International Journal of Community Medicine and Public Health
Salunkhe L et al. Int J Community Med Public Health. 2019 Jan;6(1):223-228
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20185247

Original Research Article

A household survey to assess prevalence of malaria and risk factors under urban field practice area, Dakshin Kannada

Leena Salunkhe[1], Animesh Gupta[2]*, Shahul Hameed[3]

Department of Community Medicine, [1]PIMS & R, Sangli, Maharashtra, [2]SIMS&RC, Mangalore, Karnataka, [3]K.S. Hegade Medical Academy, Derlakatte, Mangalore, Karnataka, India

Received: 26 September 2018
Accepted: 29 October 2018

***Correspondence:**
Dr. Animesh Gupta,
E-mail: animesh245@gmail.com

ABSTRACT

Background: Socio-demographic and environmental factors are associated with the malaria prevalence. Hence assessment of these factors would potentially help in identification of the possible risk factors among households with their health seeking behavior and would help to adopt the most suitable and appropriate malaria control strategies.
Methods: A baseline household survey was carried out in the study site Lingappayakadu, Mulki, Manglore involving all study population (n=4954) from July to September 2017. Total 1043 households were interviewed with predesigned semi- structured questionnaire with informed written consent. Blood samples were collected from fever cases and results were confirmed for malaria within 24 hours. Anti-malarial drugs including the Primiaquine were given to all the positive cases. Data regarding socio-demographic characteristics and health seeking behavior were also collected from study population.
Results: The prevalence of malaria in the study was 1.41% and slide positivity was 51.09%. The presence of malaria cases was statistically significant with number of members present in the family (p=0.00001, X^2=199.37), age group (p=0.0168, X^2=8.17) type of working status (p=0.0293, X^2=7.06). Environmental factors like type of housing (p=0.3366, OR=1.3854), peri-domestic sanitation (p=0.1646, OR=0.554), Mosquito breeding (p=0.4504, OR=0.6757), indoor mosquitoes (p=1.000, OR=0.6173) and mosquito bite prevention methods were (p=0.1910, OR=1.7316) not showing any significant difference. Out of 137 fever cases, 70 cases were diagnosed with malaria amongst which 94.3% cases completed anti-malaria drug treatment.
Conclusions: A survey provides data regarding socio-demographic, environmental and health seeking behavior of population. The study did not show any statistically significant association of malaria with many environmental parameters. Health seeking behavior could be analyzed and improved with frequent surveillance methods.

Keywords: Urban malaria, Survey, Households, Environmental

INTRODUCTION

Mosquitoes are insects of public health importance because it causes many deaths every year due to a wide range of parasitic diseases. These include malaria, chikungunya, dengue and Japanese encephalitis. Among these vector borne diseases, malaria contributes a significant chapter in the archives of biological parasitism.[1] For the past 80 years, human malaria has been known to be caused by four plasmodium species- *Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium ovale* and *Plasmodium vivax*. Out of thsese *P.falciparum* being responsible for the most severe cases. Recently a fifth Plasmodium species has been recognized as the cause of malaria in humans. The newcomer is Plasmodium knowlesi, which was formally known to cause malaria in macaques.[2] Malaria is transmitted by

female anopheline mosquitoes poses a diagnostic challenge to medical community worldwide.[3]

According to the World malaria report 2015, estimates 212 million cases of malaria occurred globally with about 4,29,000 deaths. Malaria was considered to be endemic in 91 countries and territories in 2016.[4] In India, the burden and the risk of malaria is enormous and it is a major health concern. The country has the 3rd highest number of cases in the World and accounts for the highest malaria burden of 70% in WHO SEAR in 2015.[5] According to the data source from the Directorate of NVBDCP the number of positive cases in Karnataka was reported 9356 cases till October 2016, out of which 70% are from Dakshina Kannada and Udupi Districts.[6] Malaria mostly affects children under the age of 5 yrs and pregnant women in developing countries.[7] Pregnant women are more vulnerable because they experience depressed immunity during pregnancy.[8] Similar problem arises with children below the age of 5 yrs as their immunity system are not yet fully developed.[9]

Malaria transmission varies across climatic seasons, ecological zones, neighboring villages and even between neighboring households.[10] Households in close proximity to breeding sites have higher mosquito densities and are at increased risk of transmission, usually following a seasonal pattern.[11] Mangaluru is 22 meters above sea level and its climatic conditions favors vector borne diseases. The rapid rise in development work and stagnant water at construction sites in urban area have also leaded to the rise in the incidence of malaria.[6] Urban malaria control have become a challenge due to the lack of inter-sectoral coordination, poor planning, mosquito control is usually practiced rather than species sanitation, acute water storage and erratic water supply in highly dense areas, water storage in a variety of containers, inadequate man power to tackle vector control operation and parasite surveillance, empirical and incomplete treatment.[12] Therefore the present study was aimed to assess the various socio-demographic and environmental factors associated with malaria prevalence among residents of urban field practice area.

METHODS

A base line survey was conducted to obtain demographic details among residents of Lingappayakadu, of urban field practice area under the Department of Community Medicine Srinivas Institute of Medical Sciences and Research Centre, Mangalore between July to September 2017.This peri-urban locality is 7 kilometers away from medical institute.

A community based survey was conducted with the help of health workers and Interns. All families were included under field practice area in the study sample. Total 1043 families were participated under study. The ethical clearance was obtained from the Medical Ethics Committee. The participants under survey were explained about purpose of study and informed written consents were taken. The survey was done similar to the fortnightly surveillance. Blood was collected for rapid diagnostic testing and a thin and thick blood smear was prepared for everyone who had fever during the survey or gave a history of fever in last 15 days. Results were confirmed within 24 hours from institutional laboratory and anti-malarial drugs including the Primiaquine (as per the guidelines of NVBCP) were given to all the positive cases.[13] Malaria positive case confirmation was done by reports regarding smear positive malaria cases.

Study was further expanded by analysis of population residing at urban field practice area on a semi structured, self-designed, oral, interview based questionnaire to elicit the socio-demographic, environmental and health seeking behavior profile regarding prevalence of malaria. The questionnaire was interviewed in vernacular (Kannada, Tulu) language. The data was entered and tabulated in Microsoft excel. The statistical test was done by using SPSS, version 20 data analysis system.

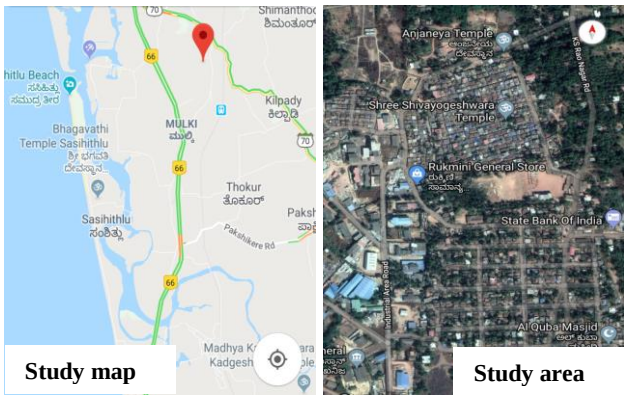

Figure 1: Study area: urban field practice area Lingappayakadu, Mulki, Mangalore.

RESULTS

Total 4954 people from 1043 households were included, out of which 41 (3.93%) households were reported to have malaria. Among participants total number of fever cases was 137 (2.76%) and out of which 70 cases were diagnosed as Malaria. The prevalence of malaria in the study was found to 1.41%. The slide positivity was 51.09%.There was significant effect on number of members present in the family (p=0.00001, X^2=199.37), age group (p=0.0168, X^2=8.17) type of working status (p=0.0293, X^2=7.06). However it was observed that there was no significant difference between gender distribution (p=0.9203, X^2=7.06) (Table 1).

The influence of particular characteristics of households was analyzed on the presence or absence of malaria cases in the households and risk was calculated. It was found that there was significant difference between number of members present in the family (p=0.00001, OR=19.2525), presence of ANC (p=0.0001, OR=0.0023)

and socioeconomic status (p=0.0001, OR=0.0939) residing in malarious or non malarious household. There was no statistical significant difference amongst children under 5 age group (p=0.0942, OR=0.05600) staying in particular type of household. Under environmental conditions, environmental factors like type of housing (p=0.3366, OR=1.3854), peri-domestic sanitation (P=0.1646, OR=0.554), Mosquito breeding (p=0.4504, OR=0.6757), indoor mosquitoes (p=1.000, OR=0.6173) and mosquito bite prevention methods were (p=0.1910, OR=1.7316) not shown any statistically significant difference. It was found that 48.8% of malarious households staying in katcha- pucca type house. About 80.5% malarious housing was having poor peri-domestic sanitation. Whereas 97.6% and 82.9% malarious households had mosquito breeding at near surroundings and Indoor mosquitoes respectively. There were 9.8% malarious and 15.7% non-malarious households not using any type of prevention methods.

Table 1: Distribution of demographic attributes of study population.

Characteristics	Total number of surveyed population (n=4954)			
Demographic features	**Number of surveyed population positive for the attributes n=4954**	**Number of malaria patients positive for the attributes n=70**	**Number of non malaria patients positive for the attributes n=4884**	**P(x^2)**
Members		**N (%)**	**N (%)**	
1to 3 members	775	6 (0.77)	769 (99.26)	0.00001 (199.37)*
4 to 7 members	247	53 (21.45)	194 (78.55)	
>7 members	21	11 (52)	10 (48)	
Under 5				
0-5yrs	357	9 (2.5)	348 (97.5)	0.01689 (8.17)*
6-25yrs	785	17 (2.2)	768 (97.8)	
>25 yrs	3812	44 (1.2)	3768 (98.8)	
Gender				
Male	2750	39 (1.41%)	2711 (98.58%)	0.9203 (0.01)
Female	2204	31 (1.40%)	2173 (98.59%)	
Working				
Oudoor occupation	3101	40	3061	0.0293 (7.06)*
Indoor occupation	883	8	875	
Not working	970	22	948	

*P<0.05

Table 2: Distribution of demographic and environmental characteristics among surveyed households.

Characteristics	Total number of surveyed house-holds (n=1043)		Number of malarious house-holds (n=41)		Number of non-malarious house-holds (n=1002)		X^2	OR
Demographic feauters	**N**	**%**	**N**	**%**	**N**	**%**		
Members								
1 to 3	775	74.3	6	0.77	769	99.25	0.00001*	19.2525
>3	268	25.7	35	13.05	233	86.94		(7.9987-46.3396)
Under 5								
Not present	651	62.4	20	48.8	631	63	0.0942	0.5600
0-5 yrs	392	37.6	21	51.2	371	37		(0.29951.0468)
Anc								
No ANC	1005	96.3	10	24.4	995	99.3	0.0001*	0.0023
ANC	38	3.7	31	75.6	7	0.7		(0.0008-0.0064)
Socioeconomic status (modified BG Prasad's classification)[14]								
Class I and II	356	34.1	2	4.9	354	35.3	0.0001*	0.0939
Class III, IV & V	687	65.9	39	95.1	648	64.7		(0.0225-0.3911)
Environment								
Type housing								
Ppucca	453	43.4	21	51.2	432	43.1	0.3366	1.3854
Kutcha –pucca	590	56.6	20	48.8	570	56.9		(0.7415-2.5883)

Continued.

Characteristics	Total number of surveyed house-holds (n=1043)		Number of malarious house-holds (n=41)		Number of non-malarious house-holds (n=1002)		X^2	OR
Peridomestic sanitation								
Poor	313	30	8	19.5	305	30.4	0.1646	0.554
Good	730	70	33	80.5	697	69.6		(0.2529-1.2134)
Mosquito breeding								
Absent	241	23.1	7	17.1	234	23.3	0.4504	0.6757
Present	802	76.9	34	82.9	768	76.7		(0.2957-1.5443)
Mosquitos indoor								
Absent	40	3.8	1	2.4	39	3.9	1.000	0.6173
Present	1003	96.2	40	97.6	963	96.1		(0.0827-4.6072)
Prevention (mosquito bite)								
No method	162	15.5	4	9.8	158	15.7	0.1910	1.7316
Net and repellants	881	84.5	37	90.2	844	84.3		(0.6087-4.9262)

*P<0.05

Table 3: Demographic characteristics health seeking behavior among fever and malaria cases.

Characteristics	Total number of fever cases (n=137)		Total number of malaria cases (n=70)*	
Demographic features	**Number**	**Percentage (%)**	**Number**	**Percentage (%)**
Age (in years)				
0-5	21	15.3	9	12.9
6-25	40	29.2	17	24.3
<25	76	55.5	44	62.9
Gender				
Male	76	55.5	39	55.7
Female	61	44.5	31	44.3
Education				
Illiterate and primary	79	57.7	37	52.9
Illiterate (secondary and higher)	58	42.3	33	47.1
Health seeking behavior of fever cases				
Treatment taken from				
1.government hospital	72	52.6	40	57.1
2.private hospital	33	24.1	19	27.1
3.private clinic	9	6.6	9	12.9
4.ayush	7	5.1	2	2.9
5.chemist	1	0.7	-	-
6.not taken from anywhere	15	10.9	-	-
Type of treatment				
no anti-malarial treatment	52	38	-	-
oral anti-malarial drugs and injectables	64	46.7	67	95.71
only injectable drugs	21	15.3	3	4.29
Treatment completed				
Not complete (do not know)	19	13.9	4	5.7
Not complete (do not care)	6	4.4	-	-
Treatment completed	112	81.8	66	94.3

(*Out of 137 fever cases 70 cases were diagnosed as Malaria.)

There were total 137 cases of fever were found during survey out of which 70 cases were diagnosed with malaria. Maximum number of malarial cases (62.9%) was found in >25 year age group. Distribution fever Cases (male=55.5%, females=44.5%) and malaria cases (males=557%, females=44.3%) found slightly more amongst males compared to females. Also it was found that number of malaria cases were more amongst illiterate and educated upto primary level (52.9%) compared to literate (47.1%). It was found that maximum number of

malaria cases were treated from government hospital (57.1%). Furthermore 12.9% and 27.1% malarious cases had taken treatment from private clinic and private hospital respectively. There were 95.71% malarial cases taken oral anti-malarial and injectable drugs whereas 46.7% fever cases taken treatment of oral anti-malarial drugs. Among malarial cases 94.3% completed treatment.

DISCUSSION

The study was conducted for analysis of prevalence of malaria and associated factors. Urban malaria is a major problem in Karnataka and the coastal city, Mangalore, accounted for 57% of malaria cases in 2014 compared with only 3% in 2002.[15] Total number of members present in the family, age group, type of working status showed significant difference but there was no significant difference related with gender. A similar study conducted by Thomas et al. showed age group and gender was analyzed, it did not show any significant association with malaria. However, presence of malaria was found to be significantly associated with occupation/vocation.[16] Malaria infection was found to be more with increase in number (>3) of household members. Similar results were also observed in studies from Madhya Pradesh, India.[17]

Further demographic and environmental factors were analyzed to find influence of type of households and its significance. It was found that there was significant association with socioeconomic status and presence of ANC in malarious or non malarious type of household. Poverty was associated with malaria occurrence in the study population. Many studies have regarded malaria as a disease of the poor, which is substantiated by the fact that the malaria burden is often concentrated in the poorest continents and countries.[18] Pregnant women are 3 times more likely to suffer from severe disease as a result of malarial infection compared with their non-pregnant counterparts, and have a mortality rate from severe disease that approaches 50%.[19]

Environmental factors like type of housing, peri-domestic sanitation, mosquito breeding or presence of mosquitoes indoor not having statistically significant difference.

Improved housing as a malaria intervention may be complementary to the processes of urbanization and economic development ongoing in Sub Saharan Africa. However, this observation should not be universally generalized since urban slums can contain dense housing of poor quality, with poor drainage and environmental management, enabling malaria vectors to proliferate.[20] The presence of any breeding habitat did not significantly associate with the malaria of a particular household as seen in Thomas et al study.[16] The methods used for prevention of mosquito bites like repellants, coils, mosquito bed nets did not show any statistically significant result. In another study conducted in Ghana showed the application of mosquito coils did not reduce the incidence of malaria.[21] Though maximum number of malaria cases was treated from government hospital still some of the malaria cases did not take anti-malarial treatment or completed the anti-malarial treatment course because of lack of knowledge. Poor public awareness about drug resistance and its prevention and also reported substantial proportion of self-medication. Improving general awareness about drug resistance and its prevention might lead to improved compliance to therapy.[22] Thus, health education campaigns must be tailored to plug the gaps around causes and prevention of drug resistance in order to prevent the emergence and spread of resistance.[23]

To conclude, the survey could provide data regarding socio-demographic characteristics under malaria prone urban endemic setup. Furthermore study did not show any significance of association with many environmental parameters may be because of other confounding factors like structural details of housing as well as knowledge regarding use of anti-vector measures. Knowledge regarding health seeking behavior could be improved with frequent surveillance to start correct and complete treatment with appropriate diagnostic methods as well as to prevent anti-malarial drug resistance.

Limitations of the study are that the proportion of malaria cases under urban study area did not represent the actual prevalence of malaria and represent the urban setup in Dakshin Kannada. Another limitation is the potential for recall bias, which is always a possibility when relying on self-report.

ACKNOWLEDGEMENTS

We thank the health care assistants for their assistance for collecting blood samples lab diagnostic methods. We acknowledge Health Inspector Mr. Mathen and interns (Dr. Kartik Chandra, Dr. Aishwarya H, Dr. Shwetha Ural, Dr. Srikala, Dr. Leo P, Dr. Steeve R, Dr. Silviya, Dr. Shilpa) posted under department of community medicine SIMS & RC for consenting the participants, conducting the interviews and distributing the malaria medication.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Shivakumar, Rajesh BV, Kumar A, Achari M, Deepa S, Vyas N. Malarial trend in Dakshina Kannada, Karnataka; An epidemiological assessment from 2004 to 2013. Indian J health Sci Bio Med. Res. 2015;8(2):91-4.
2. Kantele A, Jokiranta. Review of cases with the emerging fifth human malarial parasite-Plasmodium knowlesi- published in Oxford Academic 2011.
3. Lathamani K, Kotigadde S. Prevelance of malaria and a comparative study of peripheral blood smear,

quantitative buffy coat and malaria antigen rapid test methods in the diagnosis of malaria from Dakshina Kannada District, India. 2013;2(12):671-5.
4. World malaria report- 2016. WHO (Summary) Geneva: WHO 2016. Available at: www.who.int/iris/bitstream. Accessed on 3 July 2018.
5. Bekedam H. Message from WHO representative to India on World Malaria Day 2016.Available at www.searo.who.int/india/topics/malaria/wr_message_malariaday2016.pdf. Accessed on 3 July 2018.
6. Reporting of malaria cases a big concern in Karnataka. Available at: article16974196.ece/amp/news/national/Karnataka Available at www.thehindu.com Accessed on 3 July 2018.
7. Martens P, Hall L. Malaria on the move: Human population movement and malaria transmission. Emerging Infect Dis. 2000;6(2):28-45.
8. Sach J, Malaney P. The economic and social burden of malaria. Nature. 2007;415(6872):680-5.
9. World Health Organisation and UNICEF, World Malaria Report 2008,WHO,Geneva, Switzerland.
10. Pinchoff J, Chaponda M, Fields TM, Sichivuk J. For the Southern Africa International centres of excellence for malaria research/ individual and household level rise factor associated with Nchelunga district, a region with perennial transmission; a series cross sectional study from 2012 to 2015.
11. Kasasa S, Asoala V, Gosonui L, Anto F, Adjuik M, Tindana C, et al. Spatio temporal malaria transmission pattterns in Navrongo demographic surveillance site, northern Ghana, Malaria J. 2013;12:63
12. Sharma RK, Singh MP, Saha KB, Bharti PK, Jain V, Singh PP, et al. Socioeconomic & household risk factors of malaria in tribal areas of Madhya Pradesh, central India. Indian J Med Res. 2015;141:567.
13. Operational Manual for Malaria-2016-Ver.1, Available at: http://nvbdcp.gov.in. Accessed on 3 August 2018.
14. Singh T, Sharma S, Nagesh S. Socio-economic status scales updated for 2017. Int J Res Med Sci. 2017;5:3264-7.
15. Anvikar AR, Shah N, Dhariwal AC. Epidemiology of Plasmodium Vivax Malaria in India. The Am J Trop Med Hygiene. 2016;95(suppl),108-120.
16. Thomas S, Ravishankaran S, Asokan A, Justin NAJA, Kalsingh TMJ, Mathai MT, et al. Socio-demographic and household attributes may not necessarily influence malaria: evidence from a cross sectional study of households in an urban slum setting of Chennai, India. Malaria J. 2018;17:4.
17. Sharma RK, Singh MP, Saha KB, Bharti PK, Jain V, Singh PP, et al. Socioeconomic & household risk factors of malaria in tribal areas of Madhya Pradesh, central India. Indian J Med Res. 2015;141:567.
18. Ayele DG, Zewotir TT, Mwamb HG. Prevalence and risk factors of malaria in Ethiopia. Malar J. 2012;11:195.
19. World Health Organization. Guidelines for the Treatment of Malaria. Geneva: World Health Organization; 2006:58.
20. Tusting LS, Bottomley C, Gibson H, Kleinschmidt I, Tatem AJ, Lindsay SW, et al. Housing Improvements and Malaria Risk in Sub-Saharan Africa: A Multi-Country Analysis of Survey Data. von Seidlein L, ed. PLoS Med. 2017;14(2):e1002234.
21. Hogarh JN, Antwi-Agyei P, Obiri-Danso K. Application of mosquito repellent coils and associated self-reported health issues in Ghana. Malar J. 2016;15:61.
22. McNulty CAM, Boyle P, Nichols T, Clappison P, Davey P. The public's attitudes to and compliance with antibiotics. J Antimicrob Chemother. 2007;60:i63–i68.
23. Naing PA, Maung TM, Tripathy JP, Oo T, Wai KT, Thi A. Awareness of malaria and treatment-seeking behaviour among persons with acute undifferentiated fever in the endemic regions of Myanmar. Trop Med Health. 2017;45:31.

Cite this article as: Salunkhe L, Gupta A, Hameed S. A household survey to assess prevalence of malaria and risk factors under urban field practice area, Dakshin Kannada. Int J Community Med Public Health 2019;6:223-8.