

Malaria epidemiology and its control during the COVID-19 pandemic situation in India

Worldwide, total malaria cases were approximately 238 million in the year 2000, which had reduced to 229 million in 2019 in 87 malaria-endemic countries. The WHO African Region contributed to 94% of the total malaria incidences, with approximately 215 million cases in 2019. The WHO South-East Asia Region contributed approximately 3% of total malaria incidences, with nearly 6.3 million cases globally in 2019. India is situated in the WHO South-East Asia Region and malaria cases in the country declined from an estimated 20 million cases in 2000 to 5.6 million cases in 2019. Worldwide, malaria deaths declined from 736,000 in 2000 to 409,000 in 2019. The WHO African Region and the WHO South-East Asia Region contributed about 384,000 and 9000 malaria deaths respectively, in 2019. Approximately 86% of malaria deaths in the WHO South-East Asia Region were reported from India. According to the National Vector Borne Disease Control Programme (NVBDCP) malaria report, there were 181,831 malaria cases in India in 2020. The five states with the maximum malaria cases in the country in 2020 were Odisha, Chhattisgarh, Uttar Pradesh, Jharkhand and West Bengal. Long-lasting insecticidal nets (LLINs) distribution, indoor residual spraying (IRS), diagnosis and treatment are malaria control and elimination strategies, according to NVBDCP guidelines. LLINs are insecticide-treated mosquito nets that are different from normal, conventional bed nets. They normally last for 3–5 years and are distributed among risk populations of malaria-endemic areas through proper IEC (information, education and communication) to control the disease. IRS is generally used before the malaria peak season, which is determined by rainfall mediated by proper IEC to decrease the vector density. To diagnose malaria, there are two methods based on NVBDCP guidelines: rapid diagnostic tests (RDTs) and microscopy. RDTs are used for early diagnosis and prompt treatment. They are helpful in the detection of malaria in hard-to-reach areas with limited healthcare facilities. Whereas microscopy is considered the ‘gold standard method’ for malaria diagnosis mediated by Giemsa-staining of two types of smears, i.e. thick and thin. In a thick smear, there is a high probability of getting maximum

malaria parasites as it contains more blood than a thin smear. Whereas the less-blood-containing thin smear helps identify the malaria parasite species and the stage of its life cycle on microscopic examination. In *Plasmodium falciparum* predominant areas and areas where *P. falciparum* is resistant to chloroquine, the treatment for falciparum malaria is artemisinin-based combination therapy (ACT) lasting three days. Artesunate and sulphadoxine–pyrimethamine are currently used in ACT where artesunate is given for three days and a single dose of sulphadoxine–pyrimethamine is given on the first day. The resistance development will be delayed by the implementation of a combination treatment. Artemisinin derivatives will not be used as monotherapy, as the resistance development to these uniquely effective drugs will prove to be a disaster. A gametocytocidal drug, e.g. primaquine, is used with ACT to clear gametocytes in patients with falciparum malaria. The anti-malarial for vivax malaria is chloroquine and primaquine according to prescribed guidelines to kill the hypnozoites, which can cause relapses. The emergence of artemisinin-resistant falciparum malaria is currently a major problem worldwide. The first report of ACT resistance was reported from western Cambodia and the Thailand–Cambodia border in 2002–04, by Muller¹. In 2017, Blasco *et al.*² reported that the sensitivity of artemisinin and ACT partner drugs had decreased in Southeast Asian countries, resulting in an increased treatment failure rate. In 2020, van der Pluijm *et al.*³ reported that in the Greater Mekong sub-region artemisinin resistance and the emergence of resistance towards the partner drugs, leading to the total collapse of artemisinin combination therapies. So there is an alternative approach for combating this global issue of ACT resistance, which is safe, effective and affordable TACTs (triple ACTs) using artemisinin and two existing partner drugs. In this current COVID-19 pandemic situation, the malaria control and elimination programme were affected in India after the first case of COVID-19 was reported on 27 January 2020. In this unexpected pandemic situation routine works of public health are getting hampered because maximum health workers are engaged with COVID-19. Malaria surveillance and control are also being hampered. Fear of COVID-

19 has increased among common people. Hence, they hide their fever cases from the health workers during surveys and avoid going to the hospital for treatment. To overcome this situation, strengthening the public health surveillance system is necessary for malaria control and elimination programmes. According to the NVBDCP guidelines, early diagnosis and prompt treatment are necessary for all malaria-prone areas, including remote areas. Blood slide examination of all fever cases is essential and a regular survey has to be done through proper IEC. LLINs are essential for villagers of malaria-prone areas. IRS spraying followed by proper SOP (standard operating procedure) is also essential in malaria-prone areas. Health workers should encourage the villagers to check their malaria status during the mobile medical camps, maintaining all COVID-19 protocols. Self-help groups (SHGs) and quack doctors should be involved in malaria control and elimination programmes after proper training. The surveillance system by the district-level monitoring team should be strengthened by dividing the blocks and villages category-wise based on annual parasite index (API). If the implementation of geographic information system (GIS) mapping becomes possible, the malaria monitoring system will become more robust with limited human and financial resources. Medical officers and health workers should be sensitized with regular training regarding RDT kits and malaria treatment protocols. We are engaged in strengthening the epidemiological surveillance system in the COVID-19 pandemic situation using GIS mapping and the exponential decay model. Efforts are also being made to develop an anti-malarial drug.

1. Muller, O. *et al.*, *J. Travel Med.*, 2019.
2. Blasco, B. *et al.*, *Nature Med.*, 2017.
3. van der Pluijm, R. W. *et al.*, *Lancet*, 2020.

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