ABSTRACT

Ebola Disease Outbreak (EVD) is an acute and often fatal disease in humans and nonhuman primates (monkeys, gorillas and chimpanzees). The disease is caused by infection with a virus of the family of Filoviridae, genus Ebolavirus. It's case fatality ratio ranges from 25%-90% in humans. The number of travel-related cases in the absence of screening exponentially increases with every successive outbreak.The objective of this study is to develop a mathematical model incorporating screening of immigrants as a control against the spread of Ebola. To achieve the objective of this study, a deterministic non-linear mathematical model for the transmission dynamics of Ebola incorporating screening is developed and analyzed. The analysis shows that the disease free equilibrium of the model may not be globally asymptotically stable whenever R_0 is less than unity. The Ger Sgorin disc argument is used to show that the model has a unique, locally asymptotically stable Endemic Equilibrium (EE). This means that given a small perturbation near the EE, the system returns to EE. We present numerical simulation results in which we observe a significant decrease in the number of Ebola infectives as a result of screening. Hence, we can conclude that screening of immigrants should be considered alongside other control and treatment measures for the effective management and control of Ebola.This EVD outbreak, believed to have started in Guinea in March 2014 spread to Nigeria through an airline passenger, who arrived from Liberia. It also spread to Senegal by a student from Guinea, who arrived by land transportation [9, 17]. The outbreak eventually spread to other regions outside Africa. For instance, some Ebola-infected patients were flown to the US, France, Germany, Norway, Spain and the UK [4, 17] for health-care delivery. The US diagnosed its first imported travel-related Ebola case in September 2014 (by a person who had travelled to Dallas, Texas, from Liberia). The imported case, who later died of the disease on 8 October 2014, resulted in the infection of two health-care workers who cared for the deceased patient [12]. One of the cases flown to Spain also led to an infection of healthcare workers [4]. A total of 17,942 cases, with 6,388 deaths were reported to WHO as of December 2014.

With this threat of international spread of such a highly infectious disease, compounded by symptom overlap with common illnesses such as malaria, typhoid and flu, screening of immigrants for EVD is imperative if its spread is to be kept under check.