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Chapter

Consequence of Meteorological Parameters on the Transmission of Covid-19

Manish Sharma, Pargin Bangotra and Alok Sagar Gautam

Abstract

Coronavirus disease (COVID-19) was first detected in Wuhan, China in December 2019. The characteristics of the spread of COVID-19 infection from one person to another have led to an increasing number of infected cases and caused tremendous pressure around the world. The rapid spread of COVID-19 infection has made it a pandemic. In India, as of mid-May 2020, there were approximately 75,048 confirmed cases and 2,440 deaths due to COVID-19 alone. In order to break the COVID-19 chain, the Indian government decided to implement a lockdown, which was first implemented on March 23, 2020. The significant benefits of the lockdown have led to a reduction in air pollutants in cities around the world. The significant benefits of the lockdown have led to a reduction in air pollutants in cities around the world. The importance of particulate matter, temperature (°C) and relative humidity (%) to the spread of the COVID-19 virus and its correlation with the total number of cases (TC), active cases (AC), recovered cases (RC) and death cases (DC) Reference DEL will be discussed in detail in this chapter.

Keywords: COVID 19, Particulate matter, Meteorological parameters, Lockdown Impact

1. Introduction

Under the current circumstances, the entire world is at risk of widespread infection of COVID-19, a pandemic, affecting more than 208 countries [1]. According to recent research conducted by researcher [2], there were approximately 4,369,933 COVID-19 cases worldwide, of which 98% had mild infections, 2% have severe infections, and 15% of patients could not survived. On March 22, 2020, the Indian government decided to implement a complete lockdown to prevent the spread of COVID-19 infection.

COVID-19 showed a profound impact on human health as well as on the economies of most of the countries. According to the regulations of the World Health Organization (WHO), people over the age of 60 and children under 10 are severely affected by the coronavirus [3]. According to medical experts, this type of disease is somewhat similar to severe acute respiratory syndrome (SARS). In the earlier study [4] it was demonstrated the viral aerosol generation and airborne droplet transmission in case of SARS. As per some of the medical experts it was assumed the spread

of the infection mainly through droplets, and sometimes through hand contact or indirect contact, but still the exact transmission route of this virus could not been recognized.

In India, as of May 13, 2020, there are approximately 75,048 confirmed cases and 2,440 deaths [5]. In view of the seriousness of the infection various activities and operations related to social gatherings, travel, and industry, including all modes of transportation, advertising, construction, and restaurants were restricted, but groceries, milk, fruits and vegetables, medicines, etc., were allowed in limited manner. However, during this lockdown period, the reduction of various air pollutants were observed over numerous countries [1, 6]. It was also reported the deterioration of pollutants PM2.5, PM10, SO2, CO and NO2 during the period of China's lockdown [7]. Prior to lockdown, most Indian cities had pollutant levels with a high proportion of the Indian urban population [8, 9].

The impact of the COVID-19 pandemic has led to a rapid increase in the number of COVID-19 cases in DEL (about 14 million people) in India. The importance of particulate matter, temperature (°C) and relative humidity (%) in the spread of COVID-19 virus and its correlation with the total number of cases (TC), active cases (AC), recovery cases (RC) and death cases (DC) are particularly discussed for the duration from January 1, 2020 to May 15, 2020 over Delhi (DEL) and one of the neighboring cities (Gurgaon (GW)).

Additionally the study conducted by a group of researchers [10], is in close understanding of relationship between air quality and COVID-19 cases in China. Air contamination estimated as particulate matter (PM) had additionally been demonstrated to be impeding to human wellbeing [11–14] and lead to expanded death rates [15, 16]. The prior examination exhibited the observable impact of meteorological parameters particularly surface air temperature and relative dampness on particulate issue [17]. Different pollutants were incorporated to characterize Air quality through the record of CO, Ozone, SO2, NO2, NH3, Pb, PM2.5 and PM10 (NAAQS). Anyway, the most responsible toxins answerable for helpless air quality list in India are presently PM2.5 and PM10.

In the investigation over DEL [18], the PM has been considered as one of the risky contaminations liable for persistent bronchitis and Asthma. Thusly, thinking about the criticality of PM and current lockdown circumstance, the investigation of fine (PM1.0 and PM2.5) and coarse (PM10) PM information for seven different places of Delhi (DEL) and Gurugram called Gurgaon (GW), India was done. During the previous (January 1, 2020 to March 22, 2020) and lock-in period (March

COVID-19	**Coronavirus**	**Shantipath**	**SP**
DEL	Delhi	Greater Kailash	GK
GW	Gurgaon	Lodhi Road	LR
PM	Particulate matter	WHO	World Health Organization
T	Temperature	TC	Total cases
RH	Relative Humidity	RC	Recovered cases
IIT-Delhi	IIT-DEL	AC	Active cases
US Embassy	USE	DC	Death cases
Mahant Gurmukh Singh	MGS	NAAQS	National Ambient Air Quality Standard

Table 1.
Abbreviations.

23, 2020 to May 15, 2020), the daily analysis and comparison corresponding to the abbreviations mentioned (**Table 1**), was accompanied. Since the optimized T (°C) and RH (%) support droplet stability in the local environment, this may be beneficial to the widespread spread of the virus [19]. According to research conducted in different cities in Italy and China, the association between high frequency of corona cases/fatalities and persistently high levels of air pollutants for more than four years were also noticed (www.downtoearth.org.in).

In this chapter, we strive to understand the relationship between PM, T (°C) and RH (%) and their synergy on COVID-19 cases through DEL, corresponding to the total number of cases (TC), active cases (AC), by considering the data available between April 1, 2020 and May 15, 2020, recover cases (RC) and death cases (DC).

2. Data and analysis techniques

This chapter covers the examined results of the study conducted over Delhi (DEL) and Gurgaon (GW), India (**Figure 1**). In the study the major pollutants i.e. PM of size ≤ 2.5 μm (PM2.5), ≤ 10 μm (PM10) and ≤ 1.0 (PM1.0) along with meteorological parameters, i.e., T (°C), RH (%) were downloaded through Purple Air sensors website (https://www.purpleair.com).The average PM and related T (°C) and RH (%) for consecutive 24 hours from January 1, 2020 to May 15, 2020 were used to covers seven different sites in Delhi, namely IIT-DEL, GK, LR, MGS, RJ, SP and USE, as well as two locations on GW.

The information comparing to TC just as RC were gathered from the source of New Delhi Television Limited (NDTV), an Indian TV media organization. (https://www.ndtv.com/coronavirus). The 2-tailed Bivariate Pearson correlations using Statistical Package for the Social Sciences (SPSS) was applied to verify the correlation among PM, T (°C),RH (%), TC, AC, RC and DC.

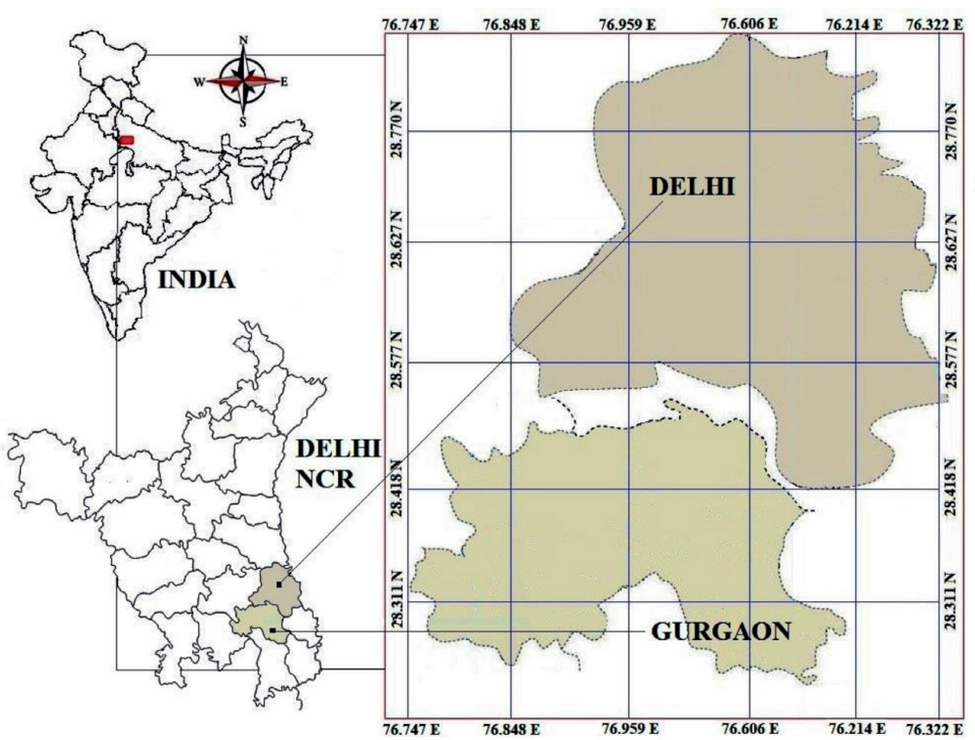

Figure 1.
Study location of Delhi (DEL) and Gurgaon (GW), India.

3. Results and discussion

This part of the chapter scrutinize the diversity in mean centralization of PM of size 1 micron, 2.5 micron and 10 micron generally perceived as PM 1.0, PM2.5 and PM10, over DEL and GW. The provocation of meteorology on PM and its relationship to TC and RC related to COVID-19 also covered here.

3.1 Dissemination of PM

The noteworthy distinction is clearly appearing for fine (PM1.0, PM 2.5) and coarse (PM10) over DEL and GW in box and whiskers charts view.

The dissimilar dispersal is clearly visible from the distribution pattern of PM concentration (PM1.0, PM2.5 and PM10) in above two sites during the period 1st January 2020 to 15th May 2020 (**Figure 2**). The concentrations are expressed in $\mu g.m^{-3}$ for PM1.0, PM2.5 and PM10.

The low mean convergence of PM (PM1.0, PM2.5 and PM10) over the site GW pronounce the better air quality as contrast with DEL. The entirety of the spans of PM were displayed divergent focus that shows the different wellsprings of contaminations over both of areas for example DEL and GW. The higher mean fixation and conspicuous trait of PM2.5 and PM10 showed in Box plot (**Figure 3**), propose street traffic [20] just as ventures, power plants and homegrown discharge.

In pattern investigation (**Figure 3a** and **b**) during first January 2020 to fifteenth May 2020, PM10 display a higher mean convergence of 127.61 $\mu g\text{-}m^{-3}$ (DEL) and 57.53 $\mu g\text{-}m^{-3}$ (GW) though PM1.0 and PM2.5, delineate the mean grouping of 69.22 $\mu g\text{-}m^{-3}$ (DEL), 34.20 $\mu g\text{-}m^{-3}$ (GW) and 111.75 $\mu g\text{-}m^{-3}$(DEL) and 53.10 $\mu g\text{-}m^{-3}$ (GW), separately.

The higher PM concentration during this period, obviously recommends the effect of vehicular emanation, modern outflow, and different types of burning cycle as the significant wellsprings of toxins. After execution of comprehensive lockdown through restricting various activities and operations related to social assembly, travel, industries operations and transport, started from 23rd March 2020, PM mass concentration in DEL (**Figure 3a**) and GW (**Figure 3b**) were significantly

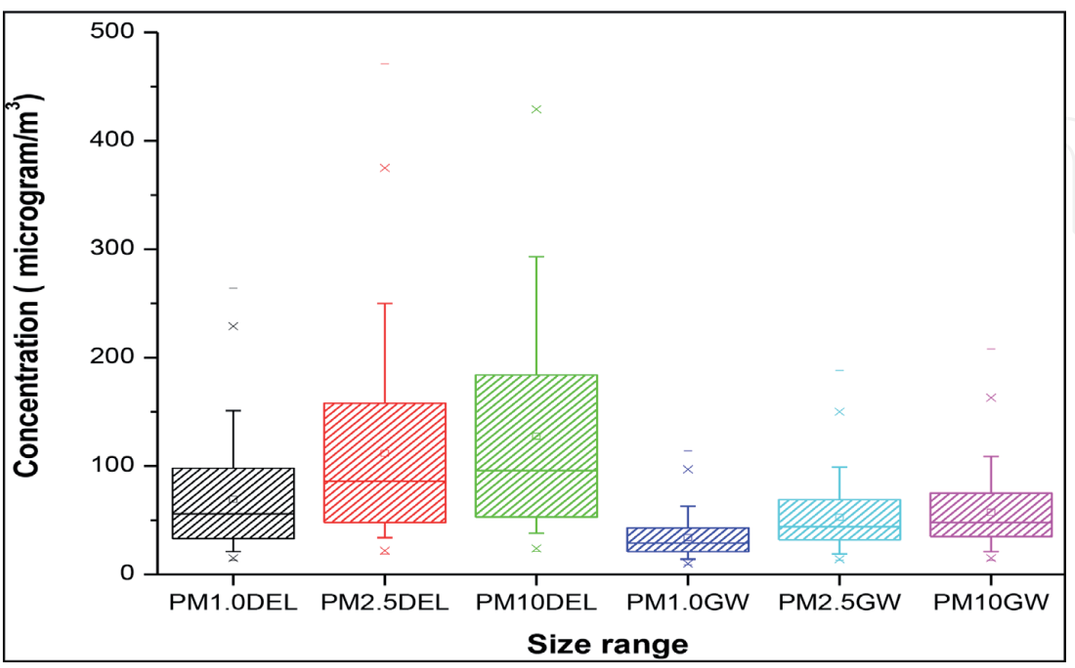

Figure 2.
Boxplots of daily concentrations of analyzed pollutants over Delhi and Gurgaon; the median is shown by the middle line of the box.

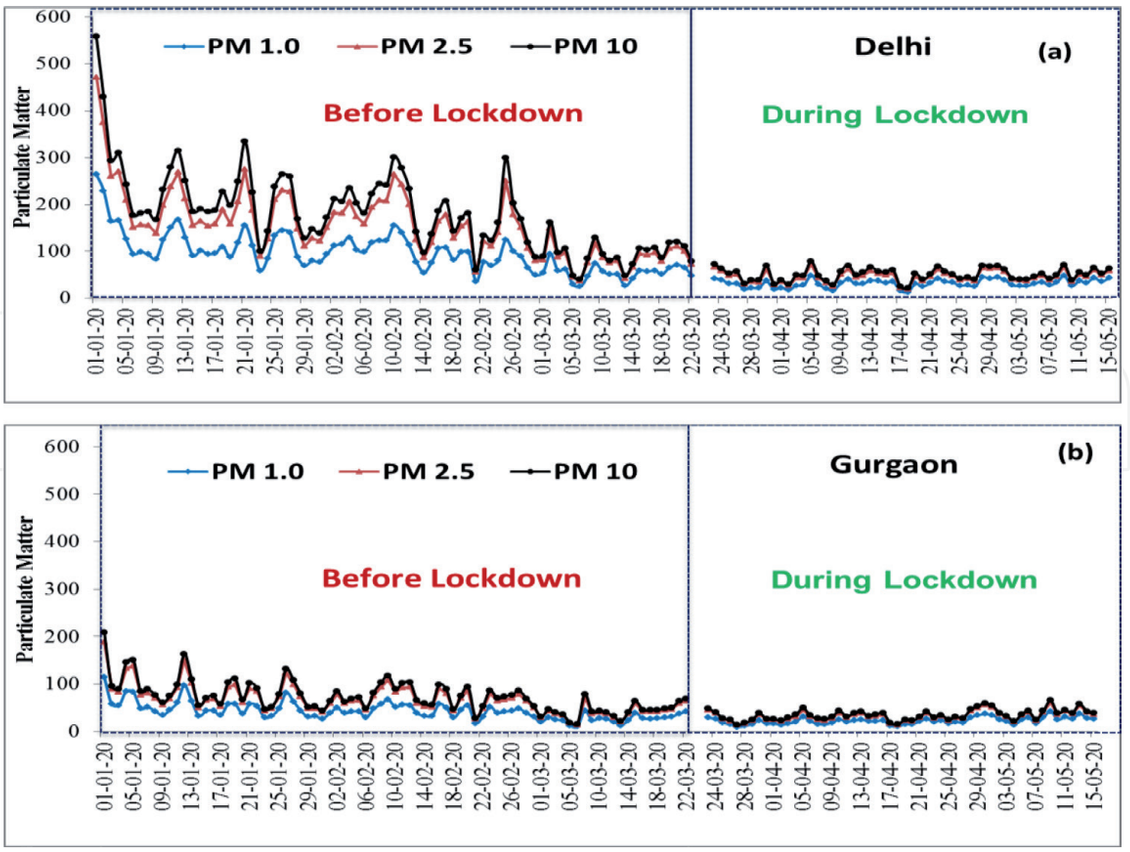

Figure 3.
(a, b). Trend analysis showing the effect of lockdown period on particulate matter in Delhi (a) and Gurgaon (b).

declined. The significant decline in the concentration of PM, clearly confirms the influence of the transport and traffic movement in the air quality of DEL. The tremendous decline of 48.21%, 51.82% and 52.45% in PM1.0 (21.90 μg-m^{-3}), PM2.5 (32.19 μg-m^{-3}) and (34.52 μg-m^{-3}) were witnessed the impact of lockdown over GW.

Because of discontinue of all kind of developments, mechanical emanation and transportation out and about, the fine (PM1.0 and PM2.5) and coarse (PM 10) particulate were essentially diminished over both of the areas (DEL and GW) and drew closer inside the restriction of NAAQS (PM2.5 = 60 μg-m^{-3}, PM10 = 100 μg-m^{-3}, in view of 24-hours normal [2] exhibiting the perceptible improvement in air quality. The huge abatement in climatic contamination credited to transportation and mechanical outflows over Beijing, Shanghai, Guangzhou, and Wuhan urban communities were likewise seen during the crown pandemic.

3.2 Effect of meteorology on PM

The past examinations exhibited the impact of meteorological factors, which influence the air quality [21, 22]. The complete example of the improvement of discretionary pollutions has the phenomenal relationship with the toxic substance release rate into the air all along, wind speed, unevenness level, air temperature, and precipitation [23]. Generally, T (°C) has a substantial involvement in air quality of the province therefore correlation analysis by considering the period of 1st March 2020 - 15th May 2020 between PM concentrations and T (°C) for the site DEL (**Figure 4**) and GW (**Figure 5**) were studied to understand the role of T (°C).

The results shows a significant negative correlation between T (°C) and PM1.0 (0.72), PM2. (0.73) and PM10 (0.73) in DEL while over GW, it is as 0.54 (PM1.0), 0.58 (PM2.5) and 0.25 (PM10). In the related **Figures 4** and **5**, the red, green and black dots indicate the data corresponding to PM1.0, PM2.5 and PM10, respectively.

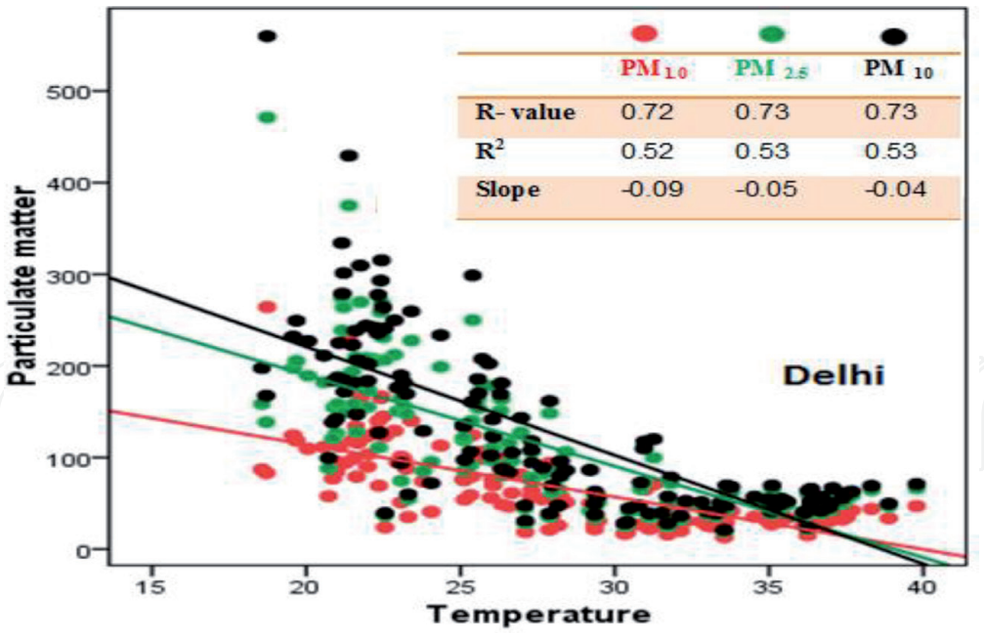

Figure 4.
Scatter plot among $PM_{1.0}$, $PM_{2.5}$ and PM_{10} and T (°C) over DEL.

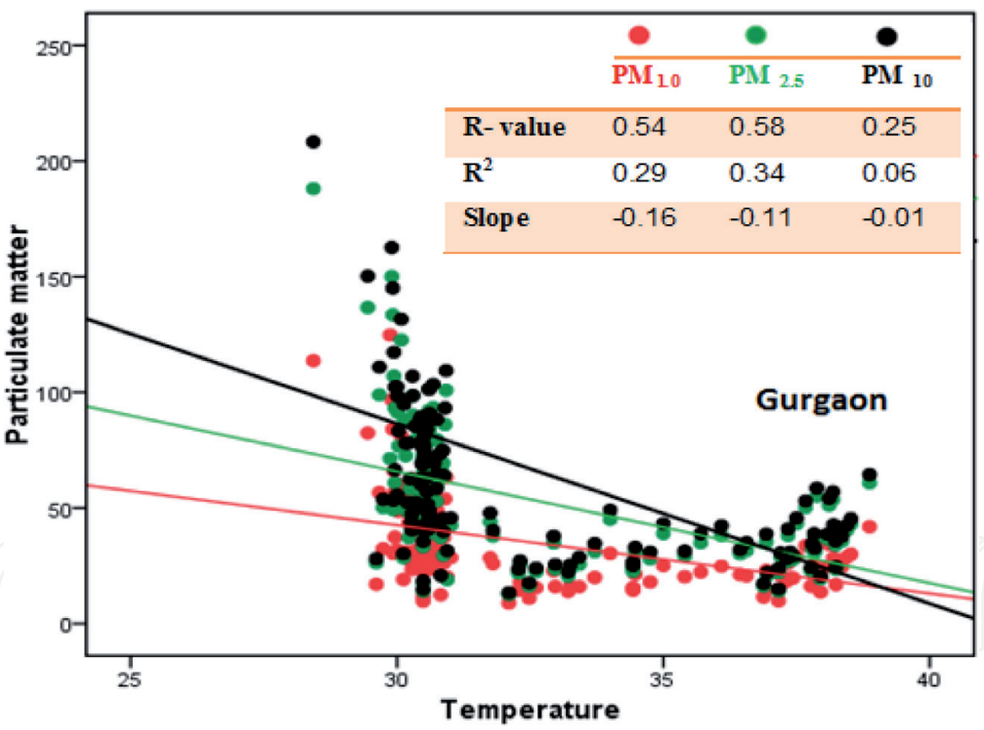

Figure 5.
Scatter plot among $PM_{1.0}$, $PM_{2.5}$ and PM_{10} and T (°C) over GW.

Here the regression analysis reveals significant negative correlation (r) of T (°C) with PM in DEL whereas GW has the low negative correlation of 0.25 with PM10. The total time of insight demonstrates the declining qualities of PM fixations on the increment of the T (°C).

3.3 PM over different locations of DEL and GW

As the long-range transport and buildup furthermore has a gigantic responsibility in the social event or dispersing of contaminations at metropolitan districts [24].

Further, the centralization of PM1.0, PM2.5 and PM10 for seven particular spaces of DEL and GW were bankrupt down and amazed for the situation and Box and whisker plot to perceive the possible impact of lockdown (**Figure 6a–c**).

Before lockdown and during lockdown season of the assessment are perceived by the letter B and A, independently. Preceding lockdown, the mean assembly of PM1.0 and PM2.5 over IIT-DEL, GK, LR, MGS, RJ, SP, and USE were noticed as 89.29 ± 45.51 μg-m^{-3}, 57.07 ± 32.70 μg-m^{-3}, 90.01 ± 40.72 μg-m^{-3}, 70.35 ± 28.33 μg-m^{-3}, 133.18 ± 68.15 μg-m^{-3}, 97.53 ± 49.39 μgm^{-3}, 121.31 ± 54.03 μgm^{-3} and 146.67 ± 78.63 μg-m^{-3}, 85.04 ± 51.02 μg-m^{-3}, 162.04 ± 91.42 μg-m^{-3}, 124.75 ± 57.26 μg-m^{-3}, 218.38 ± 144.20 μg-m^{-3}, 163 ± 88.94 μg-m^{-3},

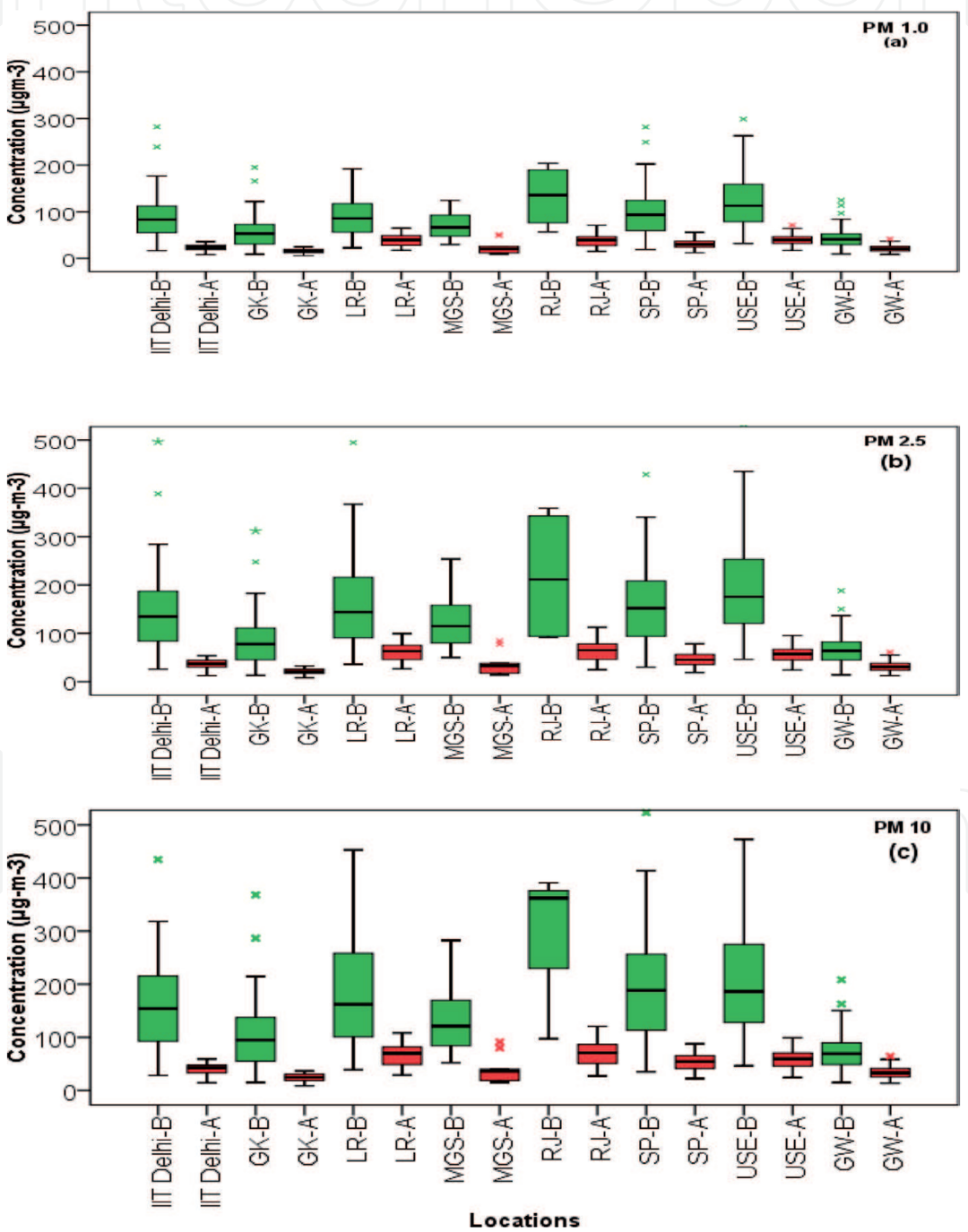

Figure 6.
Boxplots of daily concentrations of analyzed pollutants over different locations of Delhi and Gurgaon; median is shown by the middle line of the box. Concentrations are expressed in μg- m^{-3} for $PM_{1.0}$ (a), $PM_{2.5}$ (b) and PM_{10} (c). (letter "B" and "A" represents the boxes related to before lock down and during lockdown respectively).

191.09 ± 94.03 μg-m^{-3}, separately (**Figure 5a** and **b**). In any case, the mean assembly of PM1.0 in the above said regions was 166 ± 89.47 μg-m^{-3}, 103.33 ± 60.19 μg-m^{-3}, 187.32 ± 116.52 μg-m^{-3}, 134.78 ± 63.75 μg-m^{-3}, 283.46 ± 161.89 μg-m^{-3}, 200.83 ± 112.21 μg-m^{-3}, 205 ± 105.07 μg-m^{-3}, separately as portrayed in **Figure 6c**.

The GW area shows the lower PM fixation i.e. 43.31 ± 20.25 μg-m^{-3} (PM1.0), 66.55 ± 29.94 μg-m^{-3} (PM2.5) and 72.63 ± 33.10 μg-m^{-3} (PM 10) as contrast with DEL during the range of before lockdown. The normal PM2.5 and PM10 focuses over the distinctive examination site of DEL and GW districts are at higher side than the given furthest reaches of NAAQS (PM2.5 = 40 μg-m^{-3}) and PM10 = 60 μg-m^{-3}) [2]. Prior to lockdown circumstance, the most noteworthy PM1.0 esteems were found over the RJ showing mean of 133.18 μg-m^{-3} and is trailed by USE, SP, LR, IIT, MGS and GW, separately. The high interquartile range (RJ, USE, SP and LR) recommends that PM1.0 hold very extraordinary fixation exhibiting the enormous spread (56.95-203.85 μg-m^{-3}). The enormous upper stubble over the area IIT-DEL, SP and USE shows that the PM1.0 focus fluctuates among the best quartile bunch. The upper portions of the scale i.e. positive quartile bunch comparing to practically all areas with the exception of RJ shows the articulated inconstancy in the centralization of PM1.0, however, in case of least positive quartile group, the concentration spread is relatively less. However, the box plots related to before lockdown, show enormous focus disseminations of PM1.0 while the box plot associated to during lockdown shows the slight scattering that delineate the limit decrease in the grouping of PM1.0.

According to the past examinations, PM2.5 involves with various dangerous constituents, which may go into the lungs through the respiratory track and unsafe to the human wellbeing, chiefly to youngsters and the older individuals [25]. The recently directed investigation, uncover the particulate matter as one of prime explanation for damaging outcome on the human respiratory framework by stressing to take repetitive clinical remedy [11]. The spread and inconstancy of PM2.5 focus has been summed up in box plots as portrayed **Figure 6b**. The most noteworthy mean grouping of fine particulate matter PM2.5 (218.37 μg-m^{-3}), was seen over RJ during before lockdown period and 63.41 μg-m^{-3} during the lockdown period. The incredibly upper and lower stubbles (before lockdown) show the instance of least quartile that compares to less articulated conduct of PM2.5 focus because of the less number of information (4 days) over RJ locale. Notwithstanding that, the territories LR, SP and USE divulges the huge upper bristle shows the observable irregularity in the convergence of PM2.5.

As contrast with DEL district, GW locale (**Figure 6b**) clarify the low mean PM2.5 focus checking information as 73.51 μg-m^{-3} (13.98 μg-m^{-3}-188.04 μg-m^{-3}) related to earlier lockdown (GW-B) that decreased to 31.97 μg-m^{-3} (12 μg-m^{-3}-60.83 μg-m^{-3}) because of the lockdown (GW-A). The lockdown sway was liable for the unexpected fall in PM2.5 focuses because of cross country limitation on transport development and modern units that related to the emanation of essential toxins into the area. Prior to lockdown period, the relating areas of DEL and GW were high PM2.5 focus which upholds the finding of surrounding PM2.5 fixations higher more noteworthy than 60 μg-m^{-3} over New Delhi [6, 26]. This may be because of the area of the site that is near traffic and private contamination sources [20, 27]. According to above discoveries, an extremely different source of PM concentration has been seen in the examined area. **Figure 6c** divulges the mean convergence of PM10 by showing the most noteworthy worth over RJ (283.46 μg-m^{-3}) followed by USE (205.82 μg-m^{-3}) and SP (200.83 μg-m^{-3}) related to before lockdown period that further began to disintegrate to 69.36 μg-m^{-3}(RJ), 58.64 μg-m^{-3}(USE) and 53.59 μg-m^{-3} (SP) because of the lockdown impact. The area GW shows the mean convergence of 72.63 μg-m^{-3} (preceding lock down)

and 34.28 μg-m^{-3}(during lockdown) which and both are extremely close endorsed breaking point of 60 μg-m^{-3} given by NAAQS.

3.4 COVID-19 and associated factor

DEL had been viewed as one of the focal points for Covid in India (https://indianexpress.com/article/india) and to comprehend the quick expansion in COVID-19 cases, it was important to comprehend the marvel and capable elements for its spreading. The aftereffects of 2-tailed Bivariate Pearson Correlation over DEL for the period 1 April 2020 to 15 May 2020 has been talked about here.

In light of 45 days information for period first April 2020 to fifteenth April 2020, it very well may be seen the normal TC, AC, RC, DC as 3003 ± 2393, 2137 ± 1514, 821 ± 877, 44 ± 28 individually. During this period the mean centralization of PM 1.0, PM 2.5 and PM10 has been seen as 31.42 μg-m^{-3}, 46.36 μg-m^{-3} and 50.78 μg-m^{-3}, separately. Be that as it may, normal T (°C) and RH (%) were 34.720C and 27.86% individually. The Pearson connection results (**Table 2**) over DEL uncovered the impressive relationship of T (°C) with TC (0.57, p = 0), AC (0.59, p = 0), RC (0.51, p = 0) and DC (0.58, p = 0) identified with COVID-19 and unmistakably demonstrates the expansion altogether and dynamic COVID-19 cases because of height of T (°C).

Because of inaccessibility of the information identified with different highlights that add to influence the pace of spread of COVID-19 disease inside a DEL area, the investigation does not bring up towards temperature as a solitary one factor answerable for the transmission of COVID-19. As the increment in the T (°C) over DEL during the period of April and May is likewise related to the occasional climate wonder, so it is hard to proclaim the precise relationship of T (°C) with the TC.

2-tailed Bivariate Pearson correlation										
		TC	AC	RC	DC	PM 1.0	PM 2.5	PM 10	Temp	RH
TC	Pearson Correlation	1.00	0.99**	0.98**	0.93**	0.34*	0.21	0.16	0.56**	0.28
	p value		0.00	0.00	0.00	0.02	0.16	0.29	0.00	0.06
AC	Pearson Correlation	0.99**	1.00	0.95**	0.92**	0.33*	0.20	0.15	0.58**	0.25
	p value	0.00		0.00	0.00	0.03	0.19	0.34	0.00	0.10
RC	Pearson Correlation	0.98**	0.95**	1.00	0.92**	0.36*	0.23	0.18	0.52**	0.33*
	p value	0.00	0.00		0.00	0.01	0.12	0.24	0.00	0.03
DC	Pearson Correlation	0.93**	0.92**	0.92**	1.00	0.32*	0.20	0.14	0.58**	0.26
	p value	0.00	0.00	0.00		0.03	0.20	0.37	0.00	0.08
RH	Pearson Correlation	0.28	0.25	0.33*	0.26	0.09	0.06	0.03	−0.07	1.00
	p value	0.06	0.10	0.03	0.08	0.55	0.70	0.85	0.65	

***shows here that correlation is significant at the 0.01 level (2-tailed).*
**showing that correlation is significant at the 0.05 level (2-tailed).*

Table 2.
Two-tailed bivariate Pearson correlation among Total cases (TC), active case (AC), recovered case (RC), PM1.0, PM2.5, PM10, temp, and RH over DEL.

The significant finding identified with the commendable certain connection (0.51, p = 0) of T (°C) and RC has been noticed yet likelihood of a critical expansion in RC with temperature alone is not sensible to come at some resolution.

There is a connection between RH (%) and the COVID-19 infection perseverance. Most infections endure best at low RH (<40%) and amazingly high RH (>90%). However, the connection between the endurance of COVID-19 infection and relative dampness should be elucidated. Here, the RH (%) shows minimal relationship with TC (0.28, p = 0.06), AC (0.25, p = 0.10), and DC (0.26, p = 0.08) and moderate connection with RC (0.33, p = 0.03). Such great connection of RH (%) with RC recommends the slight positive impact of RH on RC. The lower dampness upholds the mist concentrates molecule to decrease its size to remain suspended in air for longer time. As in the current month (April to May 2020) the mean RH (%) is lower (27.86%) and the disease spread might be because of the suspended mist concentrates molecule. In the event of COVID-19 infection scattering, these suspended vaporizers particles may assume a significant part in the transmission of infection starting with one then onto the next yet dependent upon some insufficient distance. To keep away from this disease, Government of India, pronounced the rules to keep up the social removing too least of 1 meter distance with someone else which was useful to stay away from the conceivable outcomes of contamination and enormous expansion in the quantity of TC (0.28, p = 0.06). The expansion of RH (%) with the presence of beads in the air supports to the substantial pressurized canned products particles to settle down on the ground surface. Thus, for this situation, when the contaminated individual, hack or sniffle around there, the mist concentrates drops because of its substantialness begins to settle down on a superficial level and further add to send the COVID-19 infection through the surface contact.

Some of prior examinations tracked down the critical job of T (°C) and RH (%) liable for the spread of numerous respiratory irresistible infections like flu [28, 29]. As claimed in the study [19], the urban areas with the common transmission of COVID-19 infection were high RH of 60% ~ 90% and low T (°C). To analyze the impact of the grouping of particulate poisons on all out number of COVID-19 cases, the spatio-transient investigation (**Figure 7**) was finished. It was tracked down the 154 number of affirmed instances of COVID-19 on dated 1 April 2020 which compares to the particulate mass centralization of 21.96 μg-m^{-3} (PM1.0), 34.69 μg-m^{-3} (PM2.5) and 39.04 μg-m^{-3} (PM10). Following 43 days (15th May 2020), the instances of COVID-19 in DEL came to up to a greatest number of 8470 with the increment of 98.02% and in the comparable example the PM fixation additionally quickly expanded by 48% (PM1.0), 40.47% (PM2.5) and 38.02% (PM10).

The increment in the quantity of COVID-19 cases with the expansion of particulate matter mass fixation over DEL recommend the impact of fine and coarse mode particulate matter on TC. The impact of variable sizes of PM on TC, AC, RC and DC were shown utilizing the Pearson connection (r) and Sig. 2-i.e. p-value.

The PM of different size i.e. PM1.0, PM2.5 and PM10 demonstrated the correlation (r) with TC, AC, RC and DC (**Table 2**). The PM1.0 has the moderate correlation with TC (0.34, p value = 0.02), AC (0.33, p value = 0.02), RC (0.36, p value = 0.01) and DC (0.32, p value = 0.02) whereas PM2.5 and PM10 were least correlation value (r) with TC, AC, RC and DC as 0.21 (p value = 0.15), 0.19 (p value = 0.19), 0.23 (p value = 0.12), 0.19 (p value = 0.19) and 0.16 (p value = 0.29), 0.14 (p value = 0.23), 0.18 (p value = 0.23) and 0.13 (p value = 0.36), respectively. Our studies indicate that PM1.0is relatively more associated with the various stages of COVID-19 patients i.e. TC, AC, RC and DC as compare to 2.5 and PM10. These observations propose that, while direct COVID-19 contamination is fundamental track of transmission, the part of PM1.0 in infection transmission may play a critical character. The RH (%) was related with the PM by meaning the relationship (r) as follows for

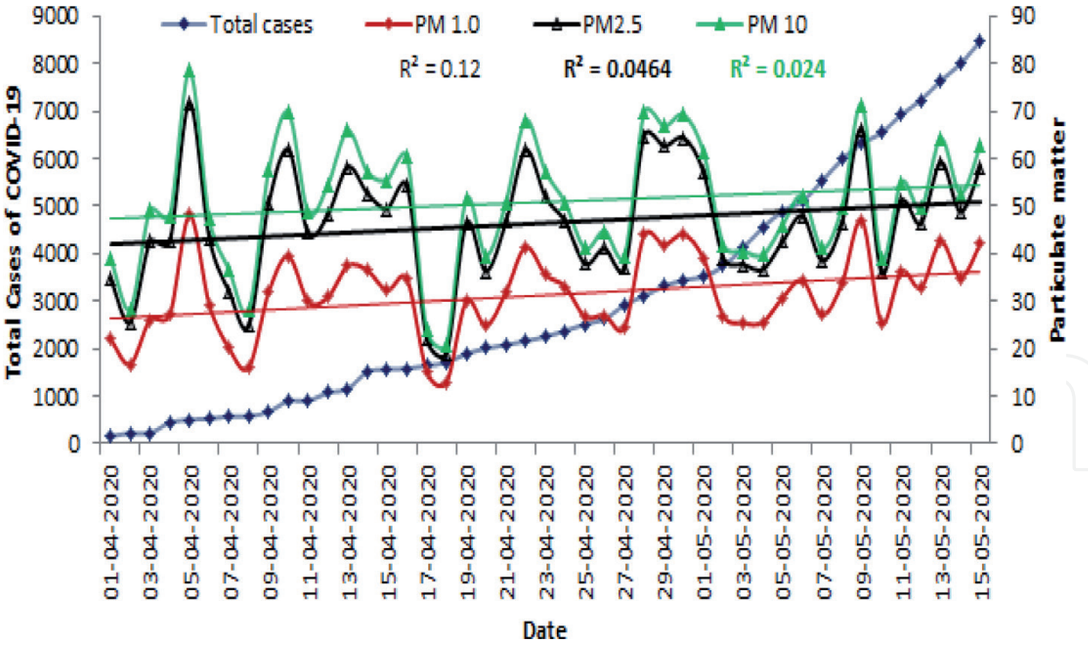

Figure 7.
Spatio-temporal observation between fine (PM1.0, PM2.5) and coarse (PM10) particulate pollutants and TC of COVID-19.

example 0.09 (PM1.0), 0.05 (PM2.5) and 0.03 (PM10). Likewise the Sig. (2-followed) for example p upsides of 0.54, 0.69 and 0.84 identified with PM1.0, PM2.5 and PM10 individually, exhibit the incredibly less impact of RH (%) on PM over DEL during the investigation time frame.

4. Conclusion

From last decade, numerous steps were taken by Delhi administration to tackle the pollution problem in distinct vicinities with main focus on air contamination over Delhi – NCR region. However, a pandemic (COVID - 19) forced to shut down all impurity sources in the form of transportation and industrial practices over this region.

The section supports the impact of lockdown over Delhi and Gurgaon on the particulate issue. It was the endeavors to exhibit the impacts of meteorological factors in COVID-19 in DEL. It was noticed the unmistakable impact of lockdown which show the decay of 67.31%, 70.29% and 71.66% more than Delhi and 48.21%, 51.82% and 52.45% over Gurgaon, in PM1.0, PM2.5 and PM10, separately. It was noticed that the Particulate Matter, Temperature and Relative Humidity (RH %) legitimize exceptional consideration. Relative humidity (RH %) was found as a considerable boundary that showed the huge connection with COVID 19 recuperated cases. For the investigation time frame chosen, the COVID-19 recuperated case in Delhi was seen to be supported by lower mean relative moistness (27.86°C) that was approved through the moderate relationship of 0.33 (p value = 0.03) with Recovered case. Such connection validate the impact of relative humidity (RH %) on COVID-19 recuperated cases. In light of double character of RH (%) on the scattering of COVID-19 infection, it was anticipated the expansion in the number COVID-19 cases in July and August through the surface transmission. However, it is essential to conduct an extensive study with long-term data, which might enhance the understanding between meteorological conditions and the COVID-19 transmissibility.

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Conflict of interest

"The authors declare no conflict of interest."

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