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Letter to Editor

Management of Drug-Resistant Plasmodium vivax and Plasmodium falciparum Malaria in India

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Sir,

The Government of India, in 2016, adopted the National framework for malaria elimination in India 2016-2030.[1] This was based on WHO's Global Technical Strategy for Malaria, covering the same period, which was adopted in 2015 and updated in 2021.[2]

The aim is to reach no malaria cases by 2027 and then wait for three years before certification of Malaria-free status can be granted by the WHO. It is already the end of 2021 and India is about to reach the halfway mark of this period from 2016 to 2027. The Annual Parasite Incidence (API) has also come down significantly (it was 0.32 during 2018)[3].

At present, the treatment of malaria due to *Plasmodium vivax* is carried out by the administration of 3 days treatment with chloroquine and 14 days treatment with primaquine. The role of primaquine is to kill the hypnozoites.

The therapy of malaria due to *Plasmodium 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 one day treatment with sulphadoxine-pyrimethamine along with one 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 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.[4]

As the API continues to decrease, it is likely that those malaria cases which will continue to persist in the community would be the drug-resistant cases of malaria. In the National Drug Policy on Malaria 2013, it is mentioned that resistance should be suspected if, despite full treatment and no vomiting or diarrhoea, the patient does not respond clinically and parasitologically within three days. In such cases, it is advised to give oral quinine with tetracycline or doxycycline.[4]

A problem that would occur is if the drug-resistant malaria patient is a child because tetracycline and doxycycline are contraindicated in this age

group. However, the artemether-lumefantrine combination, which is suitable for children has been found to be effective in the treatment of malaria caused by chloroquine-resistant *Plasmodium vivax*.[5]

Similarly, since artemisinin-resistance and lumefantrine-resistance have not been documented in India, the artemether-lumefantrine combination would also be effective in the treatment of malaria caused by sulphadoxine-pyrimethamine-resistant *Plasmodium falciparum*.

Artemether-lumefantrine is to be prescribed as per body weight:

5 kilograms to 14 kilograms
20 mg artemether plus 120 mg lumefantrine

15 kilograms to 24 kilograms
40 mg artemether plus 240 mg lumefantrine

25 kilograms to 34 kilograms
60 mg artemether plus 360 mg lumefantrine

35 kilograms & above
80 mg artemether plus 480 mg lumefantrine

Artemether-lumefantrine is not to be given to children weighing less than 5 kilograms.

These are available as 20 mg artemether plus 120 mg lumefantrine and 40 mg artemether plus 240 mg lumefantrine dispersible tablets for children. For adults, 80 mg artemether plus 480 mg lumefantrine tablets/ capsules are available.

A total of 6 doses to be administered:

- First dose at the time of diagnosis
- Second dose after a gap of 8 hours
- Third dose after 24 hours
- Fourth dose after 36 hours
- Fifth dose after 48 hours
- Sixth dose after 60 hours

Primaquine resistance has not yet been documented in India. Therefore, in the case of malaria caused by drug-resistant *Plasmodium vivax*, it is important to give the 14-day regimen of primaquine at a dose of 0.25 mg/kilogram body weight daily.

Similarly, in the case of malaria caused by drug-resistant *Plasmodium falciparum*, it is important to give primaquine at a dose of 0.75 mg/kilogram body weight on day 2 of therapy. Primaquine is not to be given to children less than 1 year of age.

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Yours sincerely

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