



COMMENTARY ARTICLE

Overview of Malaria Epidemiology

Running Title: Malaria Epidemiology

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ARTICLE INFO

Article history Received:
Jun 03, 2021
Accepted: Jun 17, 2021
Published: Jun 24, 2021
Volume: 6
Issue: 2

ABSTRACT

To reduce malaria burden on a global scale, focused global efforts will require increase surveillance of endemic transmission and imported malaria cases, mosquito vector populations, climate change, and human mobility, coupled with new improved prevention and control action plan.

Key words:

Malaria,
Mortality

INTRODUCTION

To reduce malaria burden on a global scale, focused global efforts will require increase surveillance of endemic transmission and imported malaria cases, mosquito vector populations, climate change, and human mobility, coupled with new improved prevention and control action plan.

Malaria is an infectious disease transmitted through the female Anopheles mosquitoes. The single-celled parasites of the *Plasmodium* genus are the causes this disease and are further classified into over a hundred species of which five *Plasmodium falciparum*, *P. vivax*, *P. malariae*, *P. ovale* and *P. knowlesi* primarily infected person resulting in flu- like symptoms (including fever, headache, and nausea). The average incubation period is 2 weeks but it may be many months for some species. *P. falciparum* causes the most dangerous and more fatal form of malaria if treatment is not given. There have been may be some changes, however, in the diseases epidemiology over the last few years.

INCIDENCE AND MORTALITY

Malaria is endemic throughout the world including in areas of Sub-Saharan Africa, Asia, the Caribbean, Oceania, and South America. The WHO reported 228 million malaria cases in 2018 with 23 million fewer cases from 2010. The WHO Africa Region contributes most malaria cases 93% & South-East Asia 3.4%. Globally, the incidence rate declined between 2010 and 2018 from 71-51 cases per 1000 persons at risk.

P. falciparum counted for 99.7% and 50% of cases in Africa and South-East Asia respectively whereas *P. vivax* was the predominant species and 75% in the Americas. There were 405,000 malaria deaths in 2018, which representing a decrease curve from 585,000 in 2010. Children less than 5 years old remain the most affected population and continue to account for two of every three malaria-associated deaths.

Africa having the largest decrease in curve and in the past 2 years, four countries – Uzbekistan, Paraguay, Argentina and Algeria were declared malaria free.

While risk of malaria remains low in the Caribbean, there was a 20% increase of malaria patient count in the Dominican Republic from 2017 to 2018, it is around 360 to 438 cases, almost all of which being *P. falciparum*. Canada has about 500 cases of malaria annually imported by returning travelers and new migrants from other region. According to the Public Health Agency of Canada, severe malaria cases requiring more intensive medical management which are uncommon in Canada with about 14 cases per year and over the past decades; the national rate of malaria has gradually increased.

TRANSMISSION OF MALARIA IN NON-ENDEMIC AREAS

In recent years, there have been a few reports of locally transmitted malaria in non-endemic countries. From August to September of 2017 in France 2 locally cases of *P. falciparum* were reported. Both affected individuals attended the same wedding and had not recently travelled to any other country where malaria was endemic. From investigation it was found that a case of *P. falciparum* was diagnosed two weeks before to the wedding in the same area the wedding was held in. This means either that persons there was either local vector-borne transmission by resident Anopheles mosquitoes or airport malaria in which an infected mosquito from an endemic country travelled along in an airplane or luggage to France.

In August 2018, there was also a reported of delayed diagnosis of *P. falciparum* in a Moroccan man living in Tuscany, Italy. He was not suspected of having malaria initially as he did not have recent travel to any other endemic country. During the summer, he had worked outdoors on the beach with some sub-Saharan Africa travelers and reported having many mosquito bites.

Although how he caught malaria was uncertain, the delayed diagnosis led to severe anemia, requiring treatment with artesunate and blood transfusion.

CLIMATE CHANGE

Climate change must be affect the survival of the malaria mosquito vector, *Anopheles*, and also influences the development of the *Plasmodium* parasite in the mosquito. *Anopheles* populate in warm and humid conditions while the *P. falciparum* parasite requires a temperature of over 20°C to complete its life cycle, and this is reson for tropical and sub-tropical regions have the highest burden of malaria.

However, the distribution of malaria may be change with climate change. In regions where climate change results in decreased rainfall, a reduction in malaria could be expected.

However, severe climate events leading to drought situations may be followed by extreme precipitation and flooding, which would lead to greater chance of mosquitos' birth and increased malaria transmission. With global warming, cooler parts of the world where malaria is not currently an endemic but hospitable to *Anopheles* mosquitoes could also see an increase in mosquito population and higher chance of the parasite completing its life cycle leading to local transmission and epidemics.

Concerted global efforts around enhanced action plan of endemic transmission and imported malaria cases, mosquito vector populations, climate change, and human mobility, coupled with innovative prevention and controlled strategies are important to decrease malaria burden on a scale.