Transmissibility of COVID-19 and its association with temperature and humidity

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Abstract

Background: The new coronavirus disease COVID-19 outbroke in Wuhan, Hubei Province, China in December 2019, and has spread by human-to-human transmission to other areas. This study evaluated the transmissibility of the infectious disease and analyzed its association with temperature and humidity, in order to put forward suggestions on how to suppress the transmission.

Methods: In this study, we revised the reported data in Wuhan to estimate the actual number of confirmed cases. Then we used the equation derived from the Susceptible–Exposed–Infectious–Recovered (SEIR) model to calculate R0 from January 24, 2020 to February 13, 2020 in 11 major cities in China for comparison. With the calculation results, we conducted correlation analysis and regression analysis between R0 and temperature and humidity to see the impact of weather on the transmissibility of COVID-19.

Results: It was estimated that the cumulative number of confirmed cases had exceeded 45,000 by February 13, 2020 in Wuhan. The average R0 in Wuhan was 2.7011, significantly higher than those in other cities ranging from 1.7762 to 2.3700. The inflection points in the cities outside Hubei Province were between January 30, 2020 and February 3, 2020, while there had not been an obvious downward trend of R0 in Wuhan. R0 negatively correlated with both temperature and humidity, which was significant at the 0.01 level.

Conclusions: The transmissibility of COVID-19 was strong and importance should be attached to the intervention of its transmission especially in Wuhan. According to the correlation between R0 and weather, the spread of disease will be suppressed as the weather warms.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures
Comparisons between reported and revised data in Wuhan.

Figure 1
Figure 2

Calculation results of the basic reproduction number.
Figure 3

Scatter plot of temperature and basic reproduction number.
Figure 4

Scatter plot of humidity and basic reproduction number.