

Impact of the Inversion and Air Pollution in Covid-19

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Abstract

The number of coronavirus patients and the increasing inversion altitude follow a downward curve. Pollutants are dispersed throughout a greater thickness of the atmosphere as temperature inversion altitude rises, resulting in a decrease in their concentration at the earth's surface. Simultaneously, the quantity of patients with Coronavirus lessens. A decreasing and increasing relationship was found between the severity of pollutants and the number of coronavirus patients, despite a low significance level during each period. The correlation coefficient was negative for one day and nine to fourteen days. Therefore, the effects of the severity of pollutants and Covid-19 are not observed for periods of one, nine, or fourteen days. On the other hand, a positive correlation coefficient was found between 2 and 8 days. Therefore, there is a correlation between the virus infection and the onset of disease symptoms that ranges from two to eight days, with the three-day period showing the greatest correlation. It can be deduced from the relationship between the severity of pollutants, the number of patients, and the inversion altitude that occurs between 2 and 5 days that this virus is most prevalent in the Iranian metropolis of Tehran.

Keywords: Covid-19, Temperature inversion; Concentration of pollutant; Correlation coefficient; P value

Introduction

The enclosure of our urban environment between high mountains, rising population, denser traffic congestion, industrial activities, and other topographical factors are typically the causes of pollution in metropolises. Temperature inversion in the atmosphere's boundary layer and air stability are two prominent atmosphere processors [1]. Air stability saturates the earth's surface atmosphere with pollutants and prevents the rise and displacement of air masses, as well as the refinement and displacement of ordinary air in the urban atmosphere. Humans and the environment around them are impacted both directly and indirectly by severe inversions. Air pollution rises when the height of the inversion is closer to the earth's surface [2]. Cardiovascular and respiratory diseases, stroke, and covid-19 infection are common in Tehran, one of the world's most polluted cities. By increasing virus exposure and susceptibility, ambient air pollution can contribute to the spread of infections. As a result, aerosol-contaminated air may increase the virus's likelihood of survival and infection. A number of factors, including a set of ecological and meteorological parameters, have a reasonable relationship with atmospheric pollutants [3]. They found that the strongest attenuation of clear-sky surface solar radiation caused by aerosols occurs in most of China in April, while the strongest attenuation of clear-sky surface solar radiation caused by water vapour occurs in North China and the Yangtze River Delta in June. They also found that the monthly solar radiation losses caused by water vapour are greater than those caused by aerosols [4].

On December 31, 2019, China reported a number of unusual cases of pneumonia in the city of Wuhan, Hubei Province's capital, to the World Health Organization. A brand-new virus known as SARS-CoV-2 was identified on January 7, 2020. The World Health Organization declared a global public health emergency on January 30 [4]. It began to spread throughout Iran, Italy, and other nations in February. By the end of March, half the world's population had been quarantined as a result of this epidemic. Covid-19, the most recent coronavirus pandemic, has caused widespread quarantine in many nations and sparked global concern [6]. Since its development, research on its transmission has been continuous. It is said that contact with contaminated surfaces and subsequent transmission of the Covid-19 infection through the mouth, nose, or eyes is the most common method of transmission [7].

Another way for people to spread the disease is through respiratory droplets, which are inhaled by other people while they talk, cough, or sneeze. The World Health Organization first announced that the virus would remain in the air for two hours in a closed environment for the purpose of transmission by air. Reported an additional transmission mode via air dust [8]. Dust and other particles in the air can help spread the virus remotely if they are absorbed. Numerous studies have discovered significant evidence for a link between the rate of infection and mortality and air pollution, several months after the Covid-19 pandemic. Therefore, even though the evidence presented isn't 100% convincing, it would be foolish not to act when, based on the evidence we have, we are 90% sure that air quality has a positive effect on Covid-19 pollution and losses. In Lombardy and Vamilia Romania, an investigation into the connection between the mortality rate of acute coronavirus 2 syndromes and air pollution revealed that residents of areas with high levels of pollutants are more likely to develop chronic respiratory conditions suitable for any infectious agent [9]. These areas have the virus's highest mortality rate worldwide and are among Europe's most polluted. Likewise, openness to air contamination even in sound and youthful ones prompts a persistent provocative upgrade. As a result, we come to the conclusion that the high mortality rate in northern Italy is also caused by high pollution levels. The likelihood and severity of respiratory infections caused by coronavirus-like viruses are also exacerbated by air pollution [10].

Conclusion

Air pollution is the addition of any substance that poses a threat to human, animal, or plant life. On account of temperature reversal, air

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becomes steady and particles aggregate inside reversal layer, expanding the seriousness of air contamination. According to the World Health Organization (WHO), air pollution is responsible for approximately seven million premature deaths annually. Because air pollution can make respiratory illnesses more likely and worse, the prevalence of COVID-19 has made the risk even worse. Because it is one of the most significant causes of death, air pollution and COVID-19 can cause a variety of issues, including asthma, pulmonary disorders, heart disease, stroke, diabetes, hypertension, liver infections, skin and eye infections, cancer, and neurological diseases. Increased concentrations of pollutants, including particulate matter, have been linked to the spread of the coronavirus, according to some specialists and the World Health Organization. Particulate matter is a byproduct of chemical reactions and direct emissions that contaminates cities. On colder days of the year, this pollutant generally lowers the quality of the air and makes the sky dusty. Atmospheric pollutants, particularly those with a diameter of less than 2.5 micrometers, have the potential to exacerbate the spread of the coronavirus. The primary routes by which the coronavirus can spread are through coughing, sneezing, and speaking, which release aerosols containing the virus. As a result, the Covid-19 threat is increased by air pollution. Air pollution is directly related to the spread of COVID-19 and the possibility of an increased mortality rate. Additionally, the immune system is weakened by air pollutants, which can open the door to the disease. According to reports, the number of Covid-19-infected patients who pass away goes up by 8–15% for every unit increase in the concentration of particulate matter that is less than 2.5 m. The metropolitan city of Tehran has 51 days in the acceptable range and 39 days in the unhealthy range for sensitive groups, according to this study's analysis of air pollution data from October 1 to December 31, 2020. Also, there was no clean air for 90 days. PM10, PM2.5, and NO2 had the highest percentage of pollution compared to other pollutants on days when concentrations of pollutants were above the limit. In order to investigate the connection between the severities of pollutants, the number of Covid-19 patients, and the inversion altitude, 1–14-day intervals were set. This was done because coronavirus symptoms do not appear on the same day in an infected person. A downward curve was observed in all 13 temperature inversion altitude case studies between the number of coronavirus patients and the higher inversion altitude (in the 4-day period, this relationship is significant at $P = 0.041$). This indicates that increasing inversion altitude has resulted in a decrease in the number of Covid-19-positive patients. Pollutants are dispersed

throughout a greater thickness of the atmosphere as temperature inversion altitude rises, resulting in a decrease in their concentration on the earth's surface. Nevertheless, the number of Covid-19-positive patients is decreasing. Pearson correlation coefficients between the two factors—severity of pollutants and number of patients—were found to be negative and positive when the effect of pollutants on the number of Covid-19 patients was examined over a variety of time periods. Despite the periods' weak significance level (P -value), the relationship continues to decrease and increase. One-day and 9–14-day intervals showed a negative relationship. Consequently, the severity of pollutants and the Covid-19 virus had no effect between one and fourteen days later. On the other hand, a positive correlation coefficient was found between 2 and 8 days. According to the study days and the intensity of pollution concentrations in Tehran's metropolitan area, the time between virus infection and onset of symptoms ranges from two to eight days, with the three-day period showing the strongest correlation.

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