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Epidemiological trend of malaria from 2007 TO 2012 in a tertiary care centre of Kerala- a cross sectional study

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Abstract
India represents the highest burden of malaria in South East Asia Region. But Kerala is a low endemic area. As there were an increased number of cases recently, a cross sectional study was done to evaluate the epidemiological trend of malaria reported from 2007 to 2012 in a tertiary care centre of Kerala. Secondary data available in the Department of Community Medicine, Government Medical College Thrissur, analysed using SPSS 17. A total of 204 cases were reported during the period. Majority was males (94.1%) and in the productive age group. 26 (12.7%) cases were indigenous over these years. All others were imported. Relapse was present in 14.7% patients. Regarding the parasites, 64.9% (n=133) were of Plasmodium vivax type followed mixed and Plasmodium falciparum. As there are favorable climatic conditions to the transmission of malaria most of the time, the re-emergence of malaria should be controlled to prevent massive epidemics.

Keywords: Endemic, Indigenous, Imported, Relapse

1. Introduction
Malaria is an endemic disease in India. India has the highest malaria burden in South East Asia Region with an estimated 24 million cases per year as per world malaria report 2012. Malaria continues to be a heavy social and public health problem. The mortality in malaria is due to plasmodium falciparum. The mortality and morbidity in falciparum malaria is due to its protean manifestations, multiorgan involvement, and delay in diagnosis and failure of administration of treatment promptly and adequately. The emergence of drug resistance adds to the seriousness of the problem. India is a tropical country having distinct climatic zones, rich fauna and being the second populous country has faced many of the epidemics which severely affected the public health. Malaria being one such disease, its transmission varies with geographic areas, as the diversity and distribution of Anopheline and Plasmodium species vary. Kerala a state situated in southern tip of India in which health indicators are comparable with Developed countries. Malaria had been controlled in Kerala from 1965. Imported malaria used to occur even thereafter. This may be attributed to the travel to the endemic areas. It has been noted that indigenous malaria showed signs of resurgence from 1969 onwards. Recently migrant workers from northern and north eastern states are coming to Kerala in search of job opportunities. Recently an increasing trend of both imported and indigenous malaria cases were observed. It is time evaluate the trend of the disease and epidemiological factors to prevent and control the disease.

2. Objectives
To study the epidemiological trend of malaria cases reported from 2007 to 2012 in Govt Medical College, Thrissur, of Central Kerala

3. Materials and methods:
This is a record based cross sectional study conducted at the Department of Community Medicine, Govt. Medical College, Thrissur. All the cases diagnosed as malaria, were referred to the drug distribution centre of the College which is functioning in the Department of Community Medicine. The treatments were given from this center. Details of the patients were collected as per the first information report (here in after referred as FIR) in the Department.

One copy of this FIR is kept in the Department and a copy is sent to the District health Authority. This is the usual procedure. All the copies of the FIR for six year period from the year 2007 to 2012 were collected with the permission of the Head of the Department and included in the study. The study was done from November 2012 to January 2013. A total of 204 malaria cases were reported from 2007 to 2012 in this college. The variables of the study included were age, gender, residence, month, parasitological and epidemiological type, duration of treatment etc. This data were collected, coded, entered in Microsoft Excel and analyzed using Statistical Package for Social Science (SPSS 16).

4. Results

A total of 204 persons were reported as having malaria during the 6 year period 2007 to 2012. Among the group 192 (94.1%) were males and 12 (5.9%) were females. The mean age was 28.6 + 13.4 years (Range – 2 months to 61 years). Majority belonged to the productive age group i.e. between 20- 40 years (55.1%). Most of the cases were from Thrissur followed by the neighbouring districts of Thrissur as the study was conducted in the tertiary centre of Thrissur District Even though Kerala is low endemic area for malaria 26 (12.7%) cases were indigenous over these 6 years. All other cases were imported. Relapse was present in 14.7% (n=30) patients. Regarding the parasitological types 64.9% (n=133) were of Plasmodium vivax type followed by 18% (n=37) of mixed type and 14.1% (n=29) of Plasmodium falciparum type.

4.1 Epidemiological Trend

Maximum number of malaria cases were reported in 2012(n=73). There was a decreasing trend in the number of cases from 2007 to 2010 but it was seen that there was a sudden increase in the number of cases in 2011. Since then the cases are increasing over the years, this was shown in the figure no: 1.

a) **Epidemiological type:** Around 80% the cases were imported from different states all over India especially northern and southern states. Indigenous cases were reported in all the years except 2009. The indigenous cases were reported from Thrissur (61.5%) and Palakkad (38.5%) Districts. Palakkad is border District between Kerala and Tamilnadu which is neighbor to Thrissur
b) **Parasitological trend:** We have studied the proportion of each parasite over the years and the observed pattern is described below.

Plasmodium vivax: This was the most observed type of parasite in these years in our hospital. Maximum proportion was seen in the year 2008 where 96% of the cases were due to Plasmodium vivax. Among the patients who had relapse 76.6% were showed Plasmodium vivax followed by 13.3% of mixed type. This may be due to the incomplete treatment or the failure of detection of both types of parasite in previous infections. This has to be considered as serious issue in order to prevent relapse or drug resistance. The drug compliance is also an important concern in malaria control.

Plasmodium falciparum: Maximum reported proportion of falciparum was 26% in 2007. No malaria cases with falciparum alone reported in 2008 and 2009. There was a sudden increase in 2012(16.4%). Two patients reported previous history of malaria. This may be of mixed type or case of recurrence.

Mixed: When we compare with percentage of falciparum infection, mixed type of infections are more over these six years in this centre. Equal proportion (33.3%) of vivax infection and mixed infection was observed in the year 2010. The trend is shown below in the figure no: 2

c) **Trend of Gender in Malaria cases:** The proportion female cases were less in all these years ranging from 2% to 11%. Males may tend to travel more when compared with females for many purposes and may be exposed in high endemic areas.
d) **Seasonal trend of the cases:** Usually malaria is more seen in monsoon. In Kerala the climate and environment varies from other states of India. The temperature in Kerala normally ranges from 28° to 32° C (82° to 90° F) on the plains but drops to about 20 °C (68° F) in the highlands. Climate ranges from winter, summer, south west monsoon and north east monsoon in the state. As the climate is dry only in summer it was observed in this study that the numbers of malaria cases were less only in the summer season and just before the beginning of north west monsoon (before October). The trend is shown in the figure number 4.

5. Discussion

Malaria is a major public health problem of India. In this study majority of the patients were in the economically productive age group. Poonam *et al.* reported that 63% were in the age group of 15-45 years [2]. According to Ashwani Kumar *et al.* the total DALYs lost because of malaria was 1.86 million years in the year 1990. The maximum DALYs lost (53.25%) were in the middle productive ages from 15 to 44 years of age, followed by children < 14 years of age (27.68%), and 19% in those > 45 years of age [3]. In this study majority of the cases were males similar to reports by Preetam N *et al.* [4] His study on clinical profile of malaria reports the preponderance of males than females in case infection. Murthy GL *et al.* [5] in his hospital study on malaria reveals that males are more infected than females similar to our study. UK Chandrashekar *et al.* [6] in his study on malaria in Calicut district of Kerala also support that malaria infection in males are higher compared to females. As males are involving more in migration for work and exposed to mosquito bite when compared with females.

In Kerala, malaria was occurring only as imported from other places by migration from 1965. This study showed 12.7% cases as indigenous over the 6 years which indicates re-emergence of malaria. Moreover the relapse was noted in 14% of cases. Decreased adherence to the drugs or improper treatment can lead to drug resistance which is one of the important hindrances to the malaria control and prevention. This study showed an increasing trend of malaria cases after

2010 and maximum cases noted in 2012. This is may be the increased trend of migrants to Kerala for jobs as they are attracted by the salary and living conditions. This is similar to the study done by Jimmy Antony *et al.* in Kolanchery, Kerala [7]. Regarding the parasitological trend maximum cases were due to plasmodium vivax in this study. Even though the percentage of falciparum is increasing in India, this complicated type of disease was less in this study while mixed type of infections are more. The treatment of this type should be careful in order to prevent relapse. All patients should be well educated regarding the drug compliance. The diagnostic facilities should be strengthened at the peripheral level and the drug compliance should be ensured.

Seasonal trend of the disease varies from the national level, as the climatic conditions of Kerala vary from the Nation. An analysis of spatial and temporal patterns of malaria incidence correlated with climatic factors (temperature, rainfall and humidity) over a period of ten years (1999-2008) in Mozambique revealed that malaria risk increases with maximum temperature over 28 ^{0}C and humidity at 95% according to N. Pemola Devi *et al.* [8, 9]. The three main climate factors that affect malaria are temperature, precipitation and relative humidity [10]. Among these, the temperature in particular has been found to affect life cycle of malarial parasite and the vector mosquito that carries the infection.

6. Figures

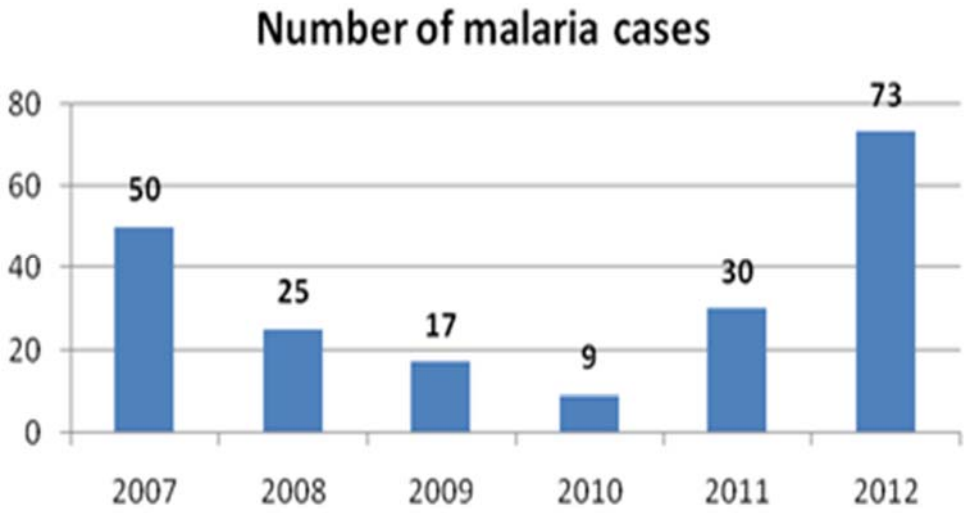

Fig 1: Trend of the cases reported over the years

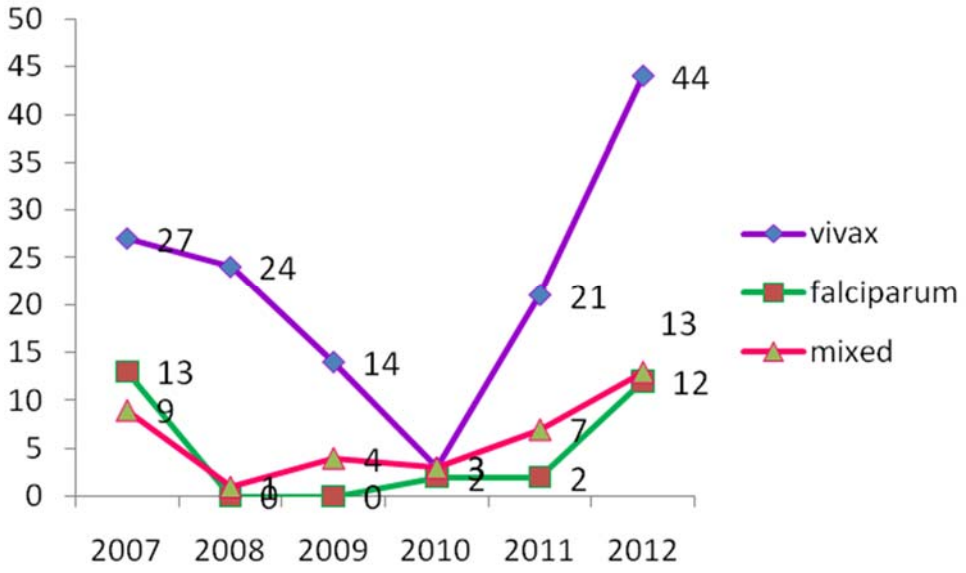

Fig 2: Trend of the cases as per parasitological type

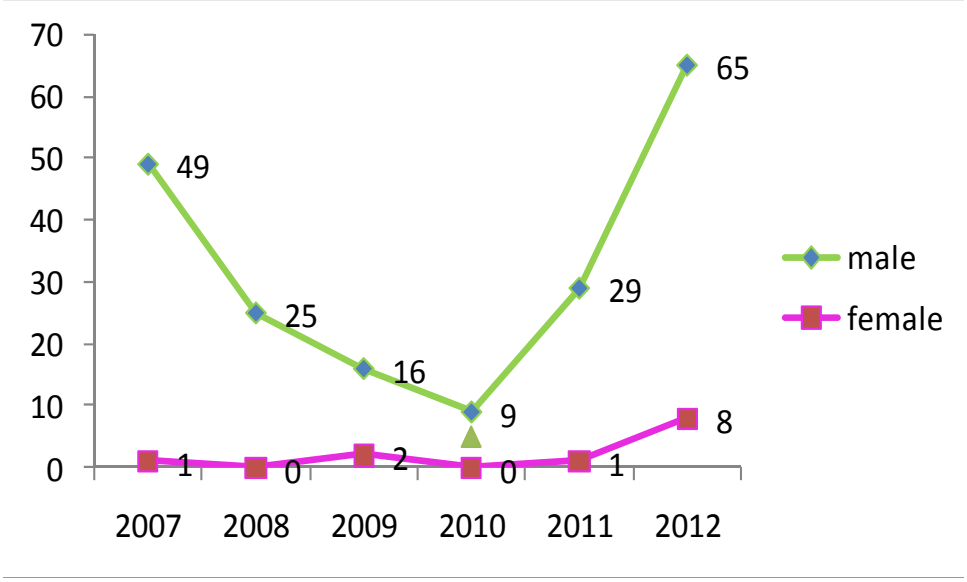

Fig 3: Trend of the cases as per gender

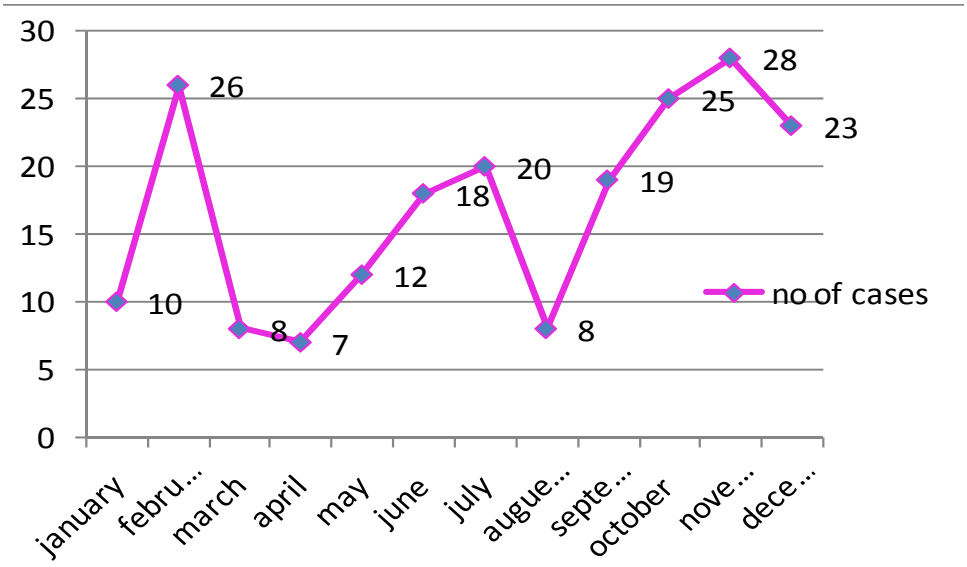

Fig 4: Seasonal trend of malaria cases

7. Conclusion

As Kerala have climatic conditions favorable to the transmission of malaria most of the time, the re-emergence of malaria cases should be controlled to prevent massive epidemics. This study showed that majority of the cases is imported. More people are coming to the state for construction and other jobs from the malaria endemic areas. People are also going for study purposes from Kerala to outside. These migrations will carry parasites to the state. The migrants coming to Kerala are staying as overcrowded in the premises of construction sites which, makes the environment unhygienic and causes transmission of the parasites to the vectors. This may be the reason for the emergence of indigenous malaria. Government should initiate programmes to screen the migrants and treat according to the disease. There should be regulations regarding the staying of migrants and that should be implemented. As these persons are not staying permanently in one place, it is difficult to follow them and to ensure the drug compliance for the period of 14 days. Moreover primary health centers should be provided with the diagnostic kits and drugs. Surveillance system should be strengthened. Medical officers of all sectors both private and public sectors should be made aware regarding National drug policy malaria. Insecticide treated nets should be provided to the high risk areas and vector control measures should be strengthened.

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