Yellow fever: ignore at our peril

The resurgence of yellow fever in Angola and the Democratic Republic of Congo should constitute an African emergency if not an international one, argues Shima Gyoh

The recent outbreak of yellow fever in Angola, especially in the capital Luanda, has so far killed 345 people and another 3464 suspected cases since December 2015. It has spread over national boundaries to Kinshasa in the Democratic Republic of the Congo, Kenya, Cape Verde, and is the source of eleven cases in China. The International Federation of Red Cross and Red Crescent Societies raised alarm that the outbreak could become a global crisis. However, the World Health Organization (WHO) has declared it to be serious, but does not constitute a global emergency.

The developing countries of Africa must nevertheless consider this outbreak both serious and an emergency because yellow fever is endemic in our environment, with mosquitoes as vectors and monkeys as the reservoir. We frequently see sporadic cases in our villages and towns. Fortunately, approximately 80% of the infections result in milder forms of the disease, but confer immunity for life, and so does its attenuated 17D live vaccine developed almost 80 years ago. Widespread international vaccination has reduced the importance of yellow fever to some 32 countries in sub-Saharan Africa where it is endemic in a belt straddling the Equator 15° north and 10° south, and the equivalent area of South America. The conditions favouring this are the environment combined with weak health infrastructure and poor disease surveillance.

The mosquito vector keeps the virus alive in three environments. In Africa, *Aedes africanus,* and in South America, *Haemogogus janthonomis,* maintain the sylvatic (jungle) cycle between the insect and monkeys in the forest canopy, while *Aedes Aegypti* maintains it in the intermediate (savannah) and the urban cycles involving monkeys and man. Human infection starts when man, monkey and the mosquito come into contact in the same habitat.

With increasing forest clearing following expanding human activity, this contact is increasing. Moreover, *Aedes* is rapidly breeding and spreading in South America, threatening to invade other countries. It can breed in small collections of rain water in the hollow of trees, plant leaves, open domestic containers, broken bottles, and creases in discarded plastic bags, so common in the urban environment where large numbers of unvaccinated susceptible people are often concentrated.

A. Aegypti is also responsible for dengue fever and Zika virus, which is now linked to microcephaly and serious brain damage in foetuses. The fast spread of Zika by mosquitoes in Brazil has coincided with steep rises in the incidence of microcephaly.

Yellow fever occurs in mild and the severe forms, depending on the virulence of the infection and the immunological status of the patient. It starts as malaise, pyrexia with fever-pulse dissociation (Faget's sign), conjunctival injection, headache, lower back pain, nausea and dizziness. There is brief remission and the patient recovers. However, 20% proceed to have the severe form with high fever, abdominal pains and vomiting. Yellow fever is so named because of the hepatocellular jaundice it causes by destruction of the liver cells through lobular steatosis and necrosis, with formation of degenerative eosinophilic hepatocytes called 'Councilman bodies'. There is hepatomegaly, severe epigastric pain and tenderness.

The immune system is compromised early, with leukopenia and relative lymphocytosis. There is also widespread increase in vascular permeability and disseminated intravascular coagulation, consuming the clotting factors which the damaged liver is unable to replace. The consequence is widespread oedema and haemorrhage in the skin, mucous membranes, gastrointestinal tract, and other organs with serious effects in the kidneys, lungs, brain, and heart. Metabolic function is deranged, and multiple organ failure likely. Hepato-renal complication increases the mortality up to 50% within two weeks. There is no specific treatment, only supportive therapy.

The United Nations and WHO advised countries to include yellow fever vaccine in their national Expanded Immunisation Programmes. With a seroconversion around 99% and lifelong immunity, it is worth its cost, which is currently US$40 in Rwanda. It is manufactured in four countries—Senegal, France, Brazil and Russia, and world output is under pressure to meet the needs for the epidemic. Vaccination should cover the population from age one to 50 years. Failure to vaccinate people results in a concentration of susceptible individuals, the tinderbox of urban epidemics.

We already have a high toll from *anopheles'* malaria, and, adding the dangers from Zika, dengue, chikungunya (severe rheumatoid arthritis-like illness), and yellow fever, all from *A. Aegypti*, we have adequate reasons to intensify the war against mosquitoes and extirpate factors that make them thrive around human habitation. Apart from insecticide impregnated nets, we have to screen our homes, remembering that *Aedes* species bite during the day. We must further destroy mosquitoes and reduce their ability to breed by keeping the environment free of stagnant water, breaking the surface tension in ponds we cannot empty or introducing biological control like larva-eating fish. Highly effective genetic control is now possible.

Shima Gyoh has held many posts ranging from village doctor to DG of Nigeria's Federal Ministry of Health and Chair of the Medical and Dental Council of Nigeria.

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