

Modeling the impact of sex and gender disparity on the overall dynamics of a nonlethal respiratory infection and the direct/indirect effect of mass-vaccination: special reference to influenza

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Abstract

The aim of this work is to study the impact of sex and gender disparity on the overall dynamics of influenza A virus infection and to explore the direct and indirect effect of influenza A mass vaccination. To this end, a deterministic SIR model has been formulated and thoroughly analyzed, where the equilibrium and stability analyses have been explored. The impact of sex disparity (i.e., disparity in susceptibility and in recovery rate between females and males) on the disease outcome (i.e., the basic reproduction number R_0 and the endemic prevalence of influenza in females and males) has been investigated. Mathematical and numerical analyses show that sex and gender disparities affect on the severity as well as the endemic prevalence of infection in both sexes. The analysis shows further that the efficacy of the vaccine for both sexes (e_1 & e_2) and the response of the gender to mass-vaccination campaigns ψ play a crucial role in influenza A containment and elimination process, where they impact significantly on the protection ratio as well as on the direct, indirect and total effect of vaccination on the burden of infection.

