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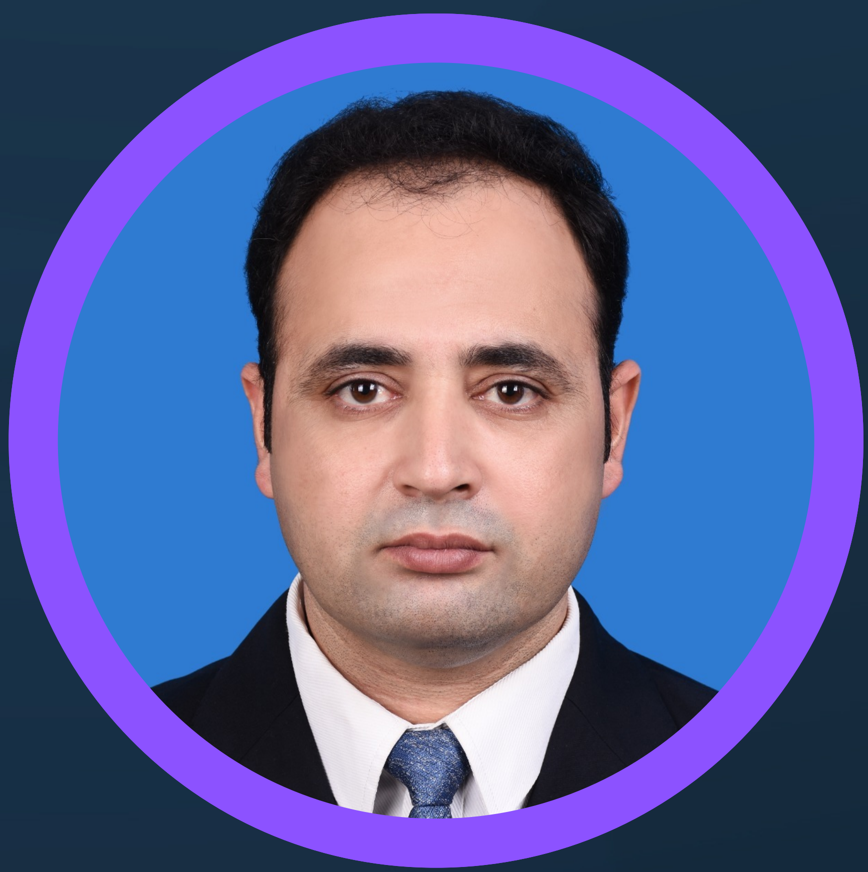
# EPIDEMIC MODELING AND ANALYSIS OF THE COVID-19 VIRAL INFECTION WITH PREVENTIVE MEASURES




**DR RASHID JAN**
**DEPARTMENT OF MATHEMATICS**
**UNIVERSITY OF SWABI**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**Abstract**. COVID-19 is a widely recognized viral infection with global implications affecting various aspects of life. Consequently, comprehending the transmission dynamics of the virus is of utmost importance for effective management and control of the spread of COVID-19. In this work, we explore an optimal control model to investigate the transmission dynamics of COVID-19. We establish essential model properties, such as the non-negativity and boundedness of solutions, as well as the region of invariance. Additionally, we compute an expression for the basic reproduction number and carry out sensitivity analysis to identify the most sensitive parameter. Based on this analysis, we present optimal control strategies to reduce the burden of the disease and related costs, and demonstrate that optimal control is both unique and feasible. We use Pontryagin's Minimum Principle to analytically study the characterization of optimal trajectories, and perform various simulations to support our analytical results. The simulations showed that the proposed controls significantly influence the disease burden compared to the absence of control cases, and that the applied control strategies are effective throughout the intervention period in reducing COVID-19 infections in the community. Furthermore, simulation results suggest that concurrently applying all control strategies is more effective in mitigating the spread of COVID-19 than any other preventive measures.


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Website: https://math.usm.my
Email: dean_mat@usm.my
Tel: +604 653 3284