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A MATHEMATICAL MODEL FOR THE SEXUAL TRANSMISSION OF ZIKA VIRUS BASED ON GENDER AND SYMPTOMS

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Abstract: Zika virus is a member of Flaviviridae that also causes Japanese Encephalitis, dengue, yellow fever, and West Nile fever. General symptoms of the zika virus are low-grade fever (less than 38.5^o), macula-papular rash, myalgia, asthenia, headache, and transient arthritis. Zika virus can cause congenital anomalies (such as microcephaly), Guillain-Barre syndrome, and other neurological and autoimmune disorders. In the present mathematical model, we observed the effect of sexual transmission on gender and symptoms based division of the infected human population. We proposed a theorem to check the local stability of disease free equilibrium state. To verify the theorem, we performed some numerical simulations. We also analyzed the global stability of disease free equilibrium state. Furthermore, we checked the effect of different sexual transmission rates on the population dynamics by calculating normalized sensitivity indices of R_0. Results of the present study suggest that sexual transmission noticeably affects Zika dissemination and by controlling sexual transmission rates, we can restrict the Zika virus spread.

Keywords and Phrases: Disease free equilibrium, Stability analysis, Sensitivity analysis, Basic reproduction number, Sexual transmission.

2020 Mathematics Subject Classification: 34A34, 34D20, 34D23.

1. Introduction

Zika virus was first detected in a rhesus monkey in the Zika Forest of Uganda in 1947, and the first human case was also reported in Uganda in 1952 [13]. It