) e.g. in year 2004 Chopda-205(48.12%), Jalgaon-140(66.35%), Parola-132(42.72%) and in 2007 Muktainagar 265(49.91%). Except above Pf% were found low in all tahsils. In 2006 P.falciparum cases nil in Dharangaon tahsil. In year 2009 P.falciparum percentage were recorded highest in Bhusawal tahsil (87.50%). Year wise P.falciparum percentage of Jalgaon district were found as follows: 2004-45.71%, 2005-29.50%, 2006-39.62%, 2007-41.31%, 2008-23.68% and 2009-29.87%. As far P.falciparum percentage were concern Amalner, Bhadgaon, Bhusawal, Chalisgaon, Chopda and Muktainagar tahsils comes under high-risk areas.

IV) The Slide Positivity Rate (SPR)

The SPR is useful parameter for provide information on the trend of malaria transmission. It is calculated as under:

SPR give malaria disease load/burden in the area year wise. It is a good indicator of malaria endemicity (Singh, 2009). Doubling of SPR during the last three years, provide the SPR in second and third year reaches 4% or more indicates that the area is 'High-risk Area' for malaria. Abnormal rise of SPR indicates that adequate or failed conversely low SPR indicates that control measures are effective.

SPR were recorded below 1 (Table 2 and Figures in the Appendix-1) in all tahsils in year 2004 to 2009. Only in 2004 it was 1.07 in Parola and in 2007 it was 1.43 in Muktainagar. The data shows that the trend of malaria transmission under control.

7) Suggestive Measures for Controlling the Outbreaks of Malaria

Malaria can be prevented by controlling the mosquitoes that spread the parasite and by avoiding mosquito bites. Effective

Table 3: Epidemiology of Malaria in Jalgoan District (2004-2009)

Year	Population	No of BS Exam	Total + ve Cases	Pf	Pf%	ABER	API	SPR	Death
2004	3811714	576506	2367	1082	45.71	15.12	0.62	0.41	0
2005	3853738	579615	983	290	29.50	15.04	0.26	0.17	0
2006	3911075	569363	715	279	39.02	14.56	0.18	0.13	0
2007	3853740	516334	2077	858	41.31	13.40	0.54	0.40	4
2008	3942388	529786	777	184	23.68	13.44	0.20	0.15	3
2009	3948980	546391	754	226	29.97	13.84	0.19	0.14	0

Source: Malaria District Office, Jalgaon

treatment with antimalarial drugs also helps to decrease malaria transmission. Following are some suggestive measures for controlling the outbreaks of Malaria:

- Early case Detection and Prompt Treatment (EDPT) is the main strategy of malaria control-radical treatment is necessary for all the cases of malaria to prevent cases of malaria to prevent transmission of malaria.
- Choloroquine is the main anti-malaria drug for uncomplicated malaria.
- Drug Distribution Centers (DDCs) and Fever Treatment Depots (FTDs) have been established in the 'High-risk Areas.'
- Use of indoor residual spray.
- Malathion fogging during outbreaks.
- Use of Larviorous fish in tanks, wells etc.
- Use of biocides.
- Use of mosquito repellent creams, liquids, coil, mats etc.
- Wearing clothes that cover maximum surface area of the body.
- Use of bed nets treated with insecticide.
- Sensitizing and involving the community for detection of Anopheles breeding places and their elimination.
- Involvement to NGOs for programme strategies.
- Filling of the breeding places.
- Proper covering of stored water.
- Monthly Computerized Management Information System (CMIS).
- Regularly field visits by State National Programme Officers, Malaria Research Centers and other ICMR Institutes.
- Feed back to states on field observations for correction actions.

Conclusions

The majority of positive blood slides were *Plasmodium falciparum*. The incidences of malaria positive cases were unevenly distributed in the district. Despite many control interventions, malaria transmission is perennial and persistent in most parts of the district mostly transmitted by female *Anopheles*. In Jalgaon district, total deaths due to malaria were found to be 4 during 2007 (Muktainagar-3 and Raver-1), 3 in 2008 (1 each in Chopda, Erandol and Jamner). In the year 2004 to 2006 and 2009 there were no malaria deaths observed. There was a high incidence of malaria was observed during 2007 and declined in later period. Reasons for this variations and causes have been identified as: late surveillance, late and incomplete treatment. This study demonstrates that, *Plasmodium falciparum* species responsible for recurrent malaria in the district. The systematic use of microscopy-based diagnosis and/ or rapid diagnostic tests should diagnostic tests should be considered to appropriately manage malaria and non-malaria cases and case detection machinery is fully supervised with full efficiency to control malaria in Jalgaon District.

Acknowledgements

I am indebted to Dr. C. P. Prakasam, Former Professor, International Institute of Population Studies, Mumbai for his encouragement and valuable inputs. I would also like to thank to Dr. M. T. Salwe, District Malaria Officer, Jalgaon for providing valuable data, records and suggestions.

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