

VOLUME 40, NUMBER 4

April 2023

ISSN 0189 - 160X

WAJM

WEST AFRICAN JOURNAL OF MEDICINE

ORIGINALITY AND EXCELLENCE IN MEDICINE AND SURGERY



OFFICIAL PUBLICATION OF
THE WEST AFRICAN COLLEGE OF PHYSICIANS *AND*
WEST AFRICAN COLLEGE OF SURGEONS



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The Resurging Outbreaks of Yellow Fever Infection

Yellow fever, an infectious disease, is an acute viral haemorrhagic disease transmitted by infected mosquitoes.¹ It is endemic in tropical Africa as well as in Central and South America and transmitted through infected mosquitoes.¹⁻² The *Aedes* specie is mostly responsible for the spread in Africa while the *Aedes*, *Haemagogus*, and *Sabethes* species are responsible in South America. There are three stages in the disease’s transmission cycle: the Jungle (also known as Sylvatic), Intermediate (also known as Savannah), and Urban. In the Jungle cycle, monkeys serve as the main reservoir of the yellow fever virus and are bitten by *Aedes* specie, *Haemagogus*/*Sabethes* species. mosquitoes that spread the virus. The intermediate transmission cycle, which is widespread in Africa, involves infected mosquitoes biting humans who work or live close to forests. The urban cycle, which is mostly to blame for sustained outbreaks, includes the spread from infected people to other people via the same mosquito species.¹⁻³

The global burden of yellow fever is estimated at 200,000 cases and 30,000 deaths annually with a case fatality as high as 50% in untreated severe cases. Africa accounts for greater than 90% of this burden.¹ In the last decade there was a marked increase in the number of reported yellow fever outbreaks in Nigeria with widespread viral trans-

mission to many states between 2017 and 2019. In 2019 alone, 13 of the 36 states in Nigeria recorded at least one confirmed case of yellow fever case.^{2,4}

The symptoms of yellow fever include fever, headache, jaundice (hence the name ‘yellow fever’), muscle pain, nausea, vomiting and fatigue. A small proportion of patients who contract the virus develop severe symptoms and approximately half of those die within 7 to 10 days. Yellow fever is difficult to diagnose, especially during the early stages. A more severe case can be confused with severe malaria, leptospirosis, viral hepatitis (especially fulminant forms), other haemorrhagic fevers, infection with other flaviviruses (such as dengue haemorrhagic fever), and poisoning. Polymerase chain reaction (PCR) of blood and urine can sometimes detect the virus in the early stages of the disease. In later stages, testing to identify antibodies is needed. Good supportive treatment in hospitals improves survival rates and there is currently no specific anti-viral drug for yellow fever.^{1,3}

Aigbokhaode et al described the pattern of presentation and the outcomes of patients with yellow fever who were managed at the FMC, Asaba during the 2020 outbreak that occurred in Delta State. The most common presentation was generalized weakness which was present in all the patients while the other common features included fever, vomiting and jaundice. More than 50% were

classified as having a moderate clinical presentation of the disease and about 40 % received blood transfusion in addition to the supportive treatment received by all the patients. Mortality was recorded in about ten percent of the cases. The importance of prevention cannot be overemphasized. There is also the need for maintenance of a high index of suspicion

Yellow fever is prevented by an extremely effective vaccine, which is safe and affordable. A single dose of yellow fever vaccine is sufficient to grant sustained immunity and life-long protection against yellow fever disease. A booster dose of the vaccine is not needed. The vaccine provides effective immunity within 10 days for 80–100% of people vaccinated, and within 30 days for more than 99% of people vaccinated. Despite this, outbreaks continue to occur in many countries, especially African countries.¹⁻³

The fact that the disease can be prevented and has been eliminated in many developed parts of the world illustrates two contrasting realities. On a positive note, it highlights the importance of vaccines in the promotion of public health. On the other hand, the persistence of the disease and the resurgence of its epidemics in some places are reminders that the coverage of yellow fever vaccination and other routine immunizations remains suboptimal, especially in the developing parts of the world.

Immunization has proven to be one of the most successful and cost-effective public health interventions over the years.⁵ The first known vaccine was introduced by British physician Edward Jenner, who in 1796 used the cowpox virus (vaccinia) to confer protection against smallpox, a related virus, in humans. Jenner's contribution was to use a substance similar to, but safer than, smallpox to confer immunity. He thus exploited the relatively rare situation in which immunity to one virus confers protection against another viral disease.⁶

According to the World Health Organization (WHO), immunization prevents between 2 to 3 million deaths across the spectrum of all age groups every year.⁷ There are many vaccines which protect against infectious diseases like measles, diphtheria, tetanus and polio among children; and pneumococcal disease and influenza among adults. However, the effective implementation of routine immunization remains a challenge in many low- and middle-income countries, with an attendant suboptimal level of coverage.⁸ In 2019, 14 million infants worldwide did not receive the required vaccines and an additional 5.7 million were partially vaccinated.⁷ Furthermore, over 2 million deaths still occur yearly from vaccine-preventable diseases, the majority of which occur in sub-Saharan Africa.⁹

The yellow fever vaccine is part of the childhood immunization program in many countries. There is a need to intensify efforts aimed at improving the coverage of the vaccines. In addition, the place of adult vaccination must also be emphasized and aggressively implemented. In accordance with the International Health Regulations (IHR), countries have the right to require travellers to provide a certificate of yellow fever vaccination.¹ If there are medical reasons for not getting vaccinated, this must be certified by the appropriate authorities.

In addition to vaccination, another important control strategy is vector control. The risk of yellow fever transmission in urban areas can be reduced by eliminating potential mosquito breeding sites, by applying larvicides to water storage containers and other places where standing water collects. Both vector surveillance and control are components of the prevention and control of vector-borne diseases, especially for transmission control in epidemic situations. For yellow fever, vector surveillance targeting *Aedes aegypti* and other *Aedes* species will help inform where there is a risk of an urban outbreak.^{1,3} Furthermore, prompt detection of yellow fever and rapid response through emergency vaccination campaigns are essential for controlling outbreaks.¹

Unprecedented action was taken with the 2017 announcement of the Eliminate Yellow Fever Epidemics (EYE) Strategy. The EYE alliance, which has more than 50 partners, helps 40 at-risk nations in Africa and the Americas to prevent, identify, and address suspected cases and outbreaks of yellow fever. The collaboration aims to quickly reduce outbreaks, safeguard populations at risk, and stop global spread. More than 1 billion individuals should be immune to the disease by 2026, according to projections.¹ It is imperative that all stakeholders in various countries put all hands on deck to ensure that this goal is not only met but potentially surpassed.

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