National University of Science and Technology
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FACULTY OF APPLIED SCIENCES

Department of
(Applied Mathematics) dy

MODELLING THE EFFECTS OF BCG VACCINATION IN HIV/AIDS AND TB COINFECTED INDIVIDUALS.
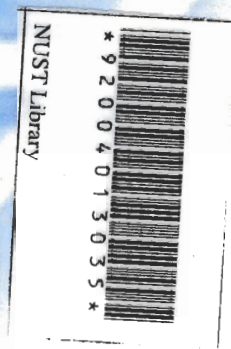
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ABSTRACT

An HIV/AIDS and TB coinfection model which considers BCG vaccination for the control of TB is presented. We start by presenting a simple TB model with BCG vaccination and analysing the model taking into considerations situations with no intervention strategies, situations with BCG vaccination as the only strategy and situations that involve BCG coupled with treatment of infectives. The TB model with BCG vaccination is shown to exhibit backward bifurcation where the stable disease-free equilibrium coexists with a stable endemic equilibrium when the associated reproduction number is less than unity. A simple HIV/AIDS model is then presented which has a locally asymptotically stable disease free equilibrium when also the associated reproduction number is less than unity. We proceed to present and analyse the full HIV/AIDS and TB coinfection model with BCG vaccination. The thresholds and equlibria quantities are determined and analysed for their stabilities. Numerical simulations are done to note the effects of parameters involved in the spread of the two diseases on the population sizes at different stages of either of the two diseases. From the study we conclude that BCG vaccination delays the onset of the AIDS stage of HIV infection and also that in poor resource settings BCG vaccination is counterproductive to children whose immune system has been compromised by HIV/AIDS.