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MATHEMATICAL MODEL FOR THE SPREAD OF COVID-19 IN AN OPEN POPULATION WITH ENVIRONMENTAL TRANSMISSION OF CORONAVIRUS

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COVID-19 is an infectious disease readily spread by a pathogen called the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) through direct contact with an infected person or contact with pathogens that have survived in the environment. In this study, we developed a compartmental model to study the dynamics of the spread of COVID-19 in a small open population for a short period. To develop the mathematical model, we considered a population in an office environment which consists of staff members and customers. We considered these two groups separately and categorized each group according to the stage of the disease: The staff members (N_w) is divided into three groups as Susceptible staff members (S_w), Exposed staff members (E_w) and Infected staff members (T_w). The customers (N_c) is divided into three groups Susceptible customers (S_c), Exposed customers (E_c) and Infected customers (I_c). Here, the dynamics of the COVID-19 prevalence were analyzed by taking the direct and environmental transmissions into account with the threshold for infection of COVID-19. Simulation results were obtained for two situations using the *odint* function in Python 3 software. First, when there are both infected staff members and infected customers in the open population, and next, when there are only infected customers in the open population. The results show that the risk of the staff members becoming exposed is greater when there are both infected staff members and infected customers in the open population than when there are only infected customers in the open population.

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Keywords: COVID-19, Environmental transmission, Open population, SARS-CoV-2, Threshold level