

Review of Malaria Situation in Assam with Special Reference to Security Forces

PMP Singh¹, Rajiva², MS Mustafa³

Abstract

Assam, alone, with 2.6% of the country's population, contributes > 5% of the total malaria cases in the country. Keeping in view the importance of malaria in the North East and its special significance to the Armed Forces the present study was undertaken to review the malaria situation in Assam.

Data on commonly used parameters of malaria surveillance including drug resistance from 2000 to 2008 were collected. Subsequently the extensive data was compiled in the form of Malaria Atlas Of Assam with choroplath maps at district and PHC level. The number of hospital admissions due to malaria in various service hospitals post 2009 have been taken as an index to measure the success of focused interventions.

District wise mean API of Assam is depicted in Table 1 whereas District wise pattern of reported chloroquine resistance is presented in Figure 1 [4] Total number of admissions due to malaria (both P Vivax and P falciparum species) in service hospitals in the state of Assam for the period 2000 to 2008 is depicted in Table 2. Month wise distribution of cases of malaria in a particular Army field formation (where the revised focused intervention strategy was first implemented) for the year 2009 along with type of infection is given in Table 3.

The service personnel deployed in NE region are especially vulnerable as they share the same anthropoecosystem as that of local population but at the same time lack the partial immunity to malaria enjoyed by local population[1].

The data collated by us has shown that the patterns of malaria incidence are not uniform across the state and varies considerably even within the same District. Having API based choroplath maps upto PHC level is of great value for malaria risk assessment for the security forces.

Keywords: Malaria, Malaria in Assam, Choroplath Maps, API, Security Forces, Malaria Surveillance, Chloroquine Resistance

Introduction

Malaria has been a major public health illness in the North East. The seven sister states contribute 10 to 12% of total malaria cases; and 14% of the total malaria morbidity in the country. Assam alone, with 2.6% of the country's population,

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How to cite this article: Singh PMP, Rajiva, Mustafa MS. Review of Malaria Situation in Assam with Special Reference to Security Forces. *Epidem Int* 2017; 2(4): 23-28.

Digital Object Identifier (DOI): <https://doi.org/10.24321/2455.7048.201720>

ISSN: 2455-7048

contributes >5% of the total malaria cases in the country. The state of Assam (24°44' to 27°45' N latitude ; 89°41' to 96°02' E longitude) is the second largest state in the Northeast region (78,523 km²) and contributes over 50% of all malaria cases from the North East and over 5% of the total reported cases in the country. *P. falciparum* is the predominant parasite species.^{1,2} The region is highly receptive to malaria transmission due to topography, vegetation (40% area is forest), excessive and prolonged rainfall (2 to 3 m) which promote vector breeding. High humidity (60 to 90%) and warmer climate for most of the year ensures longevity of the vectors. Difficult terrain and poor communication are the other highlights of this state. Because of the presence of distinct physiographic units (Brahmaputra Valley in the North, Barak Valley in the South and hill regions between valleys), sharing of interstate/international borders by 21 districts out of total 23 districts of the state, and a large tribal population of varying ethnicity all major epidemiological types of malaria like forest-related malaria, tribal malaria, border malaria, rural and urban malaria, etc., are encountered.³

It was keeping in view the importance of malaria in the North East and its special significance to the armed forces and other such security forces which remain deployed throughout the state owing to various threats and continue to have malaria cases despite routine chemoprophylaxis with weekly chloroquine, the present study was undertaken to review the malaria situation in Assam.

Materials and Methods

Data on commonly used parameters of malaria surveillance including drug resistance from 2000 to 2008 was collected by personal liaison from different District Malaria Offices. Besides, personal visits were paid to Malaria Research Centre, Sonapur, and ICMR Institute at Dibrugarh, to obtain additional data particularly on vector species prevalent in the state of Assam. Data was cross validated by means of field surveys in endemic areas. The ABER (annual blood examination rate), API (annual parasite incidence) and SPR (slide positivity rate) data was further analyzed for mean and 95% CI. This extensive data base enabled drawing

of choropleth maps of malaria for the entire state, first at district level and then up to PHC level and compiling them as an atlas titled *Malaria Atlas of Assam*. This atlas helped in identification of areas of intense transmission and/or areas of chloroquine resistance down up to PHC level. Subsequently, a focused strategy was prepared for prevention of malaria infection among armed forces personnel operating in such areas emphasizing on personal protection, chemo-suppression with an appropriate drug regimen in chloroquine-resistant areas and extensive health education. The same was implemented in an army field formation in upper Assam as a test case under the personal supervision of authors after convincing the commanders of its necessity. The documented incidence of malaria in this particular army field formation in 2009 was taken as an indicator of the success of the strategy followed by its dissemination and roll out on a larger scale. The number of hospital admissions due to malaria in various service hospitals post 2009 has been taken as an index to measure the success of such focused interventions on prevention of malaria infections among vulnerable armed forces personnel.

Results

District-wise mean API of Assam is depicted in Table 1 whereas district-wise pattern of reported chloroquine resistance is presented in Fig. 1.⁴ Districts were further classified on the basis of API. The number of districts showing a particular API during the study period is presented in Fig. 2. District-wise API from 2000 to 2008 is shown in Fig. 3. Total number of admissions due to malaria (both *P. vivax* and *P. falciparum* species) in service hospitals in the state of Assam for the period 2000 to 2008 is depicted in Table 2. Month-wise distribution of cases of malaria in a particular army field formation (where the revised focused intervention strategy was first implemented) for the year 2009 along with type of infection is given in Table 3. The incidence of malaria in the state of Assam from 2009 to 2013 along with total number of malaria cases admitted in the previously referred five service hospitals in the state of Assam is given in Table 4.⁵

Table 1. District-Wise Mean ABER, Mean API and Mean PF %: 2000–2008

S. No.	District	Mean ABER	Mean API (95% CI)	Mean Pf % (Range)
1.	Barpeta	6.03	1.31 (0.82 to 1.81)	53.04 (39.58 to 69.89)
2.	Bongaigaon	9.01	3.33 (2.30 to 4.36)	93.08 (88.55 to 94.16)
3.	Cachar	6.11	2.40 (1.98 to 2.82)	99.33 (97.35 to 99.82)
4.	Darrang	7.56	8.30 (6.20 to 10.40)	15.97 (8.52 to 25.43)
5.	Dhemaji	5.66	1.98 (0.67 to 3.29)	38.89 (2.06 to 100)
6.	Dhubri	7.29	1.10 (0.85 to 1.35)	89.84 (85.89 to 93.53)
7.	Dibrugarh	6.94	0.04 (0.02 to 0.06)	78.70 (72.73 to 88.76)
8.	Goalpara	9.09	5.33 (4.12 to 6.53)	84.19 (74.06 to 90.98)
9.	Golaghat	8.89	0.69 (0.14 to 1.24)	53.22 (22.80 to 93.56)
10.	Hailakandi	9.95	7.74 (5.97 to 9.51)	98.92 (98.00 to 99.69)
11.	Jorhat	7.24	0.18 (0.08 to 0.29)	62.04 (14.02 to 95.24)
12.	Kamrup	7.30	2.39 (1.70 to 3.08)	80.81 (76.30 to 89.77)
13.	Karbi Anglong	21.41	18.69 (16.45 to 20.92)	86.04 (82.94 to 88.17)
14.	Karimganj	5.03	0.52 (0.33 to 0.71)	90.21 (83.98 to 95.13)
15.	Kokrajhar	9.68	6.88 (5.27 to 8.49)	76.67 (66.51 to 82.08)
16.	Lakhimpur	8.16	3.68 (1.16 to 6.20)	12.72 (0.21 to 42.13)
17.	Morigaon	6.11	1.02 (0.23 to 1.81)	60.79 (43.24 to 64.20)
18.	Nagaon	10.40	2.45 (2.01 to 2.89)	60.62 (24.4 to 78.41)
19.	Nalbari	6.21	1.72 (0.94 to 2.49)	79.60 (68.32 to 86.15)
20.	North Cachar Hills	13.27	14.51 (12.76 to 16.26)	74.82 (64.81 to 82.28)
21.	Sibsagar	5.67	0.05 (0.02 to 0.08)	82.58 (70.21 to 90.91)
22.	Sonitpur	8.93	3.14 (2.02 to 4.26)	38.33 (24.04 to 59.23)
23.	Tinsukia	6.18	1.26 (0.79 to 1.74)	29.78 (18.22 to 49.59)

DISTRICT WISE PATTERN OF REPORTED CHLOROQUINE RESISTANCE

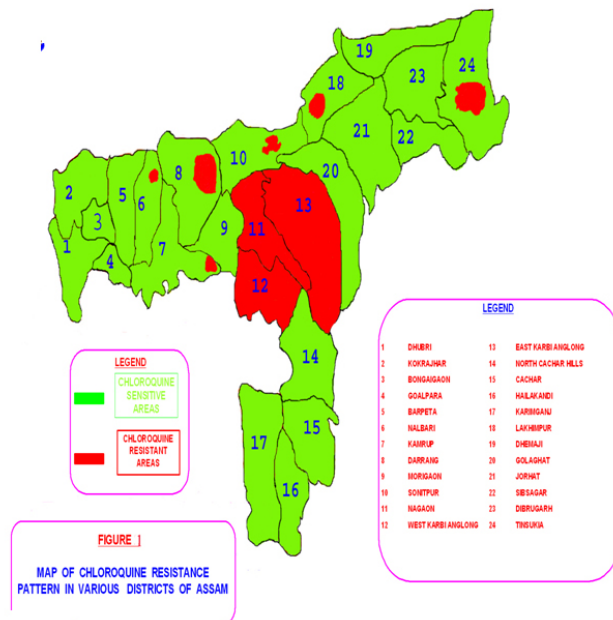


Figure 1

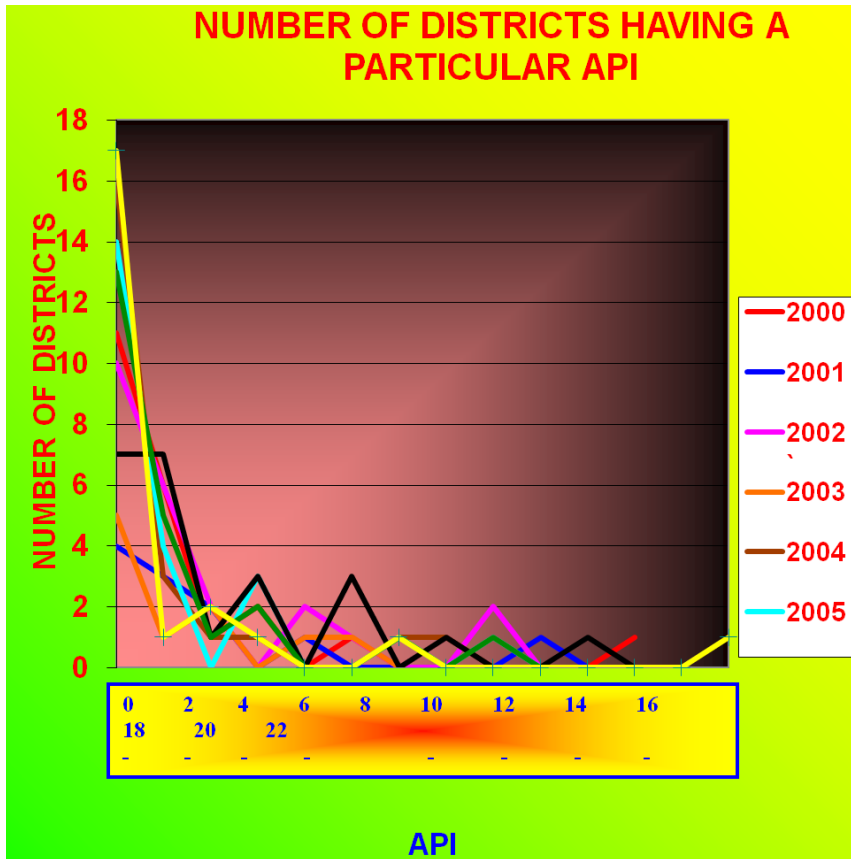


Figure 2

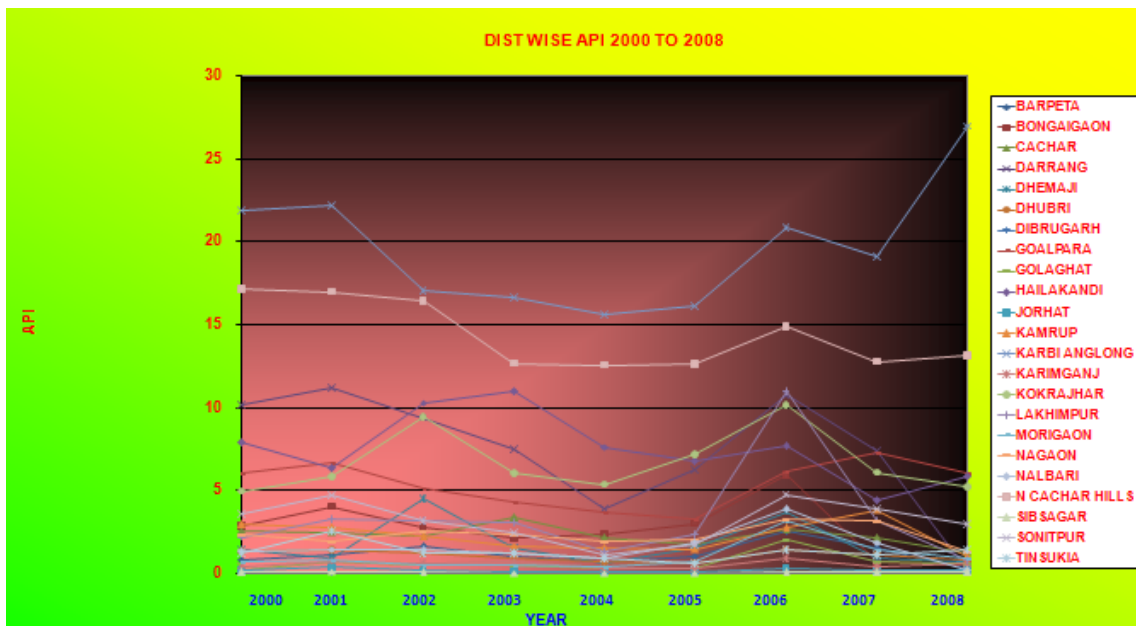


Figure 3

Table 2.Total Number of Admissions due to Malaria (both *P. vivax* and *P. falciparum* Species) in Six Service Hospitals in the State of Assam for the Period 2000 to 2008

S No.	Name of Hospital	Total Admissions									
		2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
01.	151 BH	105	129	78	89	107	75	98	66	61	808
02.	155 BH	126	144	75	94	124	93	103	78	68	908
03.	160 MH	31	61	26	78	48	19	11	02	02	278
04.	162 MH	29	56	22	69	45	17	07	01	01	247
05.	180 MH	03	05	03	06	04	22	02	05	06	056
06.	5 AFH	108	114	66	78	102	81	90	63	57	759
Total		402	509	270	414	430	307	311	215	195	3053

Table 3.Month-Wise Distribution of Cases of Malaria in an Army Field Formation for the Year 2009 along with Type of Infection (Post Targeted Intervention)

S. No.	Month	Number of Cases of Malaria		
		<i>P. falciparum</i>	<i>P. Vivax</i>	Total
1.	Jan 2009	01	00	01
2.	Feb 2009	00	00	00
3.	Mar 2009	00	00	00
4.	Apr 2009	00	00	00
5.	May 2009	00	00	00
6.	Jun 2009	02	00	02
7.	Jul 2009	05	01	06
8.	Aug 2009	03	00	03
9.	Sep 2009	01	01	02
10.	Oct 2009	00	00	00
11.	Nov 2009	02	00	02
12.	Dec 2009	00	00	00
Total		14	02	16

Note: The malaria incidence works out to 1.3 cases per thousand of the population under investigation

Table 4.Malaria in Assam, North-East India, 2009–2013

Year	Population (millions)	No. of Cases	API	<i>P. falciparum</i> %	Deaths	Total No of Hospital Admissions due to Malaria (All Types) in Six Service Hospitals of Assam
2009	31.27	91413	2.92	73	63	190
2010	31.35	66716	2.13	72	36	141
2011	32.03	47397	1.48	73	45	113
2012	32.45	29999	0.92	69	13	101
2013	32.91	19542	0.59	77	07	102

From Fig. 2, it is observed that there was an epidemic in the year 2006. The number of districts showing an API of 0–2 was 7 as compared to 10 to 15 in the other years of the study period. However, it is also observed from Fig. 3 that this epidemic was contributed to a large extent by five districts, viz., Darrang, Goalpara, Golaghat, Kokrajhar and Sonitpur.

Discussion

Malaria is endemic in most Northeastern states of India with predominance of *P. falciparum* infections.^{1,6} Outbreaks in civil and even in service population are a regular event.^{1,7,8}

Transmission of the malaria pathogen is persistent and is maintained mostly by *Anopheles minimus*; other vectors are *Anopheles dirus* and *Anopheles fluviatilis*.^{1,9-11} The service personnel deployed in NE region are especially vulnerable as they share the same anthro-po-ecosystem as that of local population due to their extensive deployment in counter-insurgency operations and border management but at the same time lack the partial immunity to malaria enjoyed by locals due to their regular turnover.¹

The data collated by us has shown that the patterns of malaria incidence are not uniform across the state and varies considerably even within the same district. Having

API-based choropleth maps up to PHC level is of great value for malaria risk assessment for the security forces operating in that area as it facilitates planning of focused interventions with greater and better compliance instead of general advisories. Such data is also a valuable input for commanders planning short-term operations against insurgents, etc.

Conflict of Interest: None

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Date of Submission: 2017-10-16

Date of Acceptance: 2017-12-16