

Original Article

Advancements in Preventing and Treating Malaria

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Abstract: In India, where only around 20% of the population, particularly in rural areas, receives healthcare that is either free or highly subsidized, malaria imposes a substantial socioeconomic burden on society. At private healthcare facilities, where the disease is often treated based on assumptions, the majority of individuals seek medical attention when affected. Given that malaria is caused by a rapidly multiplying parasite that can reach pandemic proportions within days of entering the bloodstream, early detection and treatment are paramount in preventing severe consequences. The primary carriers of malaria in India are female Anopheles mosquitoes, which are most active during the early morning and evening hours. This disease has spread throughout India, except in cooler regions with fewer mosquito populations, and symptoms typically manifest around 10 days to 4 weeks after infection. The treatment of malaria poses challenges due to the diversity of the disease, which requires different medications for its various forms. Traditional approaches to malaria treatment involve the use of quinine, although some parasites have developed resistance to this drug. Various medications, such as pyrimethamine, are employed to address malaria, with advancements like chloroquine proving more effective against specific strains of the disease.

Keywords: Anopheles, Mosquito, Chloroquine, Prevention, Quinine, Treatment, Vaccines.

1. INTRODUCTION

Malaria, a parasitic disease transmitted through mosquito bites, poses a severe threat to human life if left untreated. Its symptoms, such as fever, headache, and body aches, are often similar to those of other diseases, making accurate diagnosis crucial. Without prompt treatment, malaria can lead to organ damage, coma, severe anemia, convulsions, and even death. Approximately 40% of people in the world's poorest regions are affected by malaria, which is prevalent in both tropical and non-tropical areas.

Female mosquitoes, primarily responsible for malaria transmission, carry and transmit the

disease-causing parasites. India hosts three of the four known malaria parasite types: Plasmodium vivax (usually non-fatal), Plasmodium falciparum (causing severe malaria, especially in Orissa), and Plasmodium ovale (not found in India). Plasmodium falciparum is the primary cause of malaria-related deaths in India. Malaria risk increases during the rainy season when mosquito populations surge. Furthermore, malaria can be transmitted from an infected mother to her unborn child during pregnancy or through contaminated blood during transfusions.

When malaria parasites enter the body, they attack red blood cells and multiply in the liver before bursting out, causing malaria symptoms. Due to the diverse types of malaria requiring different treatments, self-medication is not recommended.

Proper diagnosis and identification of the specific parasite strain are essential. Severe malaria cases may necessitate hospitalization and specialized treatment.

2. MALARIA IN INDIA

India's public health system faces significant challenges in monitoring and managing malaria. In the 1950s, the country experienced a peak in malaria cases, with an estimated 75 million cases and 0.8 million fatalities annually. The National Malaria Control Program (NMCP) was launched in 1953, leading to a substantial reduction in cases to below 50,000 by 1961.

However, malaria resurged in the mid-1960s, with 6.45 million cases reported in 1976. Recent studies revealed a substantial underreporting of cases, with incidence rates possibly 9 to 50 times higher than previously recorded and deaths underestimated by 13 times. This underscores the need for comprehensive epidemiological monitoring to accurately assess the malaria burden in India. Improved surveillance is vital to effectively combat malaria, as emphasized by Singh et al. (2009).

3. MALARIA PARASITES IN INDIA AND THEIR VECTORS

India's varied climates and vast terrain create ideal conditions for malaria parasites and their vectors. Four main climate zones define the country's weather, ranging from tropical monsoons in the south to temperate regions in the north. These climatic variations result from factors like wind circulation and precipitation, leading to substantial temperature fluctuations.

The average yearly temperature varies across India, from 20°C in hilly areas near the Himalayas to over 30°C in tropical coastal regions. The monsoon season, starting in June, significantly influences rainfall patterns and annual totals. For instance, Kerala, Karnataka, Goa, Maharashtra, and Meghalaya receive over 250 cm of rainfall annually, while parts of Rajasthan receive less than 25 cm.

India's malaria types vary due to climate-induced variations in malaria parasite species and vectors. *A. culicifacies*, a common vector in India, consists of five sister species (A, B, C, D, and E) with distinct vectorization abilities, despite their physical resemblance. Species A are highly susceptible to infection, while species B act as non-vectors, with varying susceptibility levels among the others.

4. MALARIA TYPES

Malaria can be categorized into three types based on symptom frequency, duration, and the infecting parasite:

(i). Tertian fever: Fever attacks occur every other day.

(ii). Quartan fever: Fever attacks occur every three days, e.g., on the first, fourth, seventh day.

(iii) Malignant tertian: The most dangerous form, marked by malignancy, severe symptoms, and high mortality.

5. MALARIA SYMPTOMS

MALARIA SYMPTOMS THROUGH THREE STAGES:

(i) Cold stage: Sudden fever onset, shivering, extreme coldness, lasting hours.

(ii) Hot stage: High fever, profuse sweating, severe headache, lasting 2-6 hours.

(iii) Sweating stage: Fever breaks, profuse sweating, lasts 2-4 hours. Other symptoms include fatigue, nausea, vomiting, and severe headache. Some cases lack classic symptoms, warranting microscope testing during epidemics.

6. MALARIA'S ROOT CAUSES

Malaria spreads through female mosquitoes' bites, which inject Plasmodium parasites into the bloodstream. The parasites migrate to the liver, multiply, re-enter the bloodstream, and cause symptoms. Malaria is not contagious among humans but spreads through mosquitoes or blood transfusions if the donor is infected. The incubation period between a mosquito bite and symptoms varies but usually ranges from 7 to 30 days.

7. PREVENTION OF MALARIA

Malaria prevention in India employs vector control measures, chemoprophylaxis, and health education. Insecticide-treated bed nets, indoor spraying, and environmental management reduce malaria transmission. Chemoprophylaxis involves antimalarial drugs, with alternatives to chloroquine, such as atovaquone-proguanil and doxycycline, recommended due to widespread resistance. Health education, achieved through mass media, community mobilization, and school programs, raises awareness about symptoms and prevention measures. A comprehensive approach combining these strategies is crucial for effective malaria prevention.

8. TREATMENT OF MALARIA

In India, antimalarial drugs are the primary treatment for malaria. Severe cases, often caused by *Plasmodium falciparum*, are treated with artemisinin-based combination therapy (ACT), including drugs like artesunate-sulphadoxine-pyrimethamine, artemether-lumefantrine, and

artesunate-mefloquine. Chloroquine is the first-line treatment for uncomplicated *Plasmodium vivax* or *Plasmodium ovale* cases, with ACT used as an alternative where chloroquine resistance is reported. Severe malaria or other *Plasmodium* species may require intravenous artesunate or quinine treatment. Proper treatment by healthcare professionals is essential to avoid drug resistance.

- Home and Herbal Cures of Malaria
- Traditional remedies for malaria include:
- Chirayata herb infusion to reduce fever.
- Lime and lemon juice to mitigate quarternary episodes.
- Holy basil leaves with black pepper to alleviate cold weather malaria.
- Roasted alum powder as a relief measure.

9. CONCLUSION

Malaria, a deadly disease transmitted through mosquito bites, remains a significant public health challenge in tropical and subtropical regions. Early detection and proper treatment are crucial, with the type and life cycle stage of the parasite affecting treatment efficacy. Preventing malaria is preferable to treatment due to parasite resistance. A comprehensive approach combining vector control, chemoprophylaxis, and health education is vital for effective malaria prevention in India. Awareness and adherence to medical guidance are essential to combat this persistent global health threat.

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Conflict of Interest Statement: *The author declares that there is no conflict of interest regarding the publication of this paper.*

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