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An Analysis of Correlation between Temperature and Infection in Covid-2019 Transmission

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Abstract

The COVID-19 epidemic is causing an international health emergency attention and imposing financial damage to economies to lock down the countries in strict quarantine measures. Further the relationship between temperature and humidity with COVID-19 affected cities around the world justifies exceptional consideration. Geographical location 30-50 °N' of equator having an average temperatures between 5-11 °C, and absolute humidity (4-7 g/m^3) had higher capacity of transmission of respiratory viruses due to environmental factors in which pathogen and host meet. The strategies to fight coronavirus must pay consideration to the environmental factors such as weather and climate, humidity, temperature, and airflow on the transmission of human respiratory viruses to identify further scientific knowledge to fill the gaps. Further the outbreak has some positive and negative impact on earth's environment, which includes reduced CO2 level, and better air quality, while matter of concern for authorities is how to dispose-off infected waste tissue and old face masks.

Keywords: Climate; Outbreak; SARS-CoV-2

Introduction

Initial identification and isolation of SARS-CoV-2 was confirm as novel strain in hospitalized patients which came from seafood market of Wuhan, China. According to World Health Organization (WHO) corona virus and some other infectious respiratory viruses spread from individual physical unprotected direct and indirect contact to community via various modes of transmission, including discharge of infected person salvia, coughs or sneeze .The speedy spread and inception of coronavirus is a great matter of concern and challenge to public health officials across the world [1].

Low temperature (4 °C) with less humidity favor the life cycle of coronavirus family. Further viruses have altered behaviors of living in the particular location and environment. For illustration, sometimes to safeguard from ultraviolet light virus particles group together themselves to stay alive. These pathogens attach themselves further to near organic particles in the environment (plant and animal) debris as a target host. The debris (shelter) offer them physical blockade and save the virus group particle from disinfectants threats [2]. The coronavirus family includes specific group of viruses such (Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus and the human coronaviruses (HCoV), which have the ability and capacity to stay alive in open air or on specific targeted host up to a week on shells such as, plastic , glass, paper and different metal [3].

Coronaviruses has large family of viruses. Some of them root infection in respiratory system of humans and some others only infect animals. Coronaviruses infected animals spread infection in humans quickly through gene mutation as previously in observed in Middle East Respiratory Syndrome though camels. But now the recent outbreak now supposed to have transpired form bats, known as SARS-CoV-2 [4]. The virus has instigated the outbreak of the recent severe acute respiratory syndrome that causes the coronavirus disease 2019, COVID-19 [5].

Since its isolation and identification in January 2020 as a novel strain, According to available data the virus claimed 2 million people infected till April 15, so far over 125,980 confirmed deaths have been reported in 210 territories and thousands of new cases are being reported daily. The World Health Organization (WHO) health officials and scientists are in a desperate hunt for an action plan strategy against Covid -19 to shield the extent of this virus as rapidly as possible. During this outbreak the environment get a new direction and significance for researchers. The researcher

must understand how important the environmental factors are involved or linked in this whole scenario of its expansion level. Energies and action plans currently focus on person -to-person transmission, possible animal-to-human contacts, and different techniques to use to treat those at presently infected. In due course to contain the virus, we must also signify how the environment -water, soil, air, and man-made surfaces - play a role in its transmission. Certain environments aid as life pools for pathogens (organisms that cause disease). It's therefore critical to consider the environment when it comes to embark upon virus outbreaks.

Temperature and Humidity

The effect of temperature and humidity on influenza and other respiratory can be understood by various uncontroversial theories to clarify the detailed conclusion [6-9]. According to data analysis of these researches at 20 °C, transmission effectiveness of an influenza A/H3N2 segregated and showed a dependence on RH, with airborne (i.e. droplet or aerosol) .Further transmission being highest at 20-35% RH, poor at 50% RH, restrained at 65% RH, and inactive at 80% RH. Influenza transmission was stopped at high temperature (30 °C), irrespective of RH [10].

The same pattern is assumed for cornavirus outbreak from equator to higher altitudes. The significant communal transmission of COVID-19 had scattering roughly along the 30-50 °N' corridor at constantly parallel weather patterns consisting of average temperatures of 5-11°C, combined with low specific (3-6 g/kg) and absolute humidity (4-7 g/m^3). This means distribution of significant community outbreaks along restricted latitude, temperature, and humidity are consistent with the behavior of a seasonal respiratory virus. With modelling, it may be possible to predict areas at high risk of significant community transmission of COVID-19 **Figure 1.**

Environmental Factors of Disease Transmission

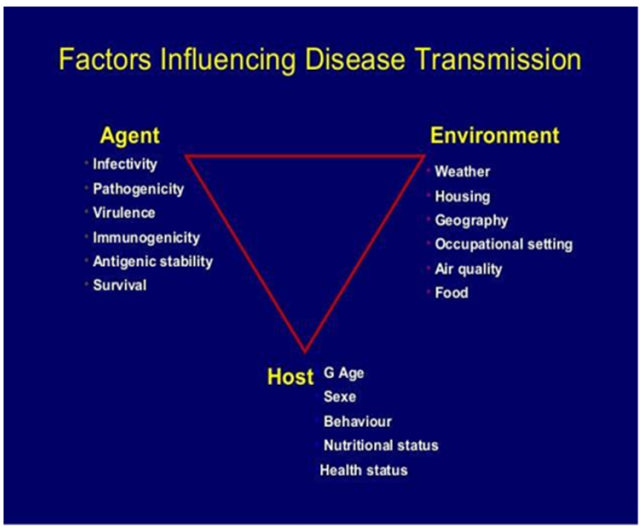

Figure 1: Transmission of respiratory viruses influenced by complex chain of events occurring between infected and targeted hosts. Environmental factors such as weather (Temperature, Humidity), Geographical location (Latitude) air quality and food are hypothesized to have an impact on various aspects of the transmission chain.

The distribution of the key unrestricted outbreaks along restricted latitude, temperature, and humidity are stable with behavior of a seasonal respiratory virus. The link between temperature and humidity in the cities affected with COVID-19 deserves special attention as shown in **Figure 2.** The map showed substantial unrestricted diffusion of infection has transpired in east and west 30- 50°N' zone. Further in **Figure 2** firsthand epicenters of disease highlighted between yellow bands that fits the requirements with highest number of reported cases and deaths. In addition initially the outbreak failed to spread immediately to south of china due to temperature difference. The South Asian countries (Pakistan, India) reported minimum number of cases as compared to cooler climates and temperate regions.

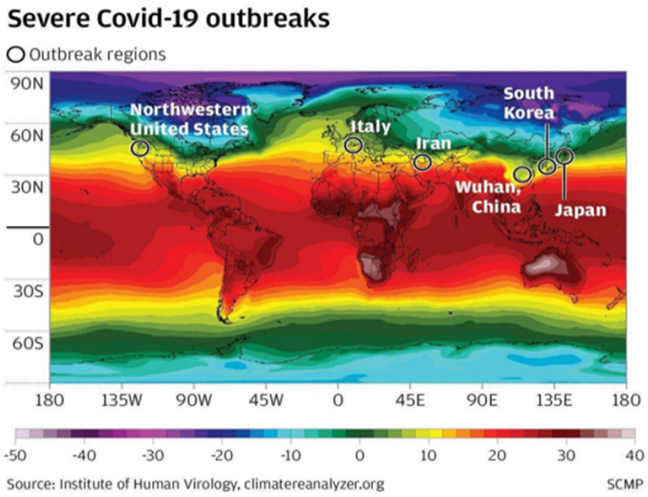

Figure 2: World temperature map November 2019-March 2020. Color gradient indicates 2-meter temperatures in degrees Celsius. Black circles represent countries with significant community transmission (> 10 deaths as of March 10, 2020). Image from Climate Reanalyzer (https://ClimateReanalyzer.org), Climate Change Institute, University of Maine, USA.

There is a similarity in the measures of average temperature (5-11°C) and RH (44-84%) in the affected cities also the environmental conditions that are conducive to coronavirus survival (4 °C and 20-80% RH). Temperature and humidity are established factors in SARS-CoV, MERS-CoV and influenza survival in the past [11]. Furthermore, the spread of infectious viruses can be affected by a number of factors, including weather and climatic conditions (such as temperature and humidity), social behavior and awareness attitude, population density and medical treatment excellence within the countries. Therefore, understanding the relationship between weather and the transmission of COVID-19 is key to forecast the intensity and end time of this epidemic. This result is consistent with the fact that the high temperature and high humidity significantly reduce the transmission of influenza. It indicates that the arrival of summer and rainy season in the northern hemisphere can effectively reduce the transmission of the COVID-19. There is a resemblance in the events of average temperature (5-11°C) and RH (44-84%) in the cities which are affected and can be called conditions of coronavirus continued existence (4°C and 20-80% RH). It is significant to footnote that uniform colder zones in the more northern latitudes have

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been comparatively free of COVID-19 indicating to a probable bottom range for the temperature, which could be in line for to anticipation of freeze-thaw cycles that could shake virus capability or other factors. This assumption can be established in experimental conditions parallel to work that have been done before, environmental sample testing from areas of ongoing infection, and close epidemiologic and climate studies.

In the couple of two months, temperatures will increase intensely through many areas in the Northern Hemisphere, which hypothetically zoom many areas at higher risk, .The family of human coronaviruses (HCoV-229E, HCoV-HKU1, HCoV-NL63, and HCoV-OC43), which generally cause common cold signs, have been revealed to show strong winter seasonality between two months of December and April, and are untraceable in summer months in temperate regions.

Certain past studies have exposed that the alphacorona virus HCoV-229E increase in the decrease, while HCoV-OC43 (a betacoronavirus in the same genera as SARS-CoV-2) has a winter prevalence [12]. Although it would be even more challenging to make a long-term calculation at this stage, it is appealing to suppose COVID-19 to weaken substantially in affected areas (above the 30 °N') in the coming months and into the summer.

Conclusion

The respiratory and some other viral infections are common among humans and create critical illnesses by different routes in distinct sections around the globe. In addition understanding the mode of transmission of these viruses has comprehensive community health implications. Certainly, a variation in meteorological factors of effected regions has at times been linked with degrees of virus infection as well as transmission among individuals.

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