



# A Review of the Annual Parasite Incidence of Malaria in Arunachal Pradesh, India

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**Author's contribution**

*The sole author designed, analyzed, interpreted and prepared the manuscript.*

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## ABSTRACT

**Background:** Arunachal Pradesh used to have a high Annual Parasite Incidence (API) of Malaria of 4.30 during 2014.

**Methods:** The study design included an analysis of the annual reports of the National Centre for Vector-Borne Diseases Control (NCVBDC) pertaining to the years 2017 and 2018 and also a study of the National Framework for Malaria Elimination in India 2016 – 2030.

**Results:** It was observed that the API of Malaria in Arunachal Pradesh decreased to 0.39 in 2018.

**Conclusions:** If interventions like the treatment of asymptomatic carriers take place, it is expected that the API in the entire state will come down further.

*Keywords: Malaria; Vector-borne diseases; annual parasite incidence; Plasmodium.*

## 1. INTRODUCTION

“Malaria is one of the leading infectious diseases, and it is endemic in 104 tropical and subtropical countries of the world. Malaria is a major public health concern in the northeastern states of India, such as Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura, and it continues to deter the equitable socioeconomic development of the

region. Deaths of epidemic proportions are reported every year from different parts of the northeast region (which accounts for 10% of confirmed malaria cases and 13–14% of all malaria-related deaths), mostly caused by the infection of *P. falciparum*, which is the predominant parasite species” [1]. “Climate change has a large impact on human health. It affects the geographic distribution of vectors and vector borne diseases and also increases the

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morbidity and mortality. The influence of climatic variables on the transmission of malaria is very significant due to several factors like temperature, rainfall, wind speed and relative humidity which contribute considerably to alter the life cycle of the mosquitoes and the parasite development” [2].

## 2. METHODS

### 2.1 Study Site

The state of Arunachal Pradesh is situated in the north-eastern part of India. It is bordered

by China in the north, Assam in the south, Bhutan in the west and Myanmar in the east.

Fig. 1 showing the location of Arunachal Pradesh, India.

The study design included an analysis of the annual reports of the National Centre for Vector-Borne Diseases Control (NCVBDC) pertaining to the years 2017 and 2018 and also a study of the National Framework for Malaria Elimination in India 2016 – 2030.



Fig. 1. Map showing the State of Arunachal Pradesh [Source: (3)]

## 3. RESULTS

Table 1. Comparison of the API of Malaria in Arunachal Pradesh, 2017 and 2018

S. No.	District	API	
		2017	2018
1	Anjaw	0.08	0.00
2	Changlang	0.54	0.19
3	Dibrang Valley	0.00	0.11
4	East Kameng	1.32	1.24
5	East Siang	2.14	0.96
6	Kradaddi	0.00	0.02
7	Kurung Kumey	0.38	0.14
8	Lohit	0.92	0.36
9	Longding	1.88	0.61
10	Lower Dibrang Valley	0.95	0.18
11	Lower Siang	Not available	0.46
12	Lower Subansiri	0.27	0.12
13	Namsai	2.26	0.27
14	Papum Pare	0.38	0.08
15	Siang-Pangin	1.00	0.12
16	Tawang	0.04	0.04
17	Tirap	0.67	0.43
18	Upper Siang	0.84	0.58
19	Upper Subansiri	3.02	1.49
20	West Kameng	0.65	0.24
21	West Siang	1.01	0.11
State	Arunachal Pradesh	0.99	0.39

[Source: (3) and (4)]

The API of Malaria for Arunachal Pradesh during 2014 was 4.30 [4]. "According to the most recent data available on the NCVBDC website (data for the year 2018), the API for the state of Arunachal Pradesh was 0.39. In 2017, the API was 0.99. However, by going through the data, it is seen that the Malaria problem is not equally distributed between its districts; it is unequally distributed as can be seen from the following information" [5,6].

#### 4. DISCUSSION

It is observed that there was a decline in API in the state over the two years of 2017 and 2018 but the problem is still there. Upper Subansiri District had the highest API in the state in both the years, 3.02 in 2017 and 1.49 in 2018. There was a similar difference in the infection rate with *Plasmodium falciparum* in this district. While in 2017 it was 31.57%, it decreased to 24.64% in 2018.

The "Malaria-Mukt Bastar Abhiyan" campaigns were held in Chhattisgarh initially during the following two times:

Phase 1: Jan – Feb 2020

Phase 2: Jun – July 2020

"In these campaigns, every person living in each of the villages in the Bastar region had their finger pricked and a drop of blood drawn which was examined for the Plasmodium antigen using Rapid Diagnostic Kits. These campaigns detected the Malarial antigen in both symptomatic persons as well as asymptomatic carriers" [7,8]. If the diagnosis was *Plasmodium vivax*, the patient was given Chloroquine and, to take care of the hypnozoites, Primaquine. If the diagnosis was *Plasmodium falciparum*, treatment was by way of Artemisinin-based Combination Therapy (ACT) and, to treat the gametocytes, Primaquine.

The impact of the Phase 1 and Phase 2 campaigns were as follows. In the year prior to November 2019 there were 5272 cases of Malaria in the Bastar region. During the next year until November 2020 there were only 2696 cases. In other words, there was a reduction of about half in the number of Malaria cases [9].

Therefore, some beneficial effects of these campaigns emerged in that the reservoirs of the Malarial parasite, which is, the humans were effectively treated thereby reducing the number of those persons who could be sources of infection to the female Anopheline mosquito.

#### 5. CONCLUSIONS

During 2016, the Indian Government formulated the Malaria Elimination in India framework which spanned 2016 – 2030 [4]. It was founded on the WHO Global Technical Strategy for Malaria, spanning the same period, which was formulated during 2015 and updated in 2021 [10]. The goal is to reach no Malaria cases in the country by the year 2027 and then after waiting for a period of three years, the WHO can then grant Malaria-free status certification by 2030.

If a system of complete diagnosis and treatment like that which was used in the campaigns in Chhattisgarh is adopted in Upper Subansiri District and other districts, it is quite likely that the API of Malaria may come down much faster in Arunachal Pradesh, especially if it must reach the target of zero cases by 2027. This would enable the country to receive the certification of Malaria elimination in 2030.

#### CONSENT AND ETHICAL APPROVAL

It is not applicable.

#### COMPETING INTERESTS

Author has declared that no competing interests exist.

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