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INCORPORATION OF AWARENESS PROGRAMS INTO A MODEL OF THE SPREAD OF HIV/AIDS AMONGST PEOPLE WHO INJECT DRUGS (PWIDs)

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Mathematical modelling techniques have been used extensively during the HIV epidemic. Injecting drug use is an increasing cause of HIV transmission in most countries worldwide. The media plays an important role in spreading health awareness by changing mixing behaviour. The published studies show some of the mathematical models which have been used to explore the effect of media awareness programs on the spread and control of infectious disease [1].

In this talk, we have developed a mathematical model of the effect of disease awareness programs on the prevalence of HIV amongst people who inject drugs (PWIDs), building on the models developed by [2] and [3]. A system of differential equations has been deduced to describe the improved model that reduces the spread of the diseases through the effect of awareness of disease on sharing needles and syringes amongst the PWID population. The model supposes that PWIDs clean their needles before use rather than after.

We perform an equilibrium and stability analysis for this model. Our discussion has been focused on two ways of studying the effect of awareness programs in disease transmission models. The key biological parameter of our model is the basic reproductive number R_0. We find that there is a critical threshold parameter $R_0 = 1$ which determines the behaviour of the model. We have shown that the system has a unique equilibrium solution, then we have shown that if $R_0 \leq 1$ then the disease-free equilibrium is globally asymptotically stable, so whatever the initial fraction of infected individuals the disease will die out as time becomes large. If there is no disease initially present then there will never be any disease. If $R_0 > 1$ then there is the disease-free equilibrium and additionally a unique endemic equilibrium. If there is disease initially present and $R_0 > 1$ then the system tends to the unique endemic equilibrium. We also showed that the disease-free equilibrium is locally asymptotically stable if $R_0 < 1$, neutrally stable if $R_0 = 1$ and unstable if $R_0 > 1$. In the case that $R_0 > 1$ we showed that the endemic equilibrium was locally asymptotically stable too. Our analytical results are confirmed by using simulation with realistic parameters values.

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