Aoba-yama Colloquium for Mathematical Biology
January, 2020

Dengue transmission model focusing on human awareness based transmission

Dipo Aldila*, Egi Safitri

Department of Mathematics, Universitas Indonesia, 16424 Depok, Indonesia

aldiladipo@sci.ui.ac.id (*corresponding author)

Human behavior in responding to the dangers that threaten their self is always interesting to discuss, including human responsiveness to the risks of infectious disease, for an example with dengue. Naturally, individuals, as well as the community, will try to form self-defense against dengue when the number of dengue cases begins to be realized by the community. This can be seen through the high intensity of mass media that updating the incidences or health campaigns in the field.

Many mathematical models have been proposed to understand the mechanism of the spread of dengue, which considering so many factors, such as vertical transmission, prevention and control interventions, Antibody-Dependent Enhancement (ADE), and so on. Unfortunately, not so many of them considering human self-defense, which is formed caused by awareness on the incidence of dengue in the field.

Here we present a mathematical model of dengue transmission, considering human awareness effect in the infection term between mosquito and human. Interventions with insecticide and mosquito repellent involved in the model as the dengue eradication program. Derivation of the model will be discussed in detail, followed by mathematical analysis on the existence and local stability of the equilibrium points, which related to the basic reproduction number of the model. Human awareness exhibits a backward bifurcation emphasizing the need for sustained insecticides and/or mosquito repellent intervention until the basic reproduction number, $\mathcal{R}_0$, drops below the critical value at which controls are feasible. We conclude that human awareness could help the success of the eradication program, whenever the awareness of the community to dengue above some critical level.