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Original Research Article

Investigation of an outbreak of malaria in a non- endemic coastal area, Kerala, Southern India

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ABSTRACT

Background: Kollam district, Kerala state, Southern India was free of indigenous transmission of malaria for years. Three cases of malaria were reported to the district surveillance unit of integrated disease surveillance project from coastal areas within town limits of Kollam district on 19th September 2015.
Methods: An outbreak investigation was initiated which included stimulated reporting from all hospitals, mass and contact survey, entomological assessment and exploratory interview with cases.
Results: A total of six cases of malaria were identified from a total population of 3785. All cases were males. All cases were *P. falciparum* and *P. vivax* (mixed) type malaria. *Anopheles stephensi* breeding sites were found in abandoned boats, near the temporary huts at the seashore, where all the cases used to sleep during night. Median duration of date of symptom onset to the date of diagnosis as malaria was nine days (range 5-18 days). Half of the patients had at least three visits to a health care facility before a diagnosis of malaria was made.
Conclusions: There was a delay in diagnosing malaria and hence continuous and ongoing sensitization may be needed to keep the index of suspicion high among clinicians. Success in preventing malaria resurgence in Kerala requires a paradigm shift from a focus on reactive temporary short term response to a proactive long term planned and comprehensive strategy.

Keywords: Malaria, Indigenous transmission, Outbreak investigation, Urban malaria

INTRODUCTION

Kerala, the southernmost state in India, had been declared as malaria eradicated as early as in 1965. But imported and sporadic malaria used to occur even thereafter. Recently an increasing trend of both imported and indigenous malaria cases were observed in the State.[1-3] Number of malaria cases reported to the official disease surveillance system of Kerala state from the year 2012 to 2015 are 2036,1634, 1549 and 1751.[1,2] The causes of resurgence of malaria in Kerala are rather complex and includes interstate travel, importation of cases from other states, increased migration of laborers from other states, urbanization, absence of organized preventive public health system in urban areas and overloaded health system at peripheral level.[3,4]

Kollam district is situated on the south west coast of Kerala. The numbers of malaria cases reported from the year 2012 to 2015 from Kollam district are 108, 82, 78,

82.[1] There were no evidences of indigenous transmission of malaria in Kollam for at least a decade except one outbreak among migrant labourers in 2013.

Three cases of malaria were reported to the district surveillance unit of integrated disease surveillance project from coastal areas within town limits of Kollam district on 19th September 2015.[5] None of them were having a travel history to any of the endemic places of malaria in recent past. An outbreak investigation was initiated by the district health administration. The investigation team included physician, epidemiologists, entomologists and multipurpose health workers. The objective of the investigation was to describe the epidemiological features of the outbreak and to make recommendations to further prevent the spread of the disease.

METHODS

Kollam district has a population of around 2.6 million. Literacy rate for females in Kollam is 92%. Kollam is hottest during March to May (temperature 35-37°C) and minimum temperature is experienced during December-January (20-22°C). Humidity rate is 63% in January and 87% in June-July. Kollam receives Southwest and Northeast Monsoons with an annual average rainfall of around 2,700 millimetres.

Coastal area in town limit of Kollam district lies at a close proximity to the city stretching for about three Kilometres, with a total population of around 30,000. It is spread across small village settlements of Pallithottam, Port Kollam, Muthakkara, Vadi and Thangassery. Most of the families depend on fishing activities. The area is marked with overcrowding, open but cemented drains and closely clustered houses.

We visited the nearby private hospitals and stimulated reporting of all fever cases. Contact and mass surveillance (in the places where the smear was found to be positive, blood smear was collected from 50 households around the positive cases) were initiated with the help of multi-purpose workers with door to door survey in Kollam coastal regions. Blood smears were taken for confirmation from all fever cases. Detection of malarial parasite on peripheral smear was considered as a confirmed case of malaria. Confirmed cases of malaria were visited and interviewed based on a structured questionnaire. The outbreak was described in terms of person, place and time. Epidemic curve was drawn and a spot map was generated. Vector survey was conducted in the area. Exploratory interviews were conducted with cases and a hypothesis was generated.

RESULTS

Three more confirmed cases were reported from private hospitals during the period adding together to a total of six confirmed cases of malaria. 841 families were surveyed with a total population of 3785. 45 had reported fever in last two months, but none of their blood samples were positive for malaria.

All cases were males. Age distribution was from 34 to 62 years. All cases were *P. falciparum* and *P. vivax* (mixed) type malaria. Four cases were from Muthakkara area and two from Thangasheri.

All had typical clinical features of malaria which include fever, chills, rigor and myalgia which got elevated during night. Median duration from onset of symptoms to reporting at a health facility was three days (range 1-8 days). Median duration of date of symptom onset to the date of diagnosis as malaria was nine days (range 5-18 days). Median duration of the date of first reporting to health facility and the date of diagnosis as malaria was five days (range 3- 16 days). Half of the patients had at least three visits to a health care facility before a diagnosis of malaria was made.

Three of them used to work together. All of them were fishermen. All of them used to sleep at temporary huts in the beach at the night on days when they used to go for fishing in early morning 3AM. The temporary houses are on the sea shore built in a line. *Anopheles stephensi* breeding sites were found in abandoned boats, near the temporary huts at the seashore. Man hour density (MHD) was found to be 4.5.

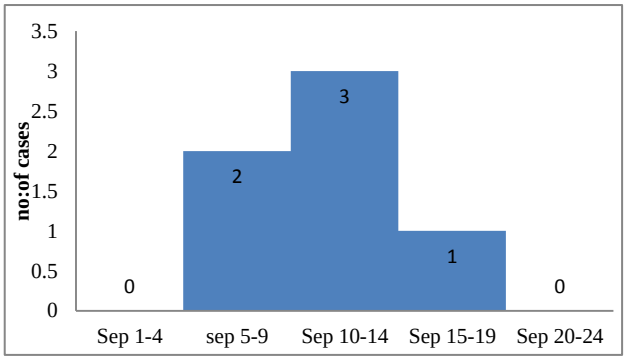

Figure 1: Epidemic curve of confirmed malaria cases, Kollam, India 2015.

DISCUSSION

Malaria is mostly present as an endemic disease, but in low transmission areas it may occur as an outbreak. Malaria outbreaks are the complex public health challenges attributed to both natural and man-made causes. Several reports are available on small malaria outbreaks with continued localized transmission.[6,7]

There was an outbreak of malaria among the fisherman sleeping outside the houses in the coastal area in Kollam. Vector was found to be *Anopheles stephensi*. Predominant breeding sites were abandoned boats. We could not find out exactly from where the mosquitoes got infected. The fishermen in Kollam used to go near the

coast of Tamilnadu (neighboring state), the nearby state for fishing. Also many fishermen from Tamilnadu used to visit and stay at Kollam coast.

There was a delay in diagnosing malaria despite repeated visits to many hospitals / clinics. Undiagnosed malaria in non-endemic areas has significant public health implications. Gametocytemia may be prolonged as a result of delays in seeking medical treatment or because of misdiagnosis. Transmission may increase due to delay in diagnosis when index of suspicion of malaria is low. Protecting the population, even against a hypothetical threat, has highest priority under such circumstances. With climate change improving conditions for competent anopheline vectors in non-endemic areas, the risk of isolated malaria infections or small outbreaks secondary to imported cases increases. This possibility should specifically be considered in urban areas of Kerala with high numbers of returning travelers and semi-immune migrants, who may carry infective gametocytes for extended periods of time. Continuous and ongoing sensitization may be needed to keep the index of suspicion high among clinicians.

In response to this outbreak, indoor residual spraying (IRS), larvicidal spraying and thermal fogging were done in the affected area. Abandoned boats were kept upside down. Doctors from private sector and Government sector were sensitized regarding the clinical suspicion and treatment protocol of malaria. Surveillance system for malaria has been strengthened by involving private doctors/clinics/hospitals and laboratories. Regular active surveillance for fever and vector surveillance in the affected areas were planned and executed. Behaviour change communication strategies has been developed to avoid outdoor night stay and for mobilising people for vector control.

Kerala State has the potential for malaria to reemerge: through the presence of environmental and climatic conditions that are favorable towards mosquitoes of the genus *Anopheles*; and vulnerability, through the constant presence of infected individuals coming from endemic areas and due to presence of large number of migrant laborers. The current outbreak demonstrates the potential for reintroduction of malaria in the area.

Because of intense migratory flows, travel to endemic areas and the high annual incidence of malaria around the world, malaria in non-endemic areas are difficult to be eradicated.[8] There is a need for augmenting malaria surveillance activities for preventing such outbreaks in future. Local and state health officials should recognize that cases of patients with positive diagnoses for malaria, without risk factors for the disease, suggest local infection until proven otherwise and such cases should be investigated immediately. Public health approach in planning and implementation of preventive and control measures is cornerstone of malaria control. This should be supported with awareness generation drive about transmission and prevention of malaria. Regular vector surveillance and geographical mapping of the vector prevalence should be done. Absences of such reports in the State are largely due to inadequate documentation and publication of data rather than collection of such data. Migrant welfare incorporating regular mechanisms to screen for communicable diseases including malaria is the need of the hour. Primary health care has to be strengthened with capacity building, intersectoral co-ordination and wider community participation.

CONCLUSION

To summarize, there was an outbreak of malaria which was indigenously transmitted in a very low endemic costal region in Kollam, Kerala, Southern India. Success in preventing malaria resurgence in Kerala requires a paradigm shift from a focus on reactive temporary short term response to a proactive long term planned and comprehensive strategy.

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