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ON THE DYNAMICS OF A MATHEMATICAL MODEL OF VIRUS SPREADING INCORPORATING THE EFFECT OF A VACCINE BY GÖKÇE ET AL. (NONLINEAR ANALYSIS: REAL WORLD APPLICATIONS 2024)

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ABSTRACT

We study a model of virus spreading incorporating the effect of a vaccine proposed in [1] by Gökçe *et al.* This model is based on a system of six differential equations describing the flow between five compartments in epidemic model with the influence of the vaccine. This influence is described by Hill function with coefficients n and κ.

In the original article [1] the authors focused on calculating $\mathcal{R}_0$, the coefficient beeing a threshold for local stability of a disease free equilibrium (DFE), whcih strongly depends on the coefficient n, as well as a backward biffurcation for $n = 2$.

In our analysis we used standard Routh-Hurwitz Criterion to prove the local stability of the DFE state for $\mathcal{R}_0 < 1$, and the global stability of this state under some more restrictive condition, based on Kamgang and Sallet approach [2]. We also attempted to estimate the number of positive steady states and study their stability for arbitrary n.

REFERENCES

[1] A. Gökçe, B. Gürbüz, and A.D. Rendall: *Dynamics of a mathematical model of virus spreading incorporating the effect of a vaccine*, Nonlinear Analysis: Real World Applications **78** (2024), 104097.

[2] J.C. Kamgang and G. Sallet: *Computation of threshold conditions for epidemiologi- cal models and global stability of the disease-free equilibrium (dfe)*, Mathematical Biosciences **213** (2008), 1–12.