



Clinico-epidemiological profile of malaria: Analysis from a primary health centre in Karnataka, Southern India

Ramachandra Kamath¹, Sneha Gaitonde^{2*}, Pooja Tripathi², Dhritiman Das², Mayuri Banerjee², Myna Shetty², Sandeep Kumar Nayak², Md. Asadullah²

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¹Head of Department
²Postgraduate Student
Department of Public Health,
Manipal University,
Manipal – 576104,
Karnataka, India

ABSTRACT

Malaria continues to be a major public health problem in India and worldwide. The present study was based on records from a primary health centre in Karnataka. Morbidity patterns and important features of malaria transmission specific to Udupi district were investigated. The incidence of malaria and various morbidity patterns during 2010 and 2011 were compared and analyzed. Factors such as rapid urbanization, increased construction activities and influx of migratory workers were highlighted as the leading causes for the advent of malaria in the area. Recommendations have been provided for implementation in the near future.

*Corresponding Author
Department of Public Health,
Manipal University, Manipal –
576104, Karnataka, India
sneha.gaitonde@gmail.com

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INTRODUCTION

Malaria continues to be a heavy social and health burden in India, with an estimated 1.52 million cases reported in 2009 that accounted for 60% of cases in the SEAR¹. With nearly 95% of its population residing in malaria-endemic areas, India is battling the burden through implementation of the National Vector Borne Disease Control Program (NVBDCP). Through continuous efforts of the NVBDCP, malaria is now on a declining trend but *P. falciparum* cases are increasing³. The states severely afflicted include Uttar Pradesh, Bihar, Karnataka, Orissa, Rajasthan, Madhya Pradesh and Pondicherry². Karnataka, in particular is witnessing an increasing incidence of malaria cases over the past 5 years due to increase influx of migrant population.

Manipal is a small, rapidly urbanizing geographical unit of Udupi District; part of the coastal belt of Karnataka with higher levels of average annual rainfall and humidity. A study done by Kamath et al. (2009) in Udupi comparing the malaria situation between 2008 and 2009 in the district reported a rapidly increasing prevalence of malaria in the district. Another hospital based study done in Manipal indicated high prevalence of *P. falciparum* and *P. vivax* among the subjects afflicted with malaria².

In the present study, we assess the various factors influencing the rise in malaria cases reported in areas under Primary Health Centre - Hiriadka in Udupi District, Karnataka. Our study aims to determine the burden of malaria in the area, assess morbidity patterns as well as identify barriers to access to prevention and treatment.

MATERIALS AND METHODS

A retrospective record based study was undertaken and case records over a period of 2 years (2010-2011) were reviewed at Primary Health Centre – Hiriadka in Udupi district. Udupi District is a coastal district of Karnataka state with an area of 8,441 km² with 29% covered by forest area and has a population density of 100–300 people/km². The summer season is from March to May followed by rainy season in the months of June to September, with an average annual rainfall of 3,940 mm and relative humidity of 55–60%⁵.

This study included confirmed cases of malaria reported from 1st January 2010 to 30th September 2010 and 1st January 2011 to 30th September 2011.

All patients were tested positive for malaria parasite via either blood smear test or rapid diagnostic test were included in this study. Patient records were retrieved from Primary Health Centre - Hiriadka. The number of malaria cases reported in Hiriadka, Udupi district during 2010 and 2011 were compared and analyzed using SPSS 16.0 software.

RESULTS

The following figures display data as reported by PHC - Hiriadka from the months of January – September in years 2010 and 2011, respectively. A total of 3614 slides were collected from January – September 2010, out of which 136 were positive (22.8% P.f.; 77.2% P.v.). In 2011, a total of 6917 slides were collected, out of which 186 were positive (16.1% P.f.; 83.9% P.v.).

Rainfall is one of the most important natural factors that influence the transmission and distribution of malaria⁴. Positive cases were more frequent in rainy seasons (June-Sept) with a steady increase in the number of cases starting in April. In 2010, the highest number of cases was reported in June (32; 23.5%). In 2011, number of positive cases started increasing in May and the highest number of cases were reported in September (52; 28.0%).

Demographic Analysis

In both 2010 and 2011, majority of positive cases were male (83.8% and 81.7%, respectively). Majority of positive cases were in the age group of 21-30 years (40.44% and 36.56%, respectively), followed by 11-20 years (34.56% and 27.42%, respectively) in both years.

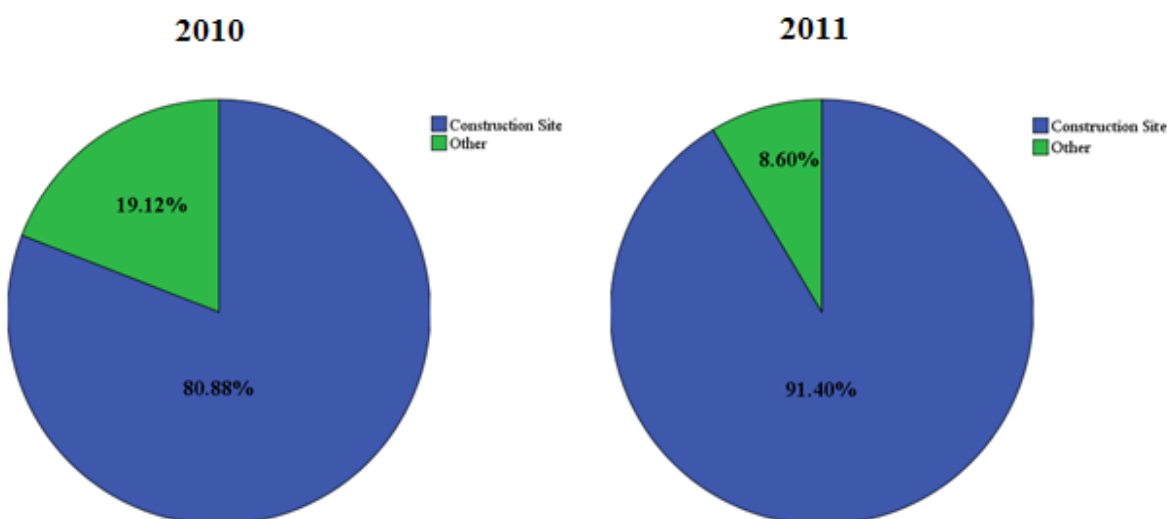


Figure 1: Distribution of Malaria Cases According to Place

In 2010, out of 136 cases, 110 (80.88%) were reported from construction sites and only 26 (19.12%) cases reported from other sites (Figure 1). In 2011, out of 186 cases, 170 (91.4%) were reported from construction sites and only 16 (8.6%) cases reported from other sites (Figure 1). Please note: "Other" in Figure 1 refers to any place other than Construction Site.

Treatment Analysis

In both years, majority of positive cases were *P. vivax* (76.47% and 84.85%), followed by *P. falciparum* (20.6% and 14.52%) and mixed (2.94% and 0.54%) types.

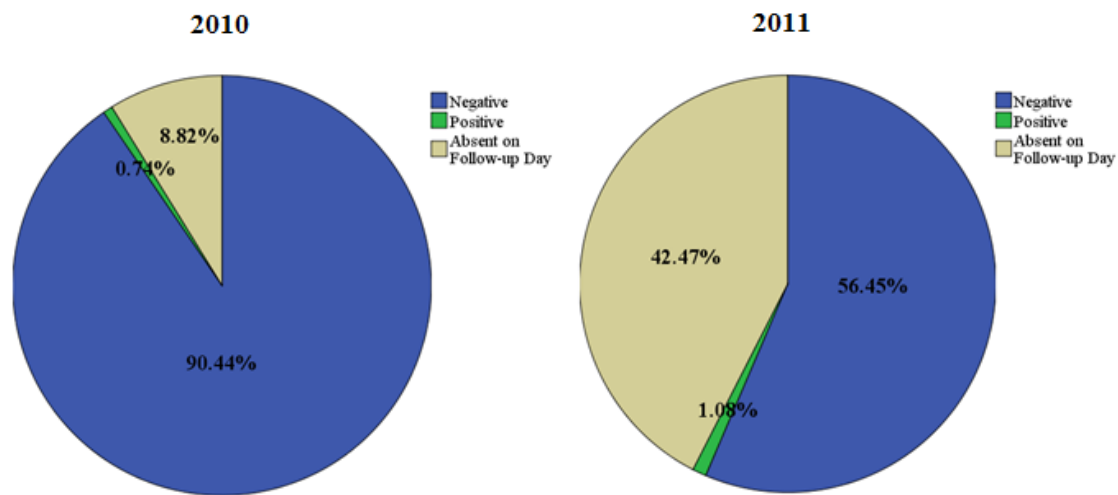


Figure 2: Post-Treatment Result

Following radical treatment, majority of cases (90.4% and 54.5%, respectively) tested negative. However in 2011, nearly half (42.5%) of cases were reported absent on the follow-up 6th day, resulting in lack of post-treatment results (Figure 2).

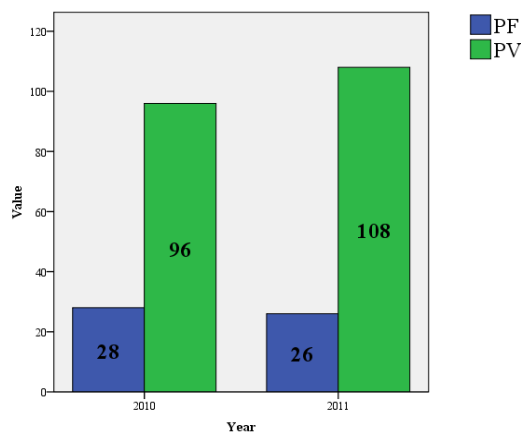


Figure 3: Incidence of Malaria as reported by Hiriadka PHC from Jan. to Aug. 2010 (N=124) and 2011 (N=134)

From the months of January to August, there was an overall 8.1% increase in reported malaria cases from 2010 to 2011. While the number of *P. falciparum* cases remained constant, a significant 12.5% increase in *P. vivax* cases were observed (Figure 3).

There was a significant increase in the number of malaria cases in the month of August from 2010 to 2011. For the month of August alone, there were three fold greater cases in 2011 than the prior year (Figure 4).

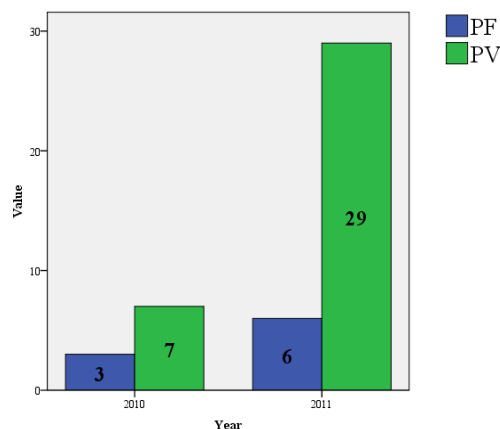


Figure 4: Incidence of Malaria as reported by Hiriadka PHC in Aug. 2010 (N=10) and 2011 (N=35)

DISCUSSION

Malaria continues to be a major public health problem in South India with majority of cases observed during the period of monsoon and the time immediately following the end of monsoon (June to October), when water logging helps mosquito breeding and hence the transmission of the disease. In 2011, majority of cases were reported in September (28%) while in 2010, majority of cases (23.5%) were reported in June. Kamath et al. (2009) found majority of cases in the month of July and August in the same district⁶. The peak in September 2011 may be a result of climate change and delayed onset of the monsoon season or the steady increase in urbanization in the area bringing in greater numbers of migratory workers. An overall increase in positive cases was found from 2010 to 2011.

Demographic Analysis

The place-wise distribution of malaria in 2010 and 2011 in the area under PHC – Hiriadka, Udupi district reveals that majority of positive cases are reported at construction sites. This may be due to growing urbanization and

construction activities taking place in the surrounding area. Poor management at construction sites provides ideal breeding conditions (such as stagnant water) for the *Anopheles* mosquito. Factors such as poor living conditions, overcrowding, high man-to-mosquito contact and limited or lack of health seeking behavior contributes to accelerated transmission of the disease. Our results show that the majority of positive cases were male in the age group of 21-30 years, which is consistent with previous studies.^{2,3,5} Majority of cases appeared to be young construction workers who also happened to be migrants. Constant travel between high-malaria endemic regions puts migrant workers at increased risk for acquiring the disease.

Treatment Analysis

The present results are consistent with the incidence pattern as reported by earlier workers in different parts of India³⁻⁵. While the overall incidence of *P. falciparum* is less in 2011 compared to 2010, *P. vivax* appears to be on an upward trend. There was a significant difference in the post-treatment results from 2010 to 2011. In 2011, nearly half of positive cases were absent for the follow-up resulting in no data of the post-treatment result. This may be due to an increase in migratory population in the area. These findings highlight the barriers to addressing the malaria situation among migratory populations.

From the months of January to August, there was an overall 8.1% increase in reported malaria cases from 2010 to 2011. While the number of *P. falciparum* cases remained constant, a significant 12.5% increase in *P. vivax* cases was observed. In the month of August alone, a significant increase of more

than three-fold malaria cases was observed from 2010 to 2011.

RECOMMENDATIONS

- Awareness of malaria and preventive measures in the community (promote use of bed nets, mosquito coils etc.)
- Effective communication between health care professionals and employers to reach common goals
- There should be regular monitoring of the collection of water, cement or debris; and stagnant water reserves should be frequently cleared off before the onset of breeding of mosquitoes.
- Labourers, staying at the site should be provided with hygienic accommodation
- Labourers should be provided with insecticide impregnated nets in order to repel mosquitoes
- Pre-placement examination of labourers to screen whether they are carrying the parasite from their native place.

CONCLUSION

Overall, our findings suggest that rapid urbanization, increase in construction work and the influx of migratory populations are the main causes for the advent of malaria in the area surrounding PHC – Hiriadka in Udupi district. The numerous construction sites in the region are providing ideal conditions for mosquito breeding. Migrant laborers mostly from West Bengal, Bihar and neighboring districts reside at these sites, putting them at greatest risk. Our results also show that the increase in migratory populations may be a leading cause for loss to follow-up after treatment. This poses a great challenge for healthcare professionals as well as greater

concern for reducing the burden of the disease in the community. Though it lies beyond the scope of our study, steps should be taken to ensure effective monitoring and tracking of migratory workers. A step that is crucial to combat this major public health issue.

AUTHOR'S DISCLAIMER

The opinions expressed in this paper are those of the authors and may not reflect the position of their employing organizations.

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