



Epidemiological study of Malaria incidence in the Lakhimpur District of Assam

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ABSTRACT

Malaria is one of the most severe problems faced by the world even today. The objective of the present report was to make a comparative epidemiological study for the year 2009 and 2010 of malaria endemic blocks of Lakhimpur district of Assam, India to assess the malaria situation. The data have been collected from all block PHC's under Lakhimpur district. From the report of malaria cases for 2000-2011, Plasmodium vivax was the predominant parasite species except 2011 where Plasmodium falciparum was the majority parasite. Comparatively we got lowest API and SFR for the year 2010 than 2009. Amongst PHC's, we saw that the Boginadi PHC, which is a tribal dominated and share border with Arunachal Pradesh, was worse affected by malaria incidence. It was observed that PHC's sharing interstate border had many more cases compared to those having sharing inter district border. Also we got high malaria cases in foothill/forest fringe areas, where health infrastructure/health awareness is weak and transmission of the disease is high.

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Introduction

Assam is the most populous (27.85 million) and area wise second largest (78,523 km²) of the eight states in the north eastern region of India. It is a place with lot many geographic variations. Most areas/districts in the state (Assam) have heavy rainfall, ranging from 2 to 3 meters and floods occur annually in some districts like Lakhimpur, Dhemaji etc. Minimum precipitation associated with monsoon occurs from May to September and is preceded by pre-monsoon showers in March and April. The relative humidity ranges from 60% to 85%. Temperature ranges from 10°C to 26°C in winter (Nov- Feb) and from 23 °C to 35 °C throughout rest of the year.

Malaria is a disease which is incident in all the seasons of a year but the incidence peaks during May - Aug, which corresponds to the month of heavy rainfall. Malaria is a major public health concern in the northeastern states of India. In case of Assam also, it is regarded as one of the major epidemics in the region and it contributes more than 5% of the total cases recorded in the country annually. Malaria transmission is perennial and under the influence of several vector species, Anopheles minimus was most abundant than other species in Assam [9]. Both Plasmodium falciparum (PF) and Plasmodium vivax (PV) occur in abundance, but Plasmodium falciparum (the killer parasite) accounts for > 60% of the cases [1, 2]. Almost all districts of Assam report malaria attributable morbidity and mortality annually, and are vulnerable to focal outbreaks of the disease. Every death reported to have been due to malaria was confirmed to have been associated with a Plasmodium falciparum infection. Chloroquin resistant malaria is widespread in the state, and decreased sensitivity to other anti-malarials has been documented [3-5]. Malaria is spreading to new areas where there is enhanced morbidity and mortality [6]. One hundred twenty two of 156 primary health centers in Assam are identified as being high risk for malaria based on the selected

epidemiologic criteria, and nearly 65% of the total population of the state is estimated to be living in high-risk areas. Districts bordering other states in the northeastern region or countries including Bhutan and Bangladesh are at a greater risk of focal outbreaks due to inadequate health infrastructure and lack of coordinated vector control operations [7]. The disease is unevenly distributed across the state and associated with varying intensity of malaria transmission and risk factors. The comparative epidemiological data on malaria incidence for the preceding years 2000-2011 of Lakhimpur district as reported by Lakhimpur health services are presented in figure 1.

The objective of the present report was to make a comparative epidemiological situation of malaria –endemic blocks of Lakhimpur district of Assam for the years 2009 and 2010.

Methodology and justification of selecting it:

In our present study, the study area is Lakhimpur district. The reason behind the selection of the study area, Lakhimpur district, may be accounted as follows:

The state Assam can be broadly divided into three physiographic units, namely the Brahmaputra Valley in the north, the Barak valley in the south and the hill regions that lie between the two valleys of the total of 28 districts in the state, 21 of which either share either interstate border or an international border or both. All districts report malaria cases, but the disease is unevenly distributed across the landscape associated with varying intensity of transmission and population groups those at risk. Based on the annual parasite incidence (API), defined as number of confirmed cases per thousand of population, ten districts reported less than two cases. For all other districts (44% of the total population), API was > 2, a criterion which is considered to be sensitive malariometric indicator for residual spray interventions against vector populations [8]. So, at first researcher had selected upper Assam of Brahmaputra valley purposefully. Among the districts of

upper Assam the API is the highest in Lakhimpur, which is 3. The same for other districts in upper Assam are - Dibrugarh-0.02, Golaghat-0.4, Dhemaji-2, Jorhat-0.1, and Tinsukia-1. Also we have observed that as a whole the API of Assam is 2.75. [7]. So, Lakhimpur district has been selected.

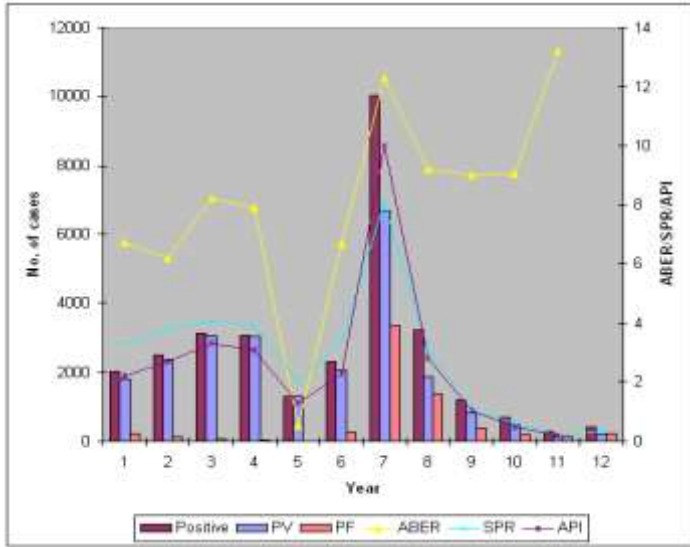


Figure 1: Comparative epidemiological data on malaria incidence for the years 2000-11 in Lakhimpur district of Assam. (Source: Lakhimpur head quarter.)

Study area: The name Lakhimpur is believed to be originated from the word “Lakshmi”, the goddess of prosperity. The district is mainly dependent upon agriculture and paddy. Paddy is regarded locally as “Lakhimi”. The word “pur” means “full”. Lakhimpur therefore means full on paddy or the place where paddies are grown abundantly. Lakhimpur District is situated on the North-East corner of Assam. The district lies between 26⁰48’ and 27⁰53’ northern latitude and 93⁰42’ and 94⁰20’ east longitudes (approx). It is bounded on the North by Siang and Papumpare district of Arunachal Pradesh and on the East by Dhemaji District and Subansiri River. Majuli sub division of Jorhat district stands on the southern side and Gahpur sub division of Sonitpur District on the west. The district covers an area of 2977 sq. km. out of which 2957 Sq. km is rural and 20 Sq. km is urban. The district is divided into two sub divisions viz North Lakhimpur and Dhakuakhana. There are 9 nos of Blocks Viz Narayanpur, Bihpuria, Karunabari, Nowboicha, Telahi, Lakhimpur, Boginadi, Ghilamora and Dhakuakhana in Lakhimpur district. The blocks are consists with 1675 no’s of villages.

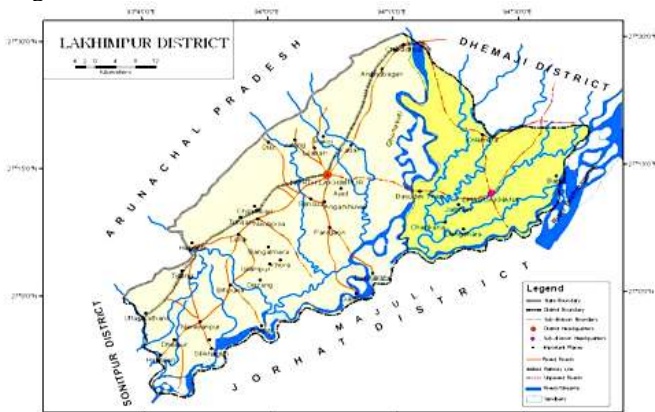


Figure 2: Map of Lakhimpur district showing boundaries with bordering districts and state

The study area comprised of six block level primary health care centers (PHCs) – Dhalpur, Bihpuria, Nowboicha, Boginadi, Ghilamora, Dhakuakhana with about 12,09,825 population’s (2,11,098 no’s of population are tribal) in Lakhimpur district. The PHC’s are consists with 156 no’s of sub centre. The climate of the district is warm, subtropical, the temperatures range from 4^oc to 32^oc in winter (Nov- Feb) and from 14^oc to 38^oc throughout rest of the year. The relative humidity varies from 60% to 85%. Most areas in the state have heavy rainfall, and floods occur annually.

Tools and data:

The data used in the present study is secondary in nature. The data have been collected from all block PHC’s under Lakhimpur district of Assam as well as from the district head quarter.

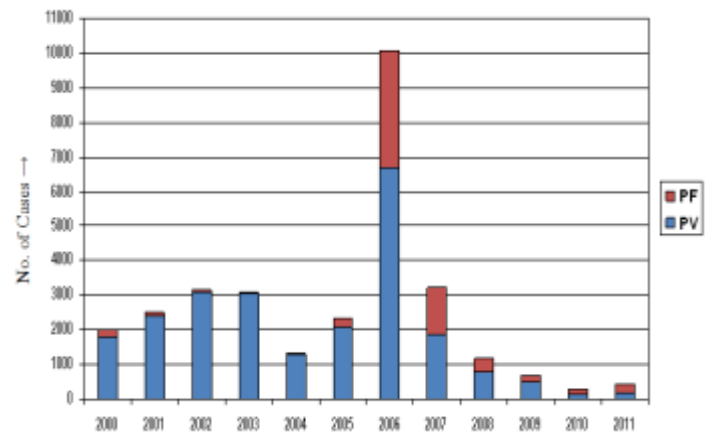


Figure 3: Comparative PV and PF Data on Malaria Incidence in Lakhimpur District of Assam for the year 2000-2011

To analyse the data epidemiological measures API (Annual Parasite Incidence), SFR (Slide Falciparum Rate) and SPR (Slide Positivity Rate) have been used in addition to simple statistical tools like diagram, percentage etc.

Result and Discussion:

In our present data on malaria cases for years 2009, 2010 and 2011 have been used. However, for comparative purpose two years (2009 & 2010) data have been used due incomplete information. From the report of the malaria cases for 2000-2011, Both Plasmodium falciparum and Plasmodium vivax occur in abundance, but Plasmodium vivax was the major parasite in the district, only for the year 2011, Plasmodium falciparum outnumbered the Plasmodium vivax cases. (Show in fig.3). Out of 6 PHC’s in the district, 3 PHC’s, namely Boginadi, Nowboicha and Dhalpur share an interstate boarder. There is report malaria cases form all PHC’s in the district. If we compare Plasmodium falciparum and Plasmodium vivax cases for last three years in PHC’s wise then we find no Plasmodium falciparum cases for Nowboicha PHC, where as for the Bihpuria, Boginadi and both Dhakuakhana and Boginadi PHC’s the Plasmodium falciparum cases outnumbered the Plasmodium vivax cases for the years 2009, 2010 and 2011 respectively.

Form table it is observed that in 2009, based on the annual parasite incidence (API), four PHC’s reported less than 0.5 cases. For other two PHC’s we had, API was > 0.5. For the year 2010 we found that, API was ≤ 0.5 If we want to classify the areas of Lakhimpur District on the basis of Annual parasite rate (API) given by district action plan on national vector borne disease control programme in village level then we got that for the year 2009 of the total of 1675 villages in the district, 759 villages reported less than two cases.

Table: Comparative epidemiological situation of malaria-endemic PHC's of Lakhimpur district based on the data for the years 2009 and 2010

Name of PHC	Year	Population (% of population at risk)	Number of blood smears examined (% of population checked)	Number and percentage of Blood smears		Percent of malaria positive cases for P.falciparum	Positive for P.vivax	API
				Positive for Malaria Parasite (SPR)	Positive for P.falciparum (SFR)			
Dhakuakhana	2009	161085 (10)	3875 (2.41)	16 (.4)	0 (0)	0	16	0.09
	2010	161807 (19)	9280 (5.7)	5 (.05)	0	0	5	0.03
Ghilamora	2009	100784 (16)	3914 (3.89)	5 (.1)	0 (0)	0	5	0.04
	2010	100816 (39)	5597 (5.5)	2 (.03)	0	0	2	0.01
Boginadi	2009	228750 (60)	27867 (12.18)	392 (1.4)	80 (.29)	20.4	312	1.71
	2010	239480 (53)	35654 (14.8)	139 (.3)	84 (.24)	60	55	0.5
Nowboicha	2009	290345 (48)	35273 (8.7)	38 (.1)	19 (.05)	50	19	0.1
	2010	290998 (22)	35779 (8.7)	6 (.010)	0	0	6	0.02
Bihpuria	2009	220726 (36)	33235 (15.05)	84 (.2)	50 (.15)	59.5	34	0.3
	2010	222746 (44)	41831 (18.7)	68 (.16)	26 (.06)	38.2	42	0.3
Dhalpur	2009	193545 (41)	14164 (7.31)	137 (.9)	33 (.23)	24	104	0.7
	2010	193978 (34)	32176 (16.5)	69 (.2)	20 (.06)	28.9	49	0.3
Total	2009	1195235(39)	108329 (9.06)	672 (.6)	182 (.17)	27	490	0.5
	2010	1209825(36)	160317 (13.2)	289 (.18)	130 (.08)	44.9	159	0.2

For all other villages (55% of the total population), API was ≥ 2 , (270 villages reported greater than 10 cases, 273 villages reported 5-10 cases and 373 villages reported 2-5 cases). While calculating the API sub centre wise, we saw that out of the total 156 sub centers in the district, 94 sub centers reported ≥ 2 cases, (where 17 sub centers reported greater than 10 cases), a criterion which is considered to be a sensitive malaria metric indicator for residual spray interventions against vector population. Comparatively for the year 2010 we got lowest API, where out of the total 1675 villages, 1400 villages and of the total 156 sub centers, 131 sub centers reported less than one cases.

Amongst PHC's, we saw that the Boginadi PHC, which is a tribal dominated and forest fringed area, was worst affected by malaria incidence. For the year 2009, we got 392 malaria positive cases out of which 312 cases are Plasmodium vivax and 80 cases are Plasmodium falciparum. In the same year of the total of 424 villages in Boginadi PHC, 53 villages API reported was greater than 10 cases, 125 villages reported 5-10 cases and 95 villages reported 2-5 cases. Comparatively we found lowest malaria positive cases in 2010, here we got 139 malaria positive cases, out of which 84 cases are Plasmodium falciparum and 55 cases are Plasmodium vivax. Also, we saw that out of the total of 156 sub-centers in the district, the malaria incidence cases were highest in Boginadi sub-centre, which is located on Boginadi PHC. Here we got 60 malaria incidence cases, out of which 15 cases were Plasmodium falciparum and 45 cases were Plasmodium vivax and out of 41 malaria incidence cases, 28 cases were Plasmodium falciparum and 13 cases were plasmodium vivax for the year's 2009 and 2010 respectively.

Comparatively PHC's of tribal- dominated population, particularly Boginadi (27% tribal population) was more malaria prone with API 1.71 and 0.5 for the year's 2009 and 2010 respectively, than other PHCs, where in 2009 the PHCs of Ghilamora and Dhakuakhana (Where the PHCs have only 7% and 4% tribal population) were affected the least reporting the

lowest API with 0.04 and 0.09 respectively. In the year 2010, from PHCs we got least reporting with the lowest API (0.01 - 0.3). As many as 91 and 55 sub centers of the existing total of 156 and 733 and 605 villages of the existing total of 1675 have been identified as high risk area in 2009 and 2010 respectively, given by District Action Plan on National vector borne disease control programme of Lakhimpur District. In Lakhimpur district, approximately 39% and 35% of the total population was estimated to be at high risk for malaria for the year 2009 and 2010 respectively. As much as >53% of the population (mostly tribal) of Boginadi PHC was considered at high risk for malaria and for other three tribal dominated PHCs, it ranges from 34% to 44%. For the remaining two PHC's, it was <22% of the population that was estimated to be at high risk.

For the year 2009 (2010), Comparatively the PHCs, which share border with Arunachal Pradesh, particularly, Boginadi and Dhalpur were more malaria prone with API 1.71 (0.5) and 0.7 (0.3) respectively than the other PHCs (except Bihpuria) which share border with inter-districts. (API ranges from 0.01 - 0.1).

In 2009, out of total blood smears checked for malaria parasite, the prevalence rates for those positive for malaria and those positive for Plasmodium falciparum (SFR) were 0.6% and 0.17% respectively, where for the year 2010 we got only 0.18% and 0.08% respectively but were noted to be variable among PHC's in Lakhimpur district (Table). In 2009 for two PHCs, namely Boginadi and Dhalpur, the smear parasite rate (SPR) was > 0.6% and for other PHCs, SPR varied from 0.1% to 0.4%. Similarly for the year 2010 we got highest SPR (0.3) in Boginadi PHC and SPR varied from 0.01 to 0.2 in other PHCs.

Concluding Remarks:

The study revealed that although malaria inflicts all age groups of both sexes, certain localities in the given geographic area contribute significantly more cases than others. Earlier study made by Dev et.al, also point out that malaria incidences were reportedly higher in villages located nearer (< 1 km) to the

vector breeding habitat and foothills [9]. Variation exists down to the household level, and it is the knowledge of location of such individual/population groups at high risk that can help malaria control measures to be targeted for desired level of transmission reduction. It was observed that PHCs sharing with interstate border had many more cases compared to those having sharing inter districts border. These borders are highly porous and health care facility is very poor. Also, we got high malaria cases in foothill/forest fringe areas, where health infrastructure/health awareness is weak and transmission of the disease is high.

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