149. A mathematical model of Typhoid Fever disease dynamics with drug resistant aspect

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Abstract

Typhoid fever continues to be a major global health challenge in the developing countries. The emergence of drug-resistant Typhoid strain currently is major problem in tackling this scourge. A dynamical transmission of Typhoid fever in human populations with antibiotic-resistant was proposed and used to analyze the treatment using antibiotics. The model consists of human population and pathogen population. The human population is grouped into six compartments namely; susceptible, exposed, infected with drug sensitive strain, infected with drug resistant strain, recovered and bacterial population. We formulated a non-linear ODEs and modelled interactions among these populations. The control reproduction number R_c, was derived using next-generation matrix approach and was used to analyze dynamical behavour of the disease. If $R_c < 1$ the disease is contained and if $R_c > 1$, it persists leading to endemic state. The local and global stability analysis at DFE points were determined using Routh-Hurwitz conditions and Lyapunov functions respectively. The DFE and endemic equilibrium were determined using theories of ODEs. Sensitivity analysis was done using normalized forward sensitivity index in order identify the most important model parameters. Using MATLAB, numerical simulation was done and graphs plotted. The findings indicated that effective treatment and strict hygiene practices especially when one is handling food, drinking water and beverages, is adequate to eradicate the disease in the community.

Keywords: *Typhoid Fever, Drug resistant strain, Stability analysis, Endemic*