



The dynamics of COVID-19 outbreak in Nigeria: A sub-national analysis



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ABSTRACT

The African health crisis feared at the beginning of the COVID-19 pandemic has not materialized, and there is interest globally in understanding possible peculiarities in COVID-19 outbreak dynamics in the tropics and sub-tropics that have led to a much milder African outbreak than initial projections. Towards this, Susceptible-Infected-Recovered-Dead compartmental models were fitted to COVID-19 data from all Nigerian states in this study, from which four parameters were estimated per state. A density-based clustering method was used to identify states with similar outbreak dynamics, and the stage of the outbreak determined per state. Subsequently, outbreak dynamics were correlated with absolute humidity, temperature, population density and distance to the international passenger travel gateways in the country. The models revealed that while the outbreak is still increasing nationally, outbreaks in at least 12 states have peaked. A total of at least 519,672 confirmed cases were predicted by January 2021, with a worst case scenario of at least 14,785,457. Weak positive correlations were found between COVID-19 spread and absolute humidity (Pearson's Coefficient = 0.136, $p < 0.05$) and temperature (Pearson's Coefficient = 0.021, $p < 0.05$). While many studies have established links between temperature and humidity and COVID-19 spread, the correlation has most usually been negative where it exists. The findings in this study of possible positive correlation is in line with a number of previous studies showing such unexpected correlations in the tropics or subtropics. This highlights even more the importance of additional studies on COVID-19 dynamics in Africa.

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Introduction

The coronavirus disease (COVID-19) first broke out in the city of Wuhan, Hubei Province in China in late December 2019 [20]. With rapid spread across countries especially across Europe, COVID-19 was declared a pandemic by the WHO

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