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Recent Scenario of Malaria in Dima Hasao District of Assam, India

Dr. Tara Nandi Majumdar[1] and Madhumita Daolagupu[2]

Author Info:
1
Associate Professor,
Department of Zoology,
Haflong Government College,
Haflong, Dima Hasao, Assam,
India. 094353-74340
Email:
tnandimajumdar@ymail.com
2
Associate Professor,
Department of Zoology,
Haflong Government College,
Haflong, Dima Hasao, Assam,
India. 094350-78288
Email:
madhumitak22@gmail.com

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Corresponding Author:

Madhumita Daolagupu

Abstract

A study was carried out to assess the recent scenario of malaria in Dima Hasao, the hill district of Assam as a whole and also in Haflong town, the headquarters of the district from 2008 to 2013. The study revealed a high incidence of malaria in first three years of study (2008-2010) both in the district level and Haflong town with API ranging from 10.27 to 16.05 and 5.3 to 16.78 respectively.

In 2010, malaria incidence was the highest in Haflong town which coincides with the very high annual average rainfall in Haflong in the same year.

From 2011, there was a remarkable decline in the incidence of malaria and API came down to 3.95 in the district level and 1.45 in Haflong town in 2013. This might be due to the changes in some environmental conditions and climatic factors that took place in the study area during the period and effective implementation of malaria eradication programme launched by Central and State Government.

Keywords: *Malaria, API, Rainfall, Haflong, Dima Hasao.*

INTRODUCTION

Malaria is a disease of global concern. The World Health organization (WHO) has reported a worldwide annual incidence of 247 million cases and malarial mortality of one million per year (WHO, 2008).

India contributes about 70% of malaria in the South-East-Asian Region of WHO. India alone annually reports about two million cases. About 1000 deaths are attributed to malaria every year in India.
Malaria is endemic in most of the North East India including Assam (Singh Pardal *et.al*., 2009). In North Eastern states, malaria is caused mainly by two *Plasmodium* species, viz. *P. vivax* and *P. falciparum* (Yadav *et al.*, 2012).

The proportion of *P. vivax* and *P. falciparum* varies in different parts of India. In national level, *P. vivax* is the dominant infection and accounts for 60-65% cases whereas *P. falciparum* contributes 30-35% cases of malaria (Sharma, 1999). On the contrary, *P. falciparum* is the predominant parasite in North East India accounting for about 86% to 98% of Malaria. The high burden populations are ethnic tribes living in the forested pockets of the North Eastern states (Dev, 2006).

Dima Hasao district of Assam is a hill district mostly covered by forest area. A number of water bodies both lotic and lentic are there which serve as breeding ground for *Anopheles* mosquito, the vector of *Plasmodium* spp. Inhabitants are mostly tribal people practicing Jhum cultivation. Heavy rainfall, optimum temperature range and humidity make the area at high risk for incidence of malaria at large scale.
No published account of the malarial scenario in the district is available so far. It is difficult to adopt an appropriate control measure without a correct picture of malarial incidence in the district. Therefore, the present study was conducted with the aim of estimating the present burden of malaria in entire Dima Hasao district as well as in Haflong town, the headquarters of the district to compare the scenario of malaria in district level with that in the urban area like Haflong.

MATERIALS AND METHODS

Study Area: Dima Hasao district is one of the two hill districts of Assam. It is situated at the southern part of Assam and is bounded by Nagaland and Manipur state in the east, Cachar district of Assam in the south, Meghalaya state and a part of Karbi-Anglong district in the west and another part of Karbi-Anglong and Nagaon district in the north.

Geographical area of the district is 4890 sq.km. It lies between $25^0 3^/$ N and $25^0 47^/$ N latitude and $92^0 37^/$ E and $93^0 17^/$ E longitude.

Altitude of (a) eastern region of the district is 600-900 meters and of (b) northern region is 1000-1866 meters above sea level.

Though major portion of the district is covered by hills, the main range is Borail. It consists of undulating hills, valleys and small patches of plain lands. Forest cover of the district is about 4626.06 sq.km [Source: Official website of National Information Center, Dima Hasao, Assam]. The main rivers here are Kapili, Dehangi, Diyung, Jatinga, Jenam, Mahur and Langting – all originating from the Borail.
The climate of this district is moderate with an average temperature range of 7.2^0C to 22.7^0C, though in Haflong town, the average temperature range is 8.3^0C to 25.7^0C. Annual average rainfall varies from 2200 mm to 2700 mm. The average relative humidity varies from 73% to 84% (District website developed by National Information Center, Haflong).
Data collection and analysis: Raw data regarding incidence of malaria in the entire

district as well as in Haflong from 2009 to 2013 were collected from the official records of National Rural Health Mission (NRHM), Dima Hasao. Collected raw data pertaining to the incidence of malaria were computed and malariometric parameters like API, SPR, relative incidence of *P. vivax* and *P. falciparum* calculated for the entire study period for entire Dima Hasao district and Haflong town (Table 1 and 2).
Data for precipitation were collected from the records of Assistant Engineer's office, Railway Department,Haflong and secondary data regarding other environmental parameters like temperature range and humidity were also collected to find out the impact of environmental factors on incidence of malaria.

RESULTS

A very high incidence of malaria was noted in Dima Hasao district from the year 2008 to 2010 with API (Annual Parasitic Index) ranging from 10.27 to 16.05 as revealed from Table- 1. The highest API (16.05) was observed in 2009 which was followed by 12.71 in 2008 and 10.27 in 2010. The highest slide positive rate (SPR) was recorded in 2008 (10.11) and was followed by 9.49 in 2009 and 6.09 in 2010.

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Incidence of malaria showed a gradual decline from 2011 to 2013 with a corresponding decline of API (6.57 in 2011, 5.85 in 2012 and 3.95 in 2013).

Slide positive rate (SPR) was also much lower in 2011 to 2013 period (4.84, 5.23 and 3.76) compared to that in the period from 2008 to 2010.

Scenario of malaria in Haflong town was found to be different from that when the entire district (Dima Hasao) was considered. Much lower incidence of malaria was noted in Haflong during the entire study period except in 2010 when Haflong showed the highest API (16.78) in the entire study (Table- 2). In other years of study period the API values for Haflong town were lower than those for the entire district. Similarly the range of SPR in Haflong town was also in lower range.

Annual average rainfall in Haflong town varied from 1360 mm to 3159 mm during the study period as revealed from Table- 3. The highest precipitation was noted in 2010 and the least in 2011.

The pattern of rainfall in Haflong town also indicates the rainfall-pattern in entire district

Table- 1: Scenario of Malaria in Dima Hasao district, Assam
[as per the data collected from office of NRHM, Dima Hasao]

Year		Positive	SPR	No. of *P. falciparum*	No. of *P. vivax*	% *P. falciparum*	% *P. vivax*	API
2008	28085	2842	10.11	2369	473	83.36	16.64	12.71
2009	38488	3653	9.49	3199	454	87.57	12.42	16.05
2010	38922 BSE	2373	6.09	1931	442	81.37	18.63	10.27
2011	32777	1589	4.84	1306	283	82.19	17.81	6.57
2012	27005	1413	5.23	1148	265	81.25	18.75	5.85
2013	25745	969	3.76	757	212	78.12	21.88	3.95

BSE- Blood Sample Examined; SPR- Slide Positive Rate; API- Annual Parasitic Index

Table- 2: Scenario of Malaria in Haflong town
[as per the data collected from office of NRHM, Dima Hasao]

Year	BSE(Blood Sample Examined)	Positive	SPR	No. of *P. falciparum*	No. of *P. vivax*	% *P. falciparum*	% *P. vivax*	API
2008	2655	245	9.23	244	02	99.59	0.41	6
2009	5231	502	9.59	482	20	96.02	3.98	5.3
2010	4516	548	12.14	545	03	99.5	0.55	16.78
2011	3398	229	6.74	217	12	94.76	5.24	3.02
2012	2534	198	7.81	187	11	94.44	5.56	3.13
2013	4062	129	3.17	129	Nil	100	0	1.45

Table- 3: Annual average rainfall in Haflong town during the study period

Year	Annual average Rainfall (mm)
2008	2242
2009	1955
2010	3159
2011	1360
2012	3002.35
2013	1995.75

[Source: Office of the Assistant Engineer, Dept. of Railway, Haflong]

DISCUSSION

High API for malaria in Dima Hasao district indicates the prevalence of malaria in the district throughout the study period except in 2013 when API came down to 3.95.

The proportion of *P. falciparum* infection was found to be consistently high ranging from 78% to 87% and the rest being attributed to *P. vivax* infection. *P. falciparum* was the predominant parasite (>60% to 97%) species in the malaria-ridden tea estates of Assam and Orissa (Gogoi *et.al.,* 1995). This is comparable with the findings of this study. In a similar study in Udalguri district of Assam, based on API>5 and *P. falciparum*>30% consistently for 3 years (2006-2008), 11 malaria 'hot spots' were identified (Yadav *et.al.,* 2012). Thus based on API values and proportion *P. falciparum* and *P.vivax*, Dima Hasao district may be considered as 'hot spots' of malaria.

In Haflong town, annual parasitic index from 2008 to 2010 was very high (6 to 16.78) for malaria incidence and the proportion of *falciparum* malaria was much higher (96.02% to 99.59%) than *vivax* malaria. This indicates that the area falls under high risk zone or hot spot for malaria. However, API showed a marked decline from 2011 to 2013 both in district level and in Haflong town. Though in Haflong town a decline in the incidence of malaria is noted from 2011, the proportion of *falciparum* malaria was found to be persistently higher ranging from 94.76% to 100%.

Anopheles dirus, the vector for *P. falciparum* is a forest breeder with high biting preference for human hosts (Dutta *et.al.,* 1996). The contributory factors for substantial increase in incidence of *P.*

falciparum in North East India are: (i) difficult terrain, (ii) jhum cultivation, (iii) presence of optimum climatic conditions for prolonged transmission, (iv) developmental projects attracting aggregation of labour, (v) influx of population (Yadav & Sharma, 1995). All these factors are found to be positive in Dima Hasao, the district under present study.

The decline in the incidence of malaria from 2011 might be due to the large scale deforestation in the study area for extension work of Railway-broad gauge project as well as for the construction of highway through the district. Long stretches of forest have been totally destroyed. This has decreased the breeding ground of *Anopheles dirus,* the vector of *P. falciparum,* since *A. dirus* is a forest breeder.

Deforestation might have reduced the amount of rainfall in the district and thereby water logging was also reduced. Hence, there was a decrease in the formation of temporary stagnant pools and swamps which serve as breeding ground for mosquitoes. *A. dirus* can also breed in bamboo-bushes but due to flowering of bamboo the bamboo cover of the district have been degraded since 2004 (Source: Department of Information and Public Relations (Janasanjog), Dima Hasao,Assam).

On the other hand, deforestation indirectly might have decreased the humidity of the study area and the temperature regime too which are some of the limiting factors for the incidence of malaria (Bhattacharya, *et.al*., 2006).

Though a marked decline in the incidence of malaria was noted in Dima Hasao district as well as in Haflong town from the year, 2011, the API in entire district was above 5 till 2012 which came down to 3.95 in 2013 whereas in Haflong town API came down to a much lower level (1.45) in 2013. This difference might be due to the fact that mosquitoes can spread malaria more in houses made by planks and bamboos found mostly in rural areas than in brick-wall houses usually found in urban areas like Haflong town (Nkuo-Akenji *et al.*, 2006).

Moreover, due to influx of population, new settlements have come up filling the low lying lands and swamps in Haflong town [National Information Center, Dima Hasao]. This has drastically reduced the breeding area for mosquitoes.

Apart from all these factors a successful implementation of effective 'malaria eradication programme' launched by the State and Central Government cannot be ruled out for such a remarkable decline in the incidence of malaria in the district. The decline was more pronounced in Haflong town which might be due to the fact that it is having easy access for both medical help and adoption of control measures for malaria.

CONCLUSION

Dima Hasao district of Assam as a whole may be considered as a 'Hot spot' of malaria with API>5, though since 2011 the incidence of malaria has decreased significantly. This might be due to various changes in environmental and climatic factors or due to successful implementation of 'malaria eradication programmes'. Also, may be that, all these factors worked together to bring this change.

However, we cannot arrive at any definite conclusion based on this preliminary survey. Improved surveillance and monitoring are necessary for a prolonged period to assess the recurrence of malaria (if any) for its total eradication from this area.

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