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A MATHEMATICAL MODEL FOR THE SPREAD OF COVID-19 IN SRI LANKA WITH THE ENVIRONMENTAL TRANSMISSION OF CORONAVIRUS

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COVID-19 is caused by a new strain of coronavirus called the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). COVID-19 is mainly transmitted to humans by direct contact with respiratory droplets emitted by COVID-19-infected persons (human-to-human/ direct transmissions). Also, the coronavirus can survive on outside surfaces; hence, COVID-19 can be transmitted by contacting the virus that survived in the environment (environmental-to-human/ environmental transmission). Vaccination programmes are among the most important strategies to prevent and control the COVID-19 pandemic. In this study, a compartmental model was developed to describe the spread of COVID-19 by dividing the population into Susceptible without vaccination ($S(t)$), Vaccinated ($V(t)$), Exposed who are vaccinated ($E_v(t)$), Exposed who are not vaccinated ($E(t)$), Asymptomatic infectious ($I_A(t)$), Symptomatic infectious ($I_S(t)$), Recovered ($R(t)$), and Dead due to disease ($D(t)$) groups. Both direct and environmental transmission of the disease was considered with the threshold level of coronavirus to result in an infection. The transmission rate from susceptible to exposed (β) is estimated using numerical methods to best fit the simulated result to the available data considering the daily reported new cases of COVID-19 in Sri Lanka when there is no ongoing vaccination programme. The simulation results were compared with the daily reported new cases of COVID-19 in Sri Lanka, when there is an ongoing vaccination programme. These results will be used in further studies to identify the optimal vaccination strategies that can be used to prevent future outbreaks.

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