Influence of socio-economic and behavioral risk factors on malaria prevalence: A study from Adilabad District of Telangana State.

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Abstract— The major burden of vector-borne disease in India comes from malaria. The biggest burden of malaria in India is often observed in backward or poor and remote parts of the country which might be due to the limited access to medical treatment or lack of knowledge on mode of malaria transmission and its preventive measures. A better understanding of the socio-economic, behavioral risk factors and knowledge gaps related to malaria infection are essential when developing coherent and effective policies Socio economic information was collected from 4872 participants in three PHCs (Jainoor, Sirpur, Lingapur) irrespective of their age and gender. The occurrence of malaria was significantly higher in individuals those don't have schooling/primary education compared to secondary/higher education level participants. Malaria infection was observed to be elevated in households with farmers head as compared to households with daily labour or employs. The present study demonstrates that those variables related to education and poor health infrastructure are the most important factors in reducing the risk of malaria infection.

I. INTRODUCTION

In India, vector-borne diseases such as malaria, chikungunya, dengue, kala-azar, lymphatic filariasis Japanese and encephalitis (JE) have considerable influence on morbidity and mortality. The epidemiology of the vector-borne diseases may differ considerably, owing to economic, sociocultural, ecology and behavioral factors. Inhabitants of rural, urban slums and tribal areas are often at risk from such vector-borne diseases, which particularly affect the poor and vulnerable population [1], [2]. Vector-borne diseases are account for disability and deaths South Asian countries, especially in poor people as they have limited access to timely and effective treatment.

The major burden of vector-borne disease in India comes from malaria. Malaria is a life threatening disease caused by protozoan parasites such as Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae and Plasmodium ovale that are transmitted through the bite of infected Anopheles mosquitoes. Malaria referred as a disease of antiquity or poverty and is a formidable deterrent to the cultural and socioeconomic development of man in tropical and subtropical areas [3]. Malaria also prevents foreign

investments and tourism into new regions which further significantly hampers the economic development of the country [4]. The incidence of malaria infection is more in African and South Asian countries. According to WHO reports (2016), about 91 countries and territories had been infected by malaria and nearly 3.2 billion people, i.e nearly half the world's population were at risk of malaria infection. The year saw an estimated 216 million malaria cases and 445000 deaths due to malaria infection worldwide. Moreover, it was reported that India accounted for 6% of all malaria cases in the world, 6% of the deaths, and 51% of the global *P. vivax* cases.

The biggest burden of malaria in India is often observed in backward or poor and remote parts of the country which might be due to the limited access to medical treatment or lack of knowledge on mode of malaria transmission and its preventive measures. A better understanding of the socio-economic, behavioral risk factors and knowledge gaps related to malaria infection are essential when developing coherent and effective policies and tools to tackle malaria in endemic areas of the world including India [5], [6].

Knowledge on malaria infection and socio-economic status are key factors to acquire the appropriate control strategies. Large number of risk factors influence malaria occurrence including knowledge about malaria transmission and prevention, demography and socio-economic status of the individuals. Since the socio-economic status, behaviors of communities and their adherence to malaria control programs has been used as an indicator to characterize malaria treatment, the present study was conducted to assess the influence of household social economic status, knowledge, attitude and practice on treatment seeking behaviors, distance to health facilities on prevalence of malaria in Adilabad district of Telangana state.

II. METHODOLOGY

Socio economic information was collected from 4872 participants in three PHCs (Jainoor, Sirpur, Lingapur) irrespective of their age and gender. Information on the socio-economic factors such as house type, human behavior such as sleeping habits clothing habits, repellants, education, knowledge on malaria disease and treatment, income, breeding site near house, treatment place, nutrition and community etc. was collected using specific proforma. Informed and written consent was taken from all participants under the study. This study was approved by institutional ethical committee, Osmania University. Statistical analysis was carried out by using SPSS software (version 20.0)

III. RESULTS

The demographic characteristics of the participants were given in table 1. Out of 4872 participants (1037 households), 49.0% were males and 51.0% were females. The mean age of the participants was 37.4±1.9 (mean age, SD). The education level of 76.0% of the participants had no schooling or primary schooling and 24.0% of participants were had secondary or higher education. Among total households, 65.3% were had knowledge about free medicine whereas 34.7% were not aware of the free medicine. Most households (66.3%) were lived near to breeding sites and 33.7% were lived far away from breeding sites. Maximum number of households (75.2%) were having live stocks at their living place. Malaria history was also observed in above 10 years age group (71.8%). The percentage of participants/households with respect to knowledge about free nets, use of bed nets, house type, monthly income, information source and treatment was more or less similar.

The occurrence of malaria was significantly higher in individuals those don't have schooling/primary education compared to secondary/higher education level participants (p=0.02) (Table 2). More malaria cases were observed in individuals those lived in conventional house types (p=0.003) compared to individuals lived in improved house

type. We did not observe any association between family income of the participants and malaria occurrence. Households with farmers head were significantly infected with malaria (p= 0.01) as compared to households with daily labour or employs. Information sources such as news papers, radio and TV were not associated with the occurrence of malaria. Further, significant association was observed between malaria occurrence and individuals sharing the house with live stock (p=0.02).

The prevalence of malaria was high in households who had poor knowledge about free supply of bed nets (521/1037, 50.2%) and observed that the percentage of those individuals was high in Lingapoor PHC (41.1%) (Table 3). Further, malaria occurrence was significantly higher in households (688/1037) who had lived near to mosquito breeding sites (p=0.04) as compared to individuals lived far away from the breeding sites (349/10.7). Among, 37.6% household were belongs to jainoor PHC. Also, the occurrence of malaria was more in households who have poor knowledge about free supply of medicine (677/1037; 65.3%) as compared to households who have knowledge about free medicine. It is observed high incidence of malaria in households who do not use bed nets during their bed time compared households who regularly use bed nets in their houses (p=0.01). More number of households (53.2%) were reported as malaria is not a preventable disease, out of these households, 35.6% were belong to Jainoor PHC. About 71% of malaria infected persons were below the age of 14 years among, 40% of the participants belong to Jainoor PHC.

Discussion

In our study population, the occurrence of malaria among both sexes was similar which was in accordance with previous studies from different geographical regions [4],[5],[7]. However, few studies have been reported that females were more susceptible to malaria infection as they are engage in household activities which make them to be at a greater risk of acquiring the malaria infection [8]. The level of education of the participants has showed significant influence on the occurrence of malaria. Individuals with illiteracy and primary education level were mostly affected by malaria infection compared to individuals with high schooling and above education levels. This might be due to the individuals ability towards the personal hygiene and sanitary may improve as they are attending to several academic curriculum related to human health compared to illiterate people. It was observed that the malaria occurrence was also high in farmers and individuals who were lived in conventional type of houses (huts) and with livestock forming livelihood. It can be attributed that poorly constructed houses with grass or bamboo sticks might have gaps and holes through which mosquito could easily contact the human hosts. Previous study had been reported that good quality houses could minimize disease transmission by

reducing the human-mosquito contact [9]. Farmers and individuals who have livestock farming might have received mosquito bite more frequently as the cattle dung, irrigation land with water lodge are habitat for mosquito breeding resulted in increase in vector abundance.

Further, the occurrence of malaria significantly associated with breeding sites and use of bed nets. The households who did not use bed nets frequently were affected by malaria as compared to those who used bed nets every night which suggesting that use of bed nets may reduce the chance of mosquito bite. Also, malaria occurrence was observed to be higher among individuals who were not used bed nets as compared to those used ITNs. Since, individuals with straneous occupation like bus drivers have been infected with malaria [10] educating those groups about usage of bed nets may help to prevent malaria infection. Several studies have reported that ITN coverage was related to malaria control strategies reduced malaria and associated with a malaria risk protective effect [11].

IV. CONCLUSION

Though malaria occurrence may depend on several variables, the present study demonstrates that those variables related to education and poor health infrastructure are the most important factors in reducing the risk of malaria infection. Our study suggests that proper education and maintenance of hygienic conditions may help in controlling the malaria infection.

Table 1. Demographic characteristics of Malaria infected participants in three PHCs

	n	%
AGE		
<12	2,184	44.8
12-50	1,124	23.1
>50	1,568	32.1
SEX		
Male	2,390	49
Female	2,482	51
EDUCATION		
No schooling/Primary schooling	3,707	76
Secondary/Higher education	1,169	24
KNOWLEDGE ABOUT FREE MEDICINE (HOUSE HOLDS)		
YES	677	65.3
No	360	34.7
Knowledge about free nets (House holds)		
YES	521	50.2
No	516	49.8

Knowledge about breeding sites (House holds)		
Running	402	38.8
Stagnant	635	61.2
Near to breeding sites		
Yes	688	66.3
No	349	33.7
Use of bed nets		
YES	365	35.2
LLIN	321	31.0
No	351	33.8
Live stock		
Yes	778	75.02
No	259	24.98
Malaria history		
0-14 years	401	71.87
>14 years	157	28.13
HOUSE TYPE		
Conventional	565	59.0
Improved	392	41.0
Monthly Income (Indian Rupees)		
<5000	404	53.5
>5000	351	46.5
Information source		
TV/Radio/News Paper	524	50.5
None	513	49.5

Table 2. Socio-economic characteristics of malaria infected participants in three PHCs

Characteristics	n(%)	Lingapor	Jainor	Sirpor	P-value
Education					
No schooling/Primary schooling	2672 (54.8)	837 (31.3)	1076 (40.2)	759(28.5)	0.02
Secondary/ higher education	2200 (45.2)	631 (28.7)	970(44.1)	599(27.2)	
House type					
Conventional	565(59.0)	170(30.2)	205(36.2)	190(33.6)	0.003
Improved	396(41.0)	159(40.5)	117(29.9)	116(29.6)	
Monthly Income (Indian Rupees)					
<5000	404(53.5)	170(42.1)	172(42.6)	62(15.3)	0.19
>5000	351(46.5)	162(46.6)	150(42.3)	39(11.1)	
Occupation					
Daily labour	266(25.7)	101(38.0)	62(23.3)	103(38.7)	
Former	652(62.8)	194(29.7)	225(34.5)	233(35.8)	0.01
Employe	119(11.5)	34(28.6)	35(29.4)	50(42.0)	
Information source					
TV/Radio/News Paper	524(50.5)	170(32.5)	172(32.8)	182(34.7)	0.22

None	513(49.5)	159(31.0)	150(29.2)	204(39.8)	
Live stock					
Yes	778(75.02)	251(32.26)	224(28.80)	303(38.94)	0.02
No	259(24.98)	78(30.11)	98(37.83)	83(32.06)	

Malaria history					
0-14 years	401(71.87)	100 (25.0)	161(40.0)	140(35.0)	0.88
>15 years	157(28.13)	42(26.75)	60(38.22)	55(35.03)	

Table 3. Epidemiological characteristics of Malaria infected participants

Characteristics	n(%)	Lingapoor	Jainoor	Sirpoor	p-value
Knowledge about free medicine					
Yes	360(34.7)	125 (34.7)	143(39.7)	92(25.6)	0.30
No	677(65.3)	207(30.6)	289 (42.7)	181(26.7)	
Knowledge about free nets					
Yes	516(49.8)	207(40.1)	158(30.6)	151(29.3)	0.11
No	521(50.2)	240(41.1)	134(25.7)	147(28.2)	
Near to breeding site					
Yes	688(66.3)	258(37.5)	259(37.6)	171(24.9)	**0.04**
No	349(33.7)	114(32.7)	123(35.2)	112(32.1)	
Breeding site					
Running	402(38.8)	158(39.3)	133(33.1)	111(27.6)	0.16
Stagnant	635(61.2)	215(33.9)	218(34.3)	202(31.8)	
Does Malaria preventable disease					
Yes	485(46.8)	158(32.6)	193(39.8)	134(27.6)	0.42
No	552(53.2)	192(34.8)	198(35.9)	162(29.3)	
Use of bed nets					
Yes	351(33.8)	111(31.6)	115(32.8)	125(35.6)	
LLIN	321(31.0)	140(43.6)	89(27.8)	92(28.6)	**0.01**
No	365(35.2)	118(32.3)	123(33.7)	124(34.0)	
How does Malaria spread					
Mosquito bite	365(35.2)	115(31.5)	126(34.5)	124(34.0)	0.22
Water/Air	321(31.0)	120(37.0)	99(31.0)	102(32.0)	
Don't know	351(33.8)	110(31.0)	112(32.0)	129(37.0)	

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