Estimating Plausible Cases of Malaria: Preventive and Treatment-seeking behavior in the Indian states

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Introduction

Malaria claims more than *435000 lives each year* (WHO World Malaria Report, 2018). As the incidence and prevalence of the disease vary with environmental and social variability, we see a huge disparity in the geographical distribution of the disease. Globally, India contributes around 4% of the total cases of Malaria disease. The actual burden of malaria is not easy to estimate because most of malaria estimated mortality and morbidity went unregistered. This study unveils the trend and pattern of the disease in different socio-demographic groups. This study will also help in analyzing the preventive and treatment-seeking behavior of the population and individuals living in malaria-endemic zones. The plausible cases are those who have fever, taken blood test and had anti-malarial drugs.

Objectives

The specific objectives of this study are :

➢ To study the prevalence, differentials, and determinants of fever in children and their treatment-seeking behavior in high malaria prevalent states.
➢ To examine usage and sufficiency of mosquito nets.

Data & Methodology

For calculating the prevalence of the disease and categorization of states as high or low prevalence, the data has been taken from the Rajya Sabha Question-Answer session which was provided by the Ministry of Health and Family Welfare. For further analysis of plausible cases, treatment-seeking etc. data is utilized from the National Family Health Survey 2015-16. The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India.

Variables Used
❑ *Outcome Variable* – (i)Has mosquito bed net for sleeping- ownership of the mosquito net by households have been categorized as 'No'(reference) and 'Yes'.
(ii) Had fever in the last two weeks (U-5 years age)
❑ *Predictor Variables* - Type of place of residence, wealth Index, Religion, Caste, Regions and time of the survey, electricity drinking water source, toilet facility, room for sleeping, household structure, household type, children under 5 slept under this net, prevalence in state.
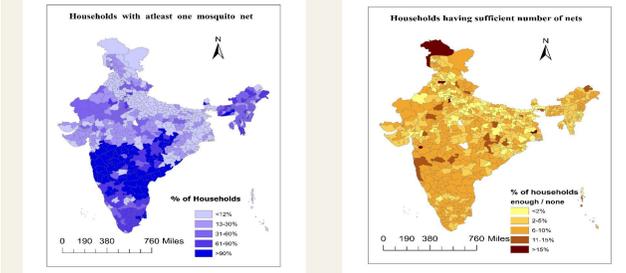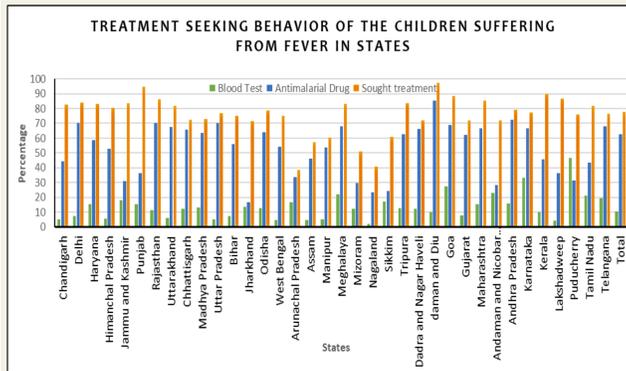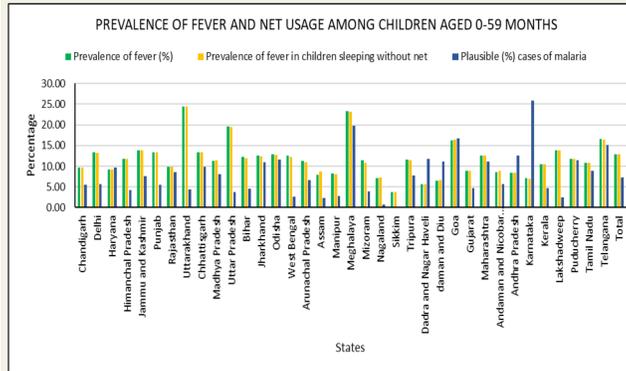
Statistical Analysis
❑ *Cross-tabs* are used to present the socio-demographic and economic differentials among Fever and treatment-seeking behavior for children aged 0-59 months in High Prevalence States. Its also used to calculate the plausible cases of malaria.
❑ *Pearson chi-square test* was used to understand the association between the predictor variables and the outcome variable.
❑ *Binomial logistic regression* was used to calculate the odds ratio for outcome variable.

Categorization of States based on Prevalence

High Prevalence States	Low Prevalence States	Moderate Prevalence States
Mizoram	Manipur	Gujarat
Meghalaya	Pondicherry	Nagaland
Orissa	Lakshadweep	Goa
Tripura	Kerala	Assam
Chhattisgarh	Bihar	Maharashtra
Jharkhand	Sikkim	Haryana
Arunachal Pradesh	Punjab	West Bengal
Andaman & Nicobar Islands	Jammu & Kashmir	Andhra Pradesh
Madhya Pradesh	Himachal Pradesh	Daman & Diu
Dadra & Nagar Haveli	Delhi	Uttar Pradesh
		Karnataka
		Rajasthan
		Chandigarh
		Uttaranchal
		Tamil Nadu

Results

PREVALENCE OF FEVER AND NET USAGE AMONG CHILDREN AGED 0-59 MONTHS

TREATMENT SEEKING BEHAVIOR OF THE CHILDREN SUFFERING FROM FEVER IN STATES

Households with atleast one mosquito net

Households having sufficient number of nets

Odds Ratio for factors influencing the occurrence of fever in children aged 0- 59 months

Predictor variable		Odds ratio (CI)
Age	Less than 6 months®	
	6-11 months	1.558 (1.4766, 1.6440)
	12-23 months	1.502 (1.4307, 1.5768)
	24-35 months	1.076 (1.0238, 1.1321)
	36-47 months	0.889 (0.8455, 0.9365)
	48-59 months	0.740 (0.7022, 0.7804)
Sex	Male®	
	Female	0.919 (0.8975, 0.9428)
Residence	Urban ®	
	Rural	1.056 (1.0225, 1.0242)
Education Level of Mother	No Education®	
	<5 years complete	1.306 (1.3069, 1.3798)
	5-7 years complete	1.170 (1.1250, 1.2177)
	8-9 years complete	1.149 (1.1038, 1.1972)
	10-11 years complete	1.151 (1.0981, 1.2078)
	12& 12+ years complete	1.151 (1.1009, 1.2045)
Wealth Index	Poorest®	
	Poorer	1.037 (0.9959, 1.0812)
	Middle	1.040 (0.9915, 1.0916)
	Richer	1.018 (0.9633, 1.0776)
	Richest	0.874 (0.8187, 0.93362)
Religion	Hindu ®	
	Muslim	1.208 (1.16599, 1.2521)
	Christian	1.414 (1.12896, 1.5510)
	Others	1.051 (0.9362, 1.1005)
Caste	Schedule caste®	
	Schedule tribe	0.8650 (0.8218, 0.9105)
	Other backward caste	1.008 (0.9761, 1.0425)
	Others	1.001 (0.9621, 1.0425)
Regions	North®	
	Central	1.580 (1.5070, 1.6579)
	East	1.017 (0.9624, 1.0760)
	North east	0.625 (0.5682, 0.6886)
	West	0.984 (0.9332, 1.0379)
	South	0.875 (0.8321, 0.9217)
Malaria Prevalence Status	Moderate prevalence®	
	High prevalence	0.782 (0.7511, 0.8149)
	Low prevalence	0.982 (0.9424, 1.0232)
Time of the Survey	Rainy season®	
	Winter season	1.274 (1.2114, 1.3412)
	Summer season	1.002 (0.9642, 1.0416)
Household has electricity	No®	
	Yes	0.973 (0.9329, 1.0154)
Toilet facility	Not Improved ®	
	Improved	1.060 (1.0250, 1.0979)
Source of drinking water	Unsafe ®	
	Safe	0.9502 (1.1543, 1.228)
Has mosquito net	No®	
	Yes	1.190 (1.1543, 1.2287)
Slept under mosquito net last night	No®	
	yes	1.164 (1.0938, 1.2390)

® reference category

Odds Ratio for factors affecting the Ownership of a Mosquito Net in a Household

Predictor Variables		Odds Ratio (CI)
Wealth Index	Poorest®	
	Poorer	1.594 (1.4963, 1.6989)
	Middle	1.962 (1.8368, 2.0974)
	Richer	2.614 (2.4393, 2.8030)
	Richest	3.302 (3.0690, 3.5530)
Religion	Hindu ®	
	Muslim	0.818 (0.7931, 0.8440)
	Christian	0.77 (0.7208, 0.8345)
	Others	1.193 (1.1309, 1.2589)
Caste	Schedule caste®	
	Schedule tribe	1.248 (1.1838, 1.3169)
	Other backward caste	1.052 (1.0211, 1.0854)
	Others	1.070 (1.00370, 1.1051)
Residence	Urban ®	
	Rural	2.196 (2.1450, 2.2483)
Malaria Prevalence Status	Moderate prevalence®	
	High prevalence	0.359 (0.3480, 0.3711)
	Low prevalence	0.748 (0.7237, 0.7748)
Time of the Survey	Rainy season®	
	Winter season	1.55 (1.4842, 1.6192)
	Summer season	1.15 (1.1179, 1.1870)
Source of drinking water	Unsafe ®	
	Improved	1.133 (1.0625, 1.2090)
Household structure	Nuclear ®	
	Non- nuclear	1.201 (1.1764, 1.2274)
Household type	kachcha®	
	Semi pucca	1.170 (1.0812, 1.2678)
	Pucca	0.745 (0.6846, 0.8096)
Persons sleeping per room	Less than one®	
	One- two persons	1.046 (0.9865, 1.1106)
	Three- four person per room	1.143 (1.0777, 1.2144)
	More than four persons	0.933 (0.8740, 0.9679)

Fever and treatment-seeking behavior for children aged 0-59 months in High Prevalence States

Background characteristics	%of children with fever	%children sought treatment	% Antimalarial drug taken	Antibiotic taken	Blood taken from child's finger/heel for testing
AGE					
<6 months	11.2***	71.2**	64.5	15.0*	12
6-11 months	16.5***	78.0**	69	17.7**	11.8
12-23 months	16.0***	75.2**	67.2	16.4*	13.8
24-35 months	12.5***	74.4**	67.3	18.3*	12.2
36-47 months	10.9***	72.6**	64	20.5**	15.5
48-59 months	8.9***	71.4**	64.3	18.7*	13.9
SEX					
Male	12.71**	75.2**	67.1	17.9	14
Female	12.04**	72.8**	65.3	17.9	12.7
RESIDENCE					
Urban	11.46*	80.3***	68	22.5***	14.4
Rural	12.45*	72.5***	65	16.8***	13.1
MOTHER'S EDUCATION					
No Schooling	10.90***	66.8***	63.5**	13.5***	13.2*
<5 Years	13.31***	73.9***	61.7**	19.4***	11.4*
5-7 Years	13.05***	76.7***	67.1**	18.7***	12.3*
8-9 Years	12.88***	75.8***	67.4**	17.9***	12.6*
10-11 Years	13.79***	78.9***	70.8**	20.1***	15.5*
12 or more years completed	12.78***	79.0***	68.3**	23.5***	16.4*
RELIGION					
Hindu	12.28***	74.2	65.8**	17.4**	13.1**
Muslims	13.28***	73.1	71.4**	20.8**	13.3**
Christians	15.23***	76.3	63.5**	23.5**	20.0**
Others	9.30***	65.7	70.1**	13.5**	8.1**
WEALTH INDEX					
Lowest	11.60***	66.7***	63.9**	13.7***	12.0**
Second	13.23	74.4***	66.3**	17.1***	12.9**
Middle	13.26	79.5***	70.1**	19.8***	14.1**
Fourth	12.78	82.2***	66.4**	22.4***	15.2**
Highest	11.3	79.7***	67.3**	27.1***	16.4**
CASTE/TRIBE					
Schedule Caste	13.05***	74.9***	64.3***	17.5	13.2
Schedule Tribe	11.60***	66.9***	59.9***	16.7	12.7
Other Backward Caste	12.42***	77.4***	71.0***	18.1	14
Others	12.85***	76.6***	67.1***	20.1	12.1
TOTAL	**12.4**	**74**	**66.2**	**17.9**	**13.4**

Conclusion

▪ The significant burden of malaria is there in some Northeastern and Eastern states. States such as Odisha, Jharkhand, Mizoram, Tripura bears the maximum burden of this disease. The prevalence of the disease is highly dependent on the geographical and climatic conditions of the place.
▪ Mosquito net availability and sufficiency are marginally low in all the regions except northeast Indian states.
▪ Treatment seeking behavior is not impressive in all states of India. Need of proper health care and blood testing facility is there.

Discussion

▪ In a country like India, there is a need to address the requirement of proper health facilities along with human resources to ensure the implementation of all malaria eradication programs on grass root levels. The socio-economic disparities of net possession, usage and treatment-seeking behavior for malaria should be minimized.
▪ The knowledge of the actual burden will help in achieving goals, planning and resource allocations.