

A cholera mathematical model with vaccination and the biggest outbreak of world's history

Ana P. Lemos-Paião¹, Cristiana J. Silva¹, Delfim F. M. Torres¹

Cholera is an infectious disease that remains a global threat to public health and an indicator of inequity and lack of social development. The number of cholera cases reported by World Health Organization (WHO) has continued to be high over the last few years.

We consider in the worst cholera outbreak that ever occurred in human history, in Yemen, from 27th April 2017 to 15th April 2018. To describe the reality of Yemen, we proposed a mathematical model for the transmission dynamics of some strains of the bacterium *Vibrio cholerae*, responsible for the cholera disease in humans, which fits this cholera outbreak. The first oral cholera vaccination campaign launched in Yemen occurred on 6th May 2018 and was concluded on 15th May 2018. Simulations of our mathematical model, with and without vaccination, show that the introduction of vaccination from the beginning of the epidemic could have changed the situation in Yemen substantially, to the case where the disease extinguishes naturally (see Figure 1).

The results of our research are supported by the recent cholera outbreak in Mozambique, and the importance of oral cholera vaccination to protect survivors of Cyclone Idai has been stressed by WHO, where more than 900 000 vaccine doses were distributed to the population.

¹ — Department of Mathematics & CIDMA, University of Aveiro

FIGURE 1

Cholera outbreak in Yemen with and without vaccination.

FIGURE 2

Boy in Yemen receives cholera vaccination (source WHO).

