

**SHORT ARTICLE**

**Treatment of Artemisinin-Resistant *Plasmodium falciparum* Malaria in India**  
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**ABSTRACT**

**Background:** Treatment failure in *P. falciparum* malaria is a major dilemma that faces health care workers throughout the country. True drug resistance is one of the causes after ruling out compliance and drug quality issues. The other cause is re-infection with a new strain of the parasite during the treatment period. **Objectives:** To find out what are the antimalarials prescribed in India for the treatment of Artemisinin-resistant *P. falciparum* malaria. **Methods:** By reviewing documents published by the National Vector Borne Disease Control Programme. **Results:** It is found that a combination of oral Quinine and oral Clindamycin can be given for Artemisinin-resistant *P. falciparum* malaria. **Conclusions:** There is a lack of awareness among health care providers on how to treat artemisinin-resistant *P. falciparum* malaria. This paper addresses this concern.

**Keywords:** Malaria, Drug resistance, *Plasmodium falciparum*, Quinine, Clindamycin

**Introduction**

Treatment of Malaria depends on the species of Plasmodium parasite causing it.<sup>1</sup> If it is *P. falciparum*, treatment is by way of Artemisinin-based Combination Therapy (ACT) and Primaquine. A dilemma that faces the health worker is what should be done if a patient, despite full compliance with treatment and no history of vomiting or diarrhea, does not respond parasitologically. If it is a case of *P. falciparum* Malaria, this treatment failure could be either due to true drug resistance or due to re-infection with a new strain of *P. falciparum* during the treatment period.<sup>2</sup> It is difficult for the health care provider to differentiate between these two possibilities in the field. This paper aims to provide a practical solution as to what he/she can do when faced with such a dilemma.

**Methods**

The study design included analysis of the documents of the NVBDCP pertaining to the treatment of *P. falciparum* malaria. Also, a web search was made of the dosages of antimalarial drugs used in the treatment of Artemisinin-resistant *P. falciparum* malaria.

**Results**

According to the operational document on Malaria Elimination in India published in 2016, resistance is suspected if, despite complete treatment and absence of vomiting or diarrhea, the patient does not respond clinically and parasitologically within 3 days. In such cases, it is advised to give Quinine with Tetracycline or Doxycycline, or Clindamycin.<sup>3</sup>

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A problem that would arise is if the patient is a child because Tetracycline and Doxycycline are contraindicated in this age group. However, Clindamycin is suitable for children. In that case, the following regimen may be used for Artemisinin-resistant *P. falciparum* Malaria in both children and adults:

- Tab Quinine 10 mg per kg body weight TDS for 7 days.<sup>4</sup>
- Cap or Syrup Clindamycin 20 mg per kg body weight TDS for 7 days.<sup>5</sup>

## Discussion

The Government of India, in 2016, adopted a framework for Malaria Elimination in India covering the period 2016 – 2030.<sup>6</sup> This was based on WHO's Global Technical Strategy for Malaria, covering the same period, which was adopted in 2015 and updated in 2021.<sup>7</sup>

The aim is to reach zero Malaria cases by 2027 and then wait for three years before WHO can grant Malaria-free status certification. It is already the beginning of 2022 and India is about to reach the halfway mark of the period from 2016 to 2027. The Annual Parasite Incidence (API) has also come down significantly (it was 0.32 during 2018)<sup>8</sup>

At present, the therapy of Malaria due to *P. falciparum* is dependent on the patient's residence:

- If the patient resides in any part of the country except the eight North-Eastern states, he/she is treated with an Artemisinin Combination Therapy (ACT) consisting of 3 days treatment with Artesunate and 1-day treatment with Sulphadoxine-Pyrimethamine (SP) along with 1-day treatment with Primaquine. The role of Primaquine is to kill the gametocytes.
- If the patient resides in any of the eight North-Eastern states, he/she is treated with a combination of Artemether and Lumefantrine for 3 days because of drug resistance to Sulphadoxine-Pyrimethamine had been observed in these eight North-Eastern states and so Lumefantrine was chosen to replace Sulphadoxine-Pyrimethamine in these areas.

## Conclusions

If a patient (whether child or adult) has developed drug resistance to ACT consisting of Artesunate and SP, he/she can be given Quinine and Clindamycin at the doses recommended above. Similarly, if a patient (child or adult) develops drug resistance to ACT consisting of Artemether and Lumefantrine, he/she too can be given Quinine and Clindamycin at the doses recommended above.

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