A mathematical model for Ebola epidemic with self-protection measure

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Keywords: Ebola transmission, dynamical systems, change of behavior, stability, NSFD scheme.

A mathematical model presented in [1] for the transmission dynamics of Ebola virus is extended into a mathematical model that incorporates vaccination and change of behavior for self-protection of susceptible individuals. In the new setting, it is shown that the disease-free equilibrium is globally asymptotically stable (GAS) when the basic reproduction number (denoted by $\mathcal{R}_0$) is less than or equal to unity and unstable when $\mathcal{R}_0 > 1$. In the latter case, we have a unique endemic equilibrium point which is locally asymptotically stable (LAS). Sensitivity analysis of the model using the parameters relevant to the transmission dynamics of the Ebola virus disease is given. A dynamical consistent nonstandard finite difference (NSFD) scheme with the continuous model is proposed. Numerical simulations are given to support the theoretical analysis.

References

[1] Berge T., Lubuma J. M. -S., Moremedi G. M., Morris N. and Shave R. K., A simple mathematical model for Ebola in Africa. *Journal of Biological Dynamics*. **Vol.** 11 (1) (2016): 42-74.