



## **Research Trends, Preventive Strategies, and Technical Framework for Mitigation of Malaria - A Global and National Perspective**

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### **ABSTRACT**

*Malaria is an acute febrile disease caused by the Plasmodium parasite, transmitted to humans through the bite of an infected female Anopheles mosquito. There are five species of parasites that cause malaria in humans, and two of these - P. falciparum and P. vivax - pose the greatest threat. P. falciparum is the deadliest and most widespread malaria parasite on the African continent. P. vivax is the predominant malaria parasite in most countries outside of sub-Saharan Africa. In endemic areas, malaria is a major cause of morbidity and mortality and causes significant social and economic stress. Current efforts to combat malaria focus on reducing paid morbidity and mortality. This article discusses the control and prevention of malaria and the research trends in malaria.*

*Keywords: Malaria, Preventive Strategies, morbidity and mortality, P. falciparum*

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### **INTRODUCTION**

The most serious infectious disease threatening half of the world's population [1]. A Protozoal infectious disease belonging to the genus Plasmodium and being transmitted to man by certain species of anopheline mosquito [2]. By 2020, nearly half of the world's population is at risk of malaria. Certain populations are at significantly higher risk of contracting malaria and developing the severe disease: infants, children under 5 years of age, pregnant women, and patients with HIV/AIDS, as well as people with chronic malaria with low immunity migrating to areas of intense malaria transmission, are migrant workers, mobile populations and tourists.

### **DISEASE BURDEN**

According to the latest Global Malaria Report, there are 241 million malaria cases in 2020, up from 227 million 4,444 in 2019. The estimated number of malaria deaths is 627,000 in 2020, an increase of 69,000 cases. Several deaths compared to the previous year. While about two-thirds of them (47,000) are due to disruptions during the COVID19 pandemic, the remaining third (22,000) reflects a recent change in the methodology for calculating mortality. WHO malaria mortality rate regardless of COVID19 [3].

### **PREVENTION OF MALARIA**

#### **RESIDUAL SPRAYING**

Insecticides like Malathion, Fenitrothion, and DDT are the most commonly used in spraying against mosquitoes. However, spraying once has not much effect and thereby requires repeated application periodically to kill the adult mosquito. Many species of mosquitoes show resistance to DDT and hence other insecticides are being used.

#### **INDIVIDUAL-LEVEL OF PREVENTION**

- Individual protection of oneself by wearing full clothes, application of mosquito repellents, use of mosquito nets, mosquito coils.[4]
- Insecticide-treated bed nets have been also included in the program.[5]
- In areas having a population of API greater or equal to 5 to be treated by residual spraying outdoors and indoors [6].

### **THE GLOBAL TECHNICAL STRATEGY FOR MALARIA(2016-2030)**

Adopted by the world health assembly in May 2015, it mainly aims at providing technical guidance to countries and development partners for the next 15 years and bringing about the importance of malaria and reaching towards elimination. It also includes the urgent need to increase the investments across all interventions which include preventive measures, diagnostic testing, and treatment.

#### **GOALS**

- Reduce malaria mortality rates globally compared with 2015 (at least 90 per cent by 2030)
- Reduce malaria case incidences globally compared with 2015 (at least 90 per cent by 2030)
- Eliminate malaria from countries in which malaria was transmitted in 2015.
- Prevent re-establishment of malaria in all malaria-free countries (Re-establishment prevented)

By adopting this strategy, WHO Member states have endorsed the bold vision of world-free malaria and set the ambitious goal of setting the world free of malaria by 2030. They have also agreed to strengthen the health system, address emerging multidrug and insecticide resistance, and intensify national, cross-border, and regional efforts to scale up malaria response to protect everyone at risk.

#### **NATIONAL VECTOR-BORNE DISEASE CONTROL PROGRAMME**

The NVBDCP is being implemented over the states and is being responsible for the prevention and control of many vector-borne diseases like Malaria, Filariasis, Kala-azar, Japanese encephalitis, Dengue, and Chikungunya. The vector-borne disease is being a complex disease and a major public health problem and hence requires greater planning in prevention and control. The directorate is being responsible for planning, programming, policy-making, monitoring, and implementing the programs [7].

#### **STRATEGY**

- Disease management by early case detection and complete treatment by improving the referral services, epidemic preparedness and thereby bringing about rapid response.
- Integrated vector management to prevent the risk of transmission by residual spraying in high-risk areas and use all preventive measures.
- Supportive measures include bringing about a change in people's behavior, awareness among people, their role in society, public-private partnership, intersectoral convergence.

National Malaria Control Programme initially began in 1953 during the five-year plan. Due to spectacular success achieved in the control of Malaria, it was converted to an eradication program in 1958. Since then, the program has undergone many changes due to its recurrence rates. All activities under NVBDCP are controlled by malaria-trained staff working in 19 regional offices located in 19 states. All the regional offices are being headed by the State program officer who is being responsible for the program to implement and progress forward.

#### **DRUG DISTRIBUTION CENTRES AND FEVER TREATMENT DEPOTS**

The main motive of this depot is to make sure that people get anti-malarial drugs on time according to the NMEP schedule as due to a steady increase in malaria cases distribution of drugs through surveillance workers and medical institutions alone was not helpful. Fever treatment depots collect blood slides in addition to antimalarial drugs. These centers are being taken over by voluntary workers from the community.

#### **URBAN MALARIA SCHEME**

The scheme was launched in 1971 to reduce or interrupt malaria transmission in towns and cities. The vectors of malaria mainly breed in manmade containers including water tanks, coolers, cisterns, flower vases, bottles, ornamental ponds, old tires. Use of larvivorous fish in water bodies in slow-moving streams, ornamental ponds are being recommended.[9]

#### **NATIONAL FRAMEWORK FOR MALARIA ELIMINATION IN INDIA(2016 – 2030)**

Following the success achieved in malaria control, the vision is being now shifted towards complete eradication.

#### **GOALS**

1. Eliminate malaria
2. Maintain a malaria-free status in areas where malaria transmission has been interrupted and prevent reintroduction of malaria.

#### **OBJECTIVES**

1. By 2022, the transmission of malaria interrupted and zero indigenous cases were to be attained in all 26 states that were under categories 1 and 2 in 2014.
2. By 2024, the incidence of malaria is to be reduced to 1 per 1000 population in all states and UTS
3. By 2027, the indigenous transmission of malaria is to be interrupted.
4. By 2030, malaria to be eliminated throughout the entire country.

## STRATEGIES

The main objective is to eradicate malaria in high endemic areas, interrupt malaria, and prevention of malaria.[9]

1. Early diagnosis and radical treatment.
2. Case-based surveillance.
3. Integrated vector management.
4. Epidemic preparedness and early response.
5. Monitoring and evaluation
6. Coordination and partnership
7. Programme planning and management.

## PARAMETERS

1. Annual parasite incidence
2. Annual blood examination
3. Slide positivity rate
4. Slide Falciparum rate
5. Annual blood examination rate.

## SENTINEL SURVEILLANCE

1 to 3 sentinel centers to be placed in each district to make sure not any of the severe cases get missed and get proper treatment and hence all cases get recorded.[10]

## ANTI - MALARIAL CAMPAIGN

It takes place every year in June (before the monsoon) to bring about awareness among people.[10]. 2019 CDC Guidelines below, appropriate treatment depends on the Plasmodium species, clinical stability, age of the patient, and regional antimalarial susceptibility:

- Uncomplicated infection with Plasmodium falciparum, Plasmodium malaria, or Plasmodium knowles in the chloroquine-sensitive region is 600 mg (children: 10 mg / kg) of chloroquine phosphate, followed by 300 mg (children: Provides a loading dose of 5 mg / kg). 6, 24, 48 hours; or 620 mg (children: 10 mg / kg) loading dose of hydroxychloroquine, followed by 6, 24, and 48 hours later 310 mg (children: 5 mg / kg)
- Severe malaria infection in unstable, non-pregnant patients in all regions includes IV artesunate 2.4 mg/kg (pediatric: children greater than 20 kg receive 2.4 mg/kg, children less than 20 kg receive 3.0 mg/kg) at 0, 12, 24, and 48 hours and either artemether-lumefantrine, atovaquone-proguanil, doxycycline, or mefloquine as per above. [11]
- P. falciparum malaria causes significant morbidity and mortality worldwide, killing 90% of people with untreated severe malaria. 4,444 In 2017, 92% of malaria cases occurred in sub-Saharan Africa, where 10 countries reported an increase in cases despite efforts to control the disease.
- An effective malaria vaccine would be an important tool in addressing the enormous socioeconomic burden caused by malaria. WHO has recognized the public health potential of the RTS, S/AS01 vaccine and recognizes the need for further evaluation before each country considers its use in the routine immunization schedule.
- Pilot implementation studies RTS, S/AS01 are underway in Ghana, Kenya, and Malawi to answer outstanding questions regarding the use of vaccines in public health.

## MALARIA VACCINE - MOSQUIRIX

Mosquirix is engineered using a hepatitis B viral protein and a chemical adjuvant to further boost the immune response for enhanced effectiveness[12]. It is given to children aged 6 weeks to 17 months to help protect against malaria caused by the parasite Plasmodium falciparum.

## EFFORTS BY INDIA FOR THE VACCINE

India's progress in the fight against malaria is the result of concerted efforts to ensure that the country's malaria program is country-owned and led, even if it is in line with the strategy is accepted worldwide. At the 2015 East Asia Summit, India pledged to eliminate the disease by 2030. Following this public statement, India launched the 5-year National Strategic Plan for Malaria Elimination. This marks a shift in focus from "control" to "elimination". The plan lays out a road map to achieve the goal of ending malaria in 571 of India's 678 districts by 2022 [13].

## DURGAMA ANCHALARE MALARIA NIRAKARAN (DAMAN) INITIATIVE

4,444 Among the states, Odisha's Durgama Anchalare Malaria Nirakaran (DAMaN) initiative is very important. This initiative aims to provide services to the hardest to reach and hardest hit people in the state. This initiative incorporates innovative strategies to combat asymptomatic malaria. The program is

co-funded by the Indian Council of Medical Research, the National Malaria Research Institute (ICMRNIMR), the National Vector-borne Disease Control Program (NVBDCP), Odisha and Medicines for Malaria Venture (MMV) [14, 15].

## CONCLUSION

Malaria is a deadly and serious infectious disease. Clinicians, infectious disease specialists, pharmacists, nurses, and medical professionals around the world are engaged in clinically relevant research on the timely care of patients diagnosed with malaria and advances in diagnostic techniques and treatments. included. It requires teamwork and communication between experts. The physician treating malaria will begin treatment as described above but consult an infectious disease pharmacist certified as an infectious disease expert to determine the regimen, active ingredient, dosage, and drug interactions of choice. confirm. It's a good idea to check the action. Infectious disease-trained professionals can also answer patient questions, build a bridge to the treating physician, and monitor the course of treatment and possible side effects. Future advances, including delays in dosing regimens and improved protection from alternative adjuvants, are likely and can be developed to achieve the ultimate goal of malaria eradication.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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