

# Post Nyiragongo Volcano eruption and the rise of covid-19 in Rwanda: A Mathematical Model

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## Abstract

Background: Nyiragongo Volcano erupted, and disturbed preventive measures taken by Rwanda to curb the pressure of COVID-19 pandemic transmission. About 232,433 Congolese left their home, and of them, more than 8000 people crossed the border to Rwanda, which disturbed COVID-19 pandemic preventive measures. Objective: This study sought to find out whether the rise in Covid-19 in Rwanda was caused by volcanic eruption in either the exposed area of Rubavu district due to suddenly unpredicted eruption or spread throughout some neighboring areas via Kigali due to the earthquakes. Both Mathematical model and a sequential mathematical preliminary were used. Methods: A sequential mathematical preliminary of Covid-19 was considered to check how it spreads within a large number of population. The model diagram was proposed with four compartmental model. The nonlinear dynamical system was derived from the model. The model was checked for positivity and boundedness in a system. The basic reproduction number was computed using the next generation Matrix. Results: We found that COVID-19 pandemic was positively invariant in a system. The transmission rate was observed with  $R_0 = 25.51$ . The transmission rate was great than what was determined before the eruption of Nyiragongo Volcano ( $R_0 = 3$ ). Since  $R_0 = 25.51$  the disease is high in the system. As of the study based, the results finally showed that the rise in Covid-19 in Rwanda was caused by volcanic eruption. Preventive measures should be reinforced by providing a place where people should be kept in case of natural disasters and wars in neighboring countries.

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