Mathematical Modeling and Analysis of NmA-cerebrospinal Meningitis Dynamics

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Meningitis (Men) is a fact of the top ten major public health concerns with more than one million cases reported in Africa only since 1988. We formulate a deterministic mathematical models for the dynamical transmission of meningitidis serogroups A (NmA) within a community. We provide a theoretical study of the model, and derive the basic reproduction number R_0. We compute equilibria and study their stability. We show that there exists a threshold parameter ξ such that when $0 < R_0 < \xi$, the disease-free equilibrium is globally asymptotically stable while when $\xi < R_0 < 1$, the model exhibits the phenomenon of backward bifurcation. The sensitivity analysis of the model has been performed in order to determine the impact of related parameters on outbreak severity. The theory is supported by numerical simulations, which further suggest that the control of the epidemic of NmA-cerebrospinal meningitis pass through a combination of the vaccination of young susceptible individuals and the treatment of infectious.