

Probable link Between COVID-19, Particulate Matter, Ozone and some Meteorological Variables in Santiago, Chile

Giovanni A Salini^{1*} and Patricio R Pacheco²

¹DMFA, Universidad Catolica de la Santisima Concepcion, Chile

²Departamento de Fisica, Universidad Tecnologica Metropolitana, Chile

Published May 19th, 2021

ABSTRACT

We present here a study on the possible spread of the SARS-CoV-2 virus of the Covid-19 disease among humans through aerosols contained in urban air contaminated by respirable particulate matter and tropospheric ozone, as well as the incidence of local meteorology in an area with orographic basin characteristics and in a certain period of time (March 30 to June 15, 2021). The data from the hourly time series of three meteorological variables - temperature, relative humidity, wind speed - and three pollutants - PM₁₀, PM_{2.5} and O₃ - were considered together with the hourly data of the largest number of patients accumulated in seven communes - chosen at random - in Santiago de Chile, studying a possible link between them. From the perspective of the pandemic, the number of infected patients was linked to the hourly time series of meteorological and pollutant variables, generating new time series. Nonlinear analysis and chaos theory formalism were applied to these new time series, obtaining the largest Lyapunov exponent, correlation dimension, Kolmogorov entropy, Hurst exponent and LempelZiv complexity. Preliminary results show that meteorological and air pollution variables may be part of the fraction of elements that give sustainability to the accumulated growth of infected patients and favor the spread of the pandemic, making the accumulated disease curve chaotic and complex. In addition, environmental pollution could worsen diseases such as coronavirus infection (COVID-19). For all time-series, the Lempel-Ziv complexity turned out to be between 0 and 1, indicating connectivity and chaos. Lyapunov's greatest exponent, as well as Kolmogorov's entropy, were positive, also indicating chaos. The Hurst exponent was found to be greater than 0.5 and less than 1 for all time-series. This, in turn, indicates a positive longterm autocorrelation. Finally, the correlation dimension was less than 5, which reveals that the new time series constructed are not random. Another predominant factor that is being studied is the crowding of people in different areas of the city. In other words, how would it affect the number of people living in the same household.

Keywords: Coronavirus; Air pollution; Entropy; Chaos; SARS-CoV-2

Corresponding author: Giovanni A Salini, DMFA, Universidad Catolica de la Santisima Concepcion, Chile. E-mail: gsalini@ucsc.cl

Citation: Salini GA & Pacheco PR. (2021) Probable link Between COVID-19, Particulate Matter, Ozone and some Meteorological Variables in Santiago, Chile. J Infect Dis Res, 4(S1): 07.

Copyright: ©2021 Salini GA & Pacheco PR. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.