ABSTRACT

COVID-19 is a serious problem in Kenya. It has put an unprecedented burden on the worldwide economy and public health. The rapid spread of COVID-19 has been driven predominantly by aerosol transmissions. We modeled the impacts of screening and non-clinical strategies like use of facemask, hand washing and social distancing on COVID-19 transmission in Kenya. The general objective of the study was to develop and analyze a deterministic mathematical model to show the effects of screening and non-clinical strategies in combating the spread of the COVID-19 in Kenya. The specific objectives of this study were to formulate mathematical models on the spread of coronavirus disease 2019, carry out the model analysis to determine the positivity, boundedness, equilibrium points, local stability, global stabilities, sensitivity and bifurcation analysis of the model and finally use numerical simulations to determine the effects of screening and non- clinical strategies on the spread of COVID-19 in Kenya. The Mathematical model was *based on SIRS epidemiological classical model. In developing the model, the population was divided into six human compartments; Susceptible, Exposed, Infected, isolated in the hospital, Isolated at home, and Recovered.

The basic reproduction number was determined using Next Generation Method. The model was analyzed through the determination of the model's steady states. The stabilities of steady states were analyzed based on reproduction number using: signs of Jacobi Matrix evaluated at steady state, Lyapunov Criteria, Centre Manifold theorem, Metzler matrix, and Routh-Hurwitz. Numerical simulations were carried out using MATLAB's inbuilt ODE solver based on Runge Kutta Method. Sensitivity analysis of the model parameters was carried out using partial differentiation of the reproduction number and also using Normalized sensitivity analysis. From this analysis, findings showed that adherence to containment measures had great negative impact on the reproduction number. When a single strategy was simulated, it was found to reduce the number of daily reported cases but the impact was little compared to when the measures were * combined. It was found through simulation that adherence to the COVID-19 containment measures by the population would reduce the reproduction number to below 1 hence containing the pademic. No single strategy has the effect of containing the pandemic alone. The findings of this study show that the combined strategies like screening, hand washing, facemask and social distancing must be used collectively to contain the spread of COVID-19 in Kenya. We recommended strict adherence to containment measures.