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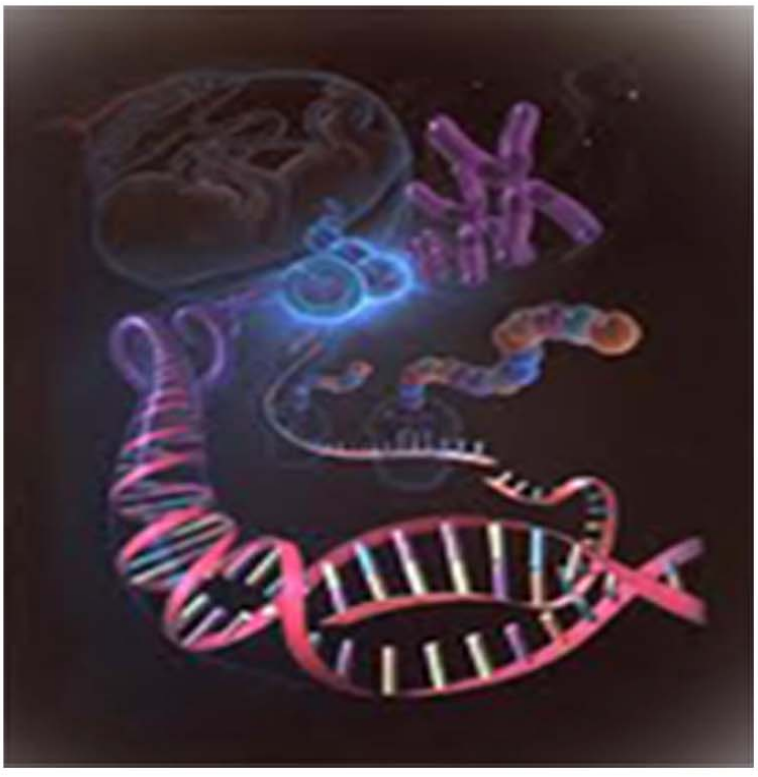

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Research Paper

PREVALENCE OF MALARIA IN LUMDING TOWN, NAGAON DISTRICT OF ASSAM, INDIA

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An analysis of malaria prevalence and its trends in Lumding town of Nagaon district, Assam over last five years from 2010-2014 (up to June, 2014) shows the occurrence of malaria. The transmission of malaria parasite takes place through only two *Plasmodium* species of *Plasmodium falciparum (PF)* and *Plasmodium vivax (PV)* and the prevalence of *Plasmodium falciparum* and *Plasmodium vivax (PV)* was found to be high. The study reported the Annual Blood Examination Rate (ABER) and Annual Parasitic Incidence (API) of last five years, which showed the prevalence of both the parasite in the study area. Special measures are necessary to prevent the transmission of malaria in the study area.

Keywords: Malaria, *Plasmodium falciparum, Plasmodium vivax.* ITNs, ABER, API

INTRODUCTION

The forests being the reservoir of the malarial disease, have been facilitating extensive malarial transmission and the challenge is so great that even the World Health Organization had to abandon its goal of total eradication of malaria in 1969 and start the current global campaign "Rollback Malaria" (Sharma, 1991). Controlling malaria in forest areas has remained a challenge in many parts of Asia and South America (ICMR). In the central Vietnam higher percentage of malarial attack takes place in the forest area (Erhart *et al.,* 2005; Hanibelsz, 2004) and the same is the case in different parts of India also-higher malaria incidence in forest areas. The northeastern part of India, to which the state of Assam belongs, is one of the regions having higher annual parasite incidence (Erhart *et al.,* 2005; ICMR).

The National Vector Born Disease Control Programme (NVBDCP) of the country identifies Nagaon district as one of the eight malaria endemic districts in the state of Assam. The thrust on malaria is important in Assam, as with only 2.5% of country's total population, it records 5% of the total malaria cases and over 20% of the total malaria deaths of the country. Lumding town is surrounded by forest where the inhabitants are mainly tribal people, the Karbi, Chakma, Bodo, Mikir, Kuki and with some population of Nepalese

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origin. The socioeconomic condition of villagers is poor and the people solely depend on paddy cultivation and collection of forest products. The villages inside the forests are scattered, thinly populated, and backward in communication. These villages are difficult to approach and remain inaccessible during rainy season, which is peak period of malaria in the town.

Rising number of *plasmodium falciarum* parasite that often lead to fatality combined with increasing resistant to chloroquine, inaccessibility and remoteness of the severely malaria prone pockets and other factors have made citizens in those regions more vulnerable. The basic objective of the study is to analyze the malaria situation in Lumding town of Nagaon district. The geographical area of Lumding is 780 sq. km and is bounded by $25^0 45^/$- $26^0 45$ North latitudes and $91^0 50^/$ -$93^0 20^/$East Latitudes. The town is surrounded by contiguous forest, called Lumding Reserve Forest (RF). Lumding RF with an area of 22,403 ha is important wild life habitat in Assam's Nagaon district. It stretches through Lanka and Lumding ranges of Nagaon South Forest Division and was notified as part of Dhansiri Lumding Elephant Reserve in 2003. The Lumding RF is also connected to the Marat- Longri Wild Life Sanctuary in Karbi Anglong district in the east and to Langting Mupa RF in the west in the North Cachar Hills district of Assam. Its approximate population is 50,570 (2011 census). There is a higher prevalence of malaria in forest area than the non-forest area (Nath and Dimacha).

Endemic diseases have been prevalent in the town for a long time. Vector born disease other than malaria is rare but malaria remains to be endemic and creates problems. Malaria is endemic in most North Eastern States of India with *Plasmodium falciparum* and *Plasmodium vivax* being the predominant parasite (Dev *et al.,* 2001, 2004; Erhart *et al.*, 2005). Enhanced morbidity takes a heavy toll on human life because disease outbreaks are an annual event (Dev *et al.,* 2001, 2004; 2006). The South-West monsoon that brings heavy rains would start only during May, and the disease usually follows monsoon.

The town has a moderate variation of temperature from 14-38^0C, January and August being the coldest and hottest months respectively. The town has low rainfall (39-200 mm) and high humidity (78-97%). These together built up a favorable condition for transmission of malaria that subsists in the town throughout the year, the monsoon season, from May to September, being the pick period of the disease.

MATERIALS AND METHODOLOGY

The study was conducted during 2010 to June, 2014. The study design was a retrospective cohort study. Retrospective study means to take a look back at event that already have taken place. The study was conducted by survey in the Railway Hospital, Lumding, State Hospital (FRU), Lumding and Health and Malaria Inspector Beat Office, N F Railway, Lumding by visiting three times per month during study period.

Sources of Data Collection

Data on morbidity and mortality attributable to malaria for the past 5 consecutive years was collected from the Railway Hospital, Lumding, State Hospital (FRU), Lumding and Health and Malaria Inspector Beat Office, N F Railway, Lumding. The data was collected directly from the prospective units and also cross checked with

data from the Base Hospital. The same was taken into account to measure morbidity and mortality attributable to malaria. Annual Blood Examination Rate and Annual Parasitic Incidence have been calculated by the following formula:

ABER (Annual Blood Examination Rate) = (No. of Slides examined/population) X 100

API (Annual Parasitic Incidence) = (Confirmed cases during 1 yr /population under surveillance) X 1000

Statistical Methods and Appliances

To draw meaningful conclusion, relevant statistical tool like MS-Excel was used to perform percentage analysis, mean and pie chart, etc.

RESULTS

Malaria Cases: During the epidemiological study period 2010-2014 (up to June, 2014) a total of 21,847 blood slides were examined for malaria cases and out of these 64 slides were tested positive. Data on morbidity attributable to malaria and the relative proportion of *Plasmodium falciparum* and *Plasmodium vivax* infected over the past 5 consecutive years is presented in Table 1. Out of these, 40-50% were *Plasmodium falciparum* infections ; the remaining were *Plasmodium vivax* infections. Overall malaria incidence shows a significantly increasing trend during the period of study.

Annual Blood Examination Rate (ABER): During the study period ABER has recorded. In 2010 the ABER was 18%, in 2011 it was 9.6%, in 2012 10%, in 2013 it was 17% and in 2014 (up to June) the ABER was 5%.

Annual Parasitic Incidence: Contrary to the ABER in the study area the annual parasitic incidence is moderate and constant throughout the study period except in the year 2013, when the annual parasitic incidence was too low (1.5) but it was again increasing during the year 2014.

Dominant Malaria Species: *Plasmodium vivax* has dominated over *Plasmodium falciparum*. During the study period (2010-2014) PV cases exceeds over PF. PF cases were declining from 2010-2013, but within the six months of 2014 it was increasing and became equal with the PV cases.

Table 1 shows year wise (2010-2014 [upto June]) total blood slides examined, total malaria affected and among them the *Plasmodium falciparum* and *Plasmodium vivax* affected and

Table 1: Malaria Attributable Morbidity and Relative Proportion of *Plasmodium falciparum* and *Plasmodium vivax* Infections in the Study Area

Year	Total Blood Slides Examined	Total Malaria Affected	Pf Affected	Pv Affected	Pf%	Pv%
2010	5206	20	8	12	40%	60%
2011	4862	16	6	10	37.5%	62.5%
2012	5012	18	7	11	38.9%	61.1%
2013	5106	8	2	6	25%	75%
2014 (Up toJune)	2623	8	4	4	50%	50%

Source: State and Railway Hospital, Lumding

Year Wise ABER and API in the Study Area		
Year	ABER	API
2010	18.0	3.8
2011	9.6	3.3
2012	10.0	3.5
2013	17.0	1.5
2014 (up to June,2014)	5.0	3.0

the percentage of infected person in the study area. Result shows an increasing incidence of malaria in the study area.

Over the 5-year period, it was observed that 3.60% to 7% of all hospital admissions were attributable to malaria. Disease burden due to malaria as a proportion of all hospital admissions also generally shows an increasing trend, though not significant (Table 2). Of the *P. falciparum* infections, 3% to 5% developed complicated malaria necessitating a transfer to the Command Hospital. There was no mortality due to malaria during the period of study.

DISCUSSION

The official statistics of malaria death in Assam in 2006 was 304, which came down to 150 in 2007, 75 in 2010, according to Dr. Kamal Khound, sub-divisional medical officer in charge of vector borne disease control, Guwahati. There is a large scale under reporting of the disease in remote and inaccessible pocket in the state. Free distribution of ITNs (insecticide treated nets) to

Table 2: Relative Disease Burden Attributable to Malaria in the Study Area

Year	Total Blood Slides Examined	No. of Admissions Due to Malaria	Disease Burden Due to Malaria (%)
2010	5206	47	3.60
2011	4862	85	7.00
2012	5012	82	5.78
2013	5106	59	4.20
2014(up to June,2014)	1661	85	5.34

Figure 1: Total Blood Slides Examined in 2010

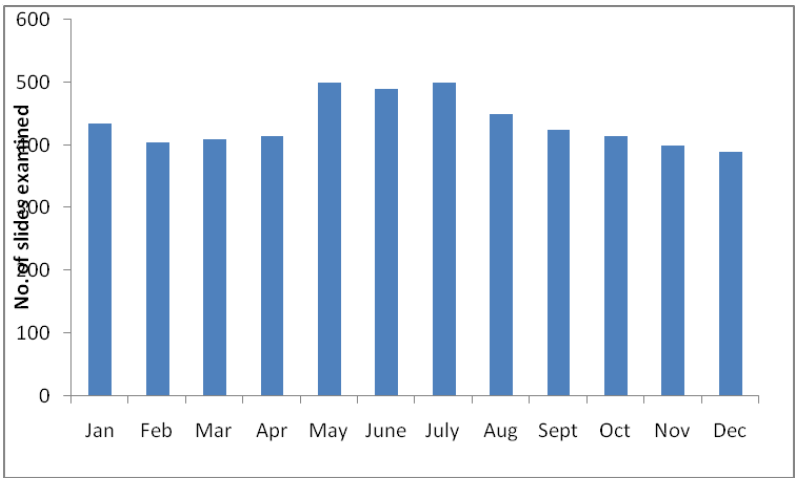


Figure 2: Total Blood Slides Examined in 2011

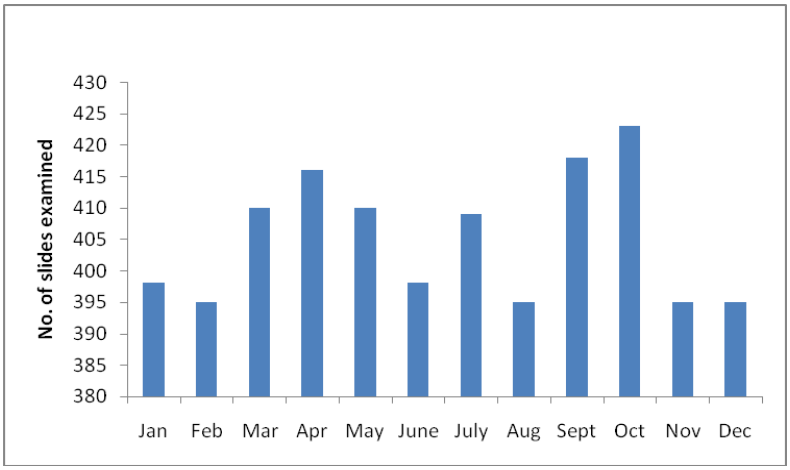


Figure 3: Total Blood Slides Examined in 2012

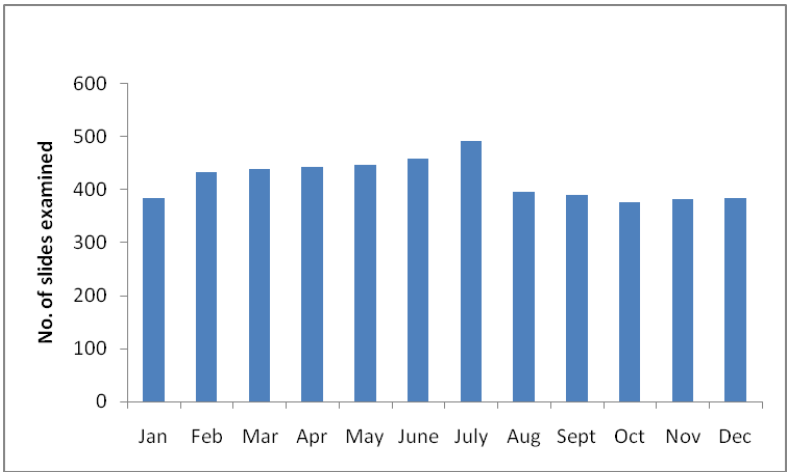


Figure 4: Total Blood Slides Examined in 2013

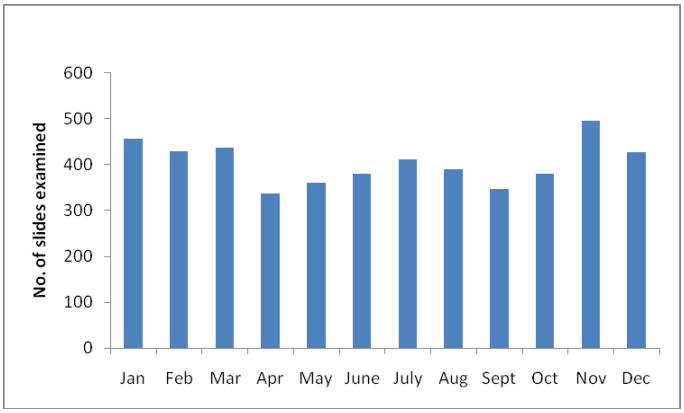


Figure 5: Total Blood Slides Examined up to Six Months of 2014

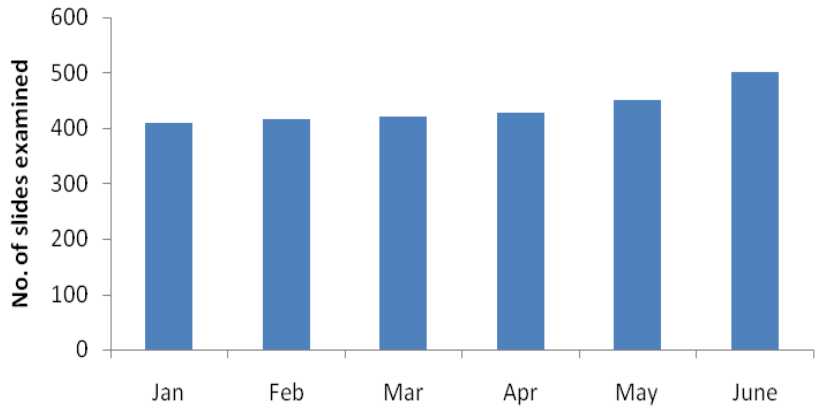


Figure 6: *Plasmodium vivax* Affected Percentage During Last Five Years

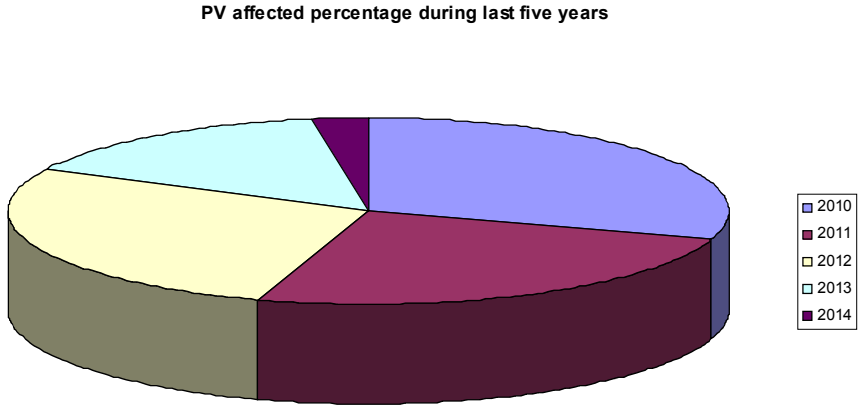
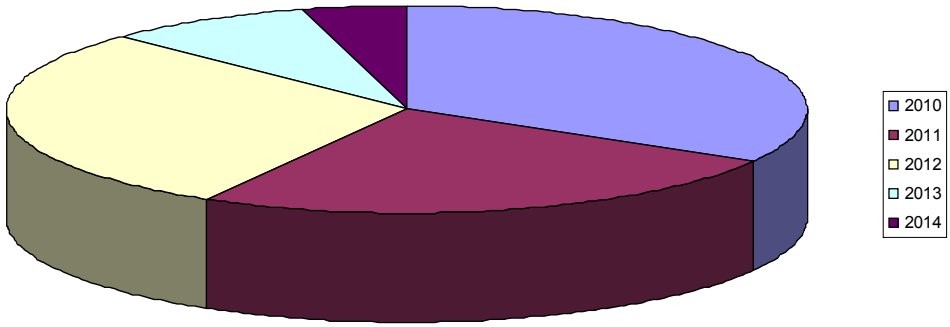


Figure 7: *Plasmodium falciparum* Affected Percentage During Last Five Years



poor families has been one of the instrumentals in combating malaria proliferation in Assam The thrust on malaria is important in Assam, as with only 2.5% of country's total population, it records 5% of the total malaria cases and over 20% of the total malaria deaths of the country. Rising number of *plasmodium falciarum* parasite that often lead to fatality combined with increasing resistant to chloroquine (Gogoi *et al.,* 1995). Inaccessibility and remoteness of the severely malaria prone pockets and other factors have made citizens in those regions more vulnerable. The use of Rapid diagnostic kits helps in timely detection and treatment of malaria (Nath *et al.,* 2012).

Currently, 2.5 to 3 million cases of malaria occur in India annually as per the available data. Most areas in Assam are considered high risk for acquiring malaria. There is a heavy parasite load in the local population in most parts of the state (Dev *et al.,* 2001). Areas with international and inter-state border in the state are more prone to malaria. Due to peculiar climatic condition with an average of 200-250 rainy days, topography and terrain the entire northeastern region including Assam is rich in flora and fauna sheltering large varieties of mosquitoes. As many as 130 species of mosquitoes including 37 anophelines and 93 culicines belonging to 12 genera have been recorded in the region. Assam, being the largest state of the region contributes maximum number of malaria positive cases of the region with over 60%. Close contact and free movement of people in bordering areas make these pockets more vulnerable to malaria.

The data presented here is strongly suggestive of the trend of malaria among the people of Lumding in Assam. Once upon a time, Lumding was high risk pocket of malaria, but after the implementation of Government strategies for Malaria Eradication Program the trend of malaria is decreasing but it is still not completely eradicated or controlled. Malaria eradication is defined as the permanent reduction to zero of the worldwide incidence of malaria infection caused by a specific agent; i.e., applies to a particular malaria parasite species.

In the study area the disease burden was highest in 2011 (7%) whereas lowest was in 2010 (3.60%) but in 2012 -2014 (up to May, 2014) the disease burden was again increasing. But there was no any report of death occurred due to malaria incidence in the study area. It is quite probable that few cases would have been missed due to non reporting. A few possible reasons for the increase in the incidence of malaria among civil and army personnel during the period of study are discussed below:

a. Over the years, case detection has increased because of better detection facilities in the form of paracheck kits (Rapid Detection Kit for *P. falciparum* and *P. Vivax* malaria infections) that have been provided to all State Hospital and Railway Hospital.

b. The possibility of an increase in the mosquito population cannot be ruled out, however, that needs to be validated by carrying out studies on vector bionomics.

c. Over the years, troops are being exposed to more mosquito bites because of the intensified counter insurgency operations in the thick jungles of Assam, which are heavily infested with mosquitoes.

d. Finding increase in malaria incidence in the local civil population of Lumding, Assam the

study has been carried out. This will, however, need to be validated by obtaining data from the Joint Director of Health Services (Malaria) of the state of Assam and comparing it with the data from this study. *Plasmodium falciparum* and *Plasmodium vivax* is the predominant parasite in the study area, whereas, *Plasmodium falciparum* is predominant in Orissa and in the tea estates of Assam (ICMR; Sharma, 1991; Mahapatra *et al.,* 1998).

CONCLUSION

The analysis of malaria data of five years in Lumding town of Nagaon district, Assam for observing trends reveals that malaria situation in the town still persists casting a gloomy picture in the town. Despite the malaria department's improved control measures such as comprehensive programs of vector control, surveillance and treatment and services of NRHM, there is still a preponderance of the disease in the town and the situation is under control when compared to the state situation. Various important topographical, operational and environmental factors contributing to the incidence of malaria in this population have been discussed. Since it is the pattern of the disease to decline for some years and then rise up again, there should be enough preparation during remission period so that the health departments can combat the disease when it takes to rise again in the following years. The study population, though comprising of common people, the army people in the state of Assam is also reported as malaria affected and where the problem is likely to be severe than civil population of the study area (Patra and Dev, 2004).

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The authors are thankful to the authorities of National Vector Born Disease Control Office, Lumding, the Railway Hospital, Lumding, State Hospital (FRU), Lumding and Health and Malaria Inspector Beat Office, NF Railway, Lumding, for providing the epidemiology situation report on malaria and related information.

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