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Refinement of AQI due to amid Lockdown

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Abstract
Air is the major component of Environment and for this it is necessary for the air to be fresh. AQI is the parameter to evaluate the pollution level in which PM2.5 concentration play a major role in affecting the pollution level. Due to COVID-19 Pandemic lockdown a drastic change in the pollution level is marked. For more clear result we did the comparison of cities with completely followed lockdown policy or partial. As a result, there is declination in the air pollution level by 55.60% in India. The aim of this study is to show that pollution already exist as a major issue in society. As corona is on the focus because it is so contagious, but pollution is a slow poison too. Preserving environment is in our hand and we expect the society to take this issue also into consideration in present and after lockdown.

Keywords: Environment, PM2.5AQI, COVOID-19, Lockdown, declination

1. Introduction
As we know, PEOPLE in Indian cities usually affected by harmful air pollution that is much far for breathing cleaner air. Due to these air pollutions, this will cause a variety of adverse health problems among our population. But the most interesting observation we see during this hard time of Pandemic COVOID-19 that there is much improvement of Air quality index that is the main parameter to evaluate the air pollution.
As we know today or at present, we are suffering from a pandemic COVOID-19 that was a big challenge for our health. And to prevent the upswing in the transmission of this COVOID-19. India came with the decision of lockdown the country, in which there is strict restriction in human mobility, no gathering of people, the college, school, office is closed, all of them enforce to do their work from home.
This is all to encourage the social or physical distancing only for our safety. Even where needed they are also imposed a curfew. In between this, there is an interesting observation of sudden change in the environment. There is a drop in the air pollution. As we know air pollution is one of the major problems in India since it will have an adverse effect on health. After going through the Air quality data, we have seen that within a month the PM2.5 AQI was decreased by 55-60%. Among all specie of AQI, PM2.5 play a major role in AQI level that is the reason why only PM2.5 concentration gas been focused in this. These changes are mainly seen in an industrialized area, metro cities due to more traffic since they are more prone to pollutions.
We can give an approximation that this will lead to an improvement in the mortality rate by preventing a maximum of 23 lakh premature death due to pollution on annually basis. Also, the lowering in pollution may help in treating or identifying COVOID -19 patient as the drop in pollution give a sharp, clearer image by satellite in the country so it will help to take aggressive measure in the virus transmission.
If we take the data for example of a city Delhi since it is the most polluted area, we observe that there is the declination of about 14% in PM2.5 concentration initially after lockdown. This was also observed that the more change in the pollution was seen in the city where there is strictly the lockdown has been followed.
Also, there is one observation during this hard time of COVOID-19, this lockdown amid has reduced the water pollution level due to less discharge of pollutants in water. As SDG GOAL 6 CLEAN WATER AND SANITATION and its target no. 6.3 which depicts IMPROVE WATER QUALITY, WASTEWATER TREATMENT & SAFE REUSE, this lockdown has effortlessly made it possible to a great extent itself [11].
We are more focusing on the area those are industrialized, more prone to traffics since they are the standards for controlling or regulation of pollution and after lockdown also only these are the main parameter in changing the environment pollution. Yes, this is also a fact that this improvement of air quality was uncommon, the pollution after lockdown will again go high but we can control it by various measure so that it should not reach the peak level.

2. Materials and Methods
It was a cross-sectional descriptive type of study carried out in a city with more pollution in India.

2.1 Time duration
The study was carried for Two months that is from March to April of 2019 as well 2020.

2.2 Source of data
Data was collected by World Air Quality Index (WAQI) Project. And by government lockdown policy by news, media, and government announcement.

2.3 Sampling type
Purposive sampling.

2.4 Sample size
Data of 23 cities has been taken. Since they are coming under the most polluted area in India.

2.5 Data collection
We are focusing in the industrialized area and an area with more traffics. Then compare it with 2019. For more confirmation of the result, we compare the area those are completely following a lockdown policy with a partial one. For this, we take one parameter to compare that is hotspot area during the study period. Hotspot area is the area where there are more than 10 patients within a week. And after this, the policy of lockdown will be followed strictly. That will have a major impact on traffic.

3. Data Analysis
According to Indian Air Quality Index, the descriptor category is there which help us to give the scale or range for health effects on pollution as shown in table 1 [3].

Table 1: Descriptor category of AQI level

AQI	Remark
0-100	Good
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

We see the two main models in this.
Firstly, compare the area pollution affect or PM2.5 AQI concentration in a time period (comparison with 2020 to 2019 year) of month February to April.

Secondly, we compare the case with control area. Here, the cases are of hotspot area during the study period and the control of corona free area during the study period, followed by lockdown due to COVOID-19.
We use a statistical method following a normal distribution that helps to measure the median of the data that we collect for analysis of AQI level of India.
Since the median is what that separates higher half from the lower half of a data sample, whatever it is a sample or a probability distribution
And, in a skewed distribution, the median is often the better measure of central tendency for a data set, it may be thought of as the "middle" value.
We can measure the median by using a different strategy for even and odd data.
Median in relative with width class, sample size the basic step for the statistical method followed by the normal curve distribution.

$$median = l + \left(\frac{n}{2} - f_c\right) c/f_m$$

For even data

$$median = \frac{\frac{n}{2} + (\frac{n}{2} + 1)}{2}$$

For odd data

$$median = \frac{n+1}{2}\ th\ observation$$

The median of the data help to assist the comparison of Pm2.5 AQI level with the last year as shown in fig.1

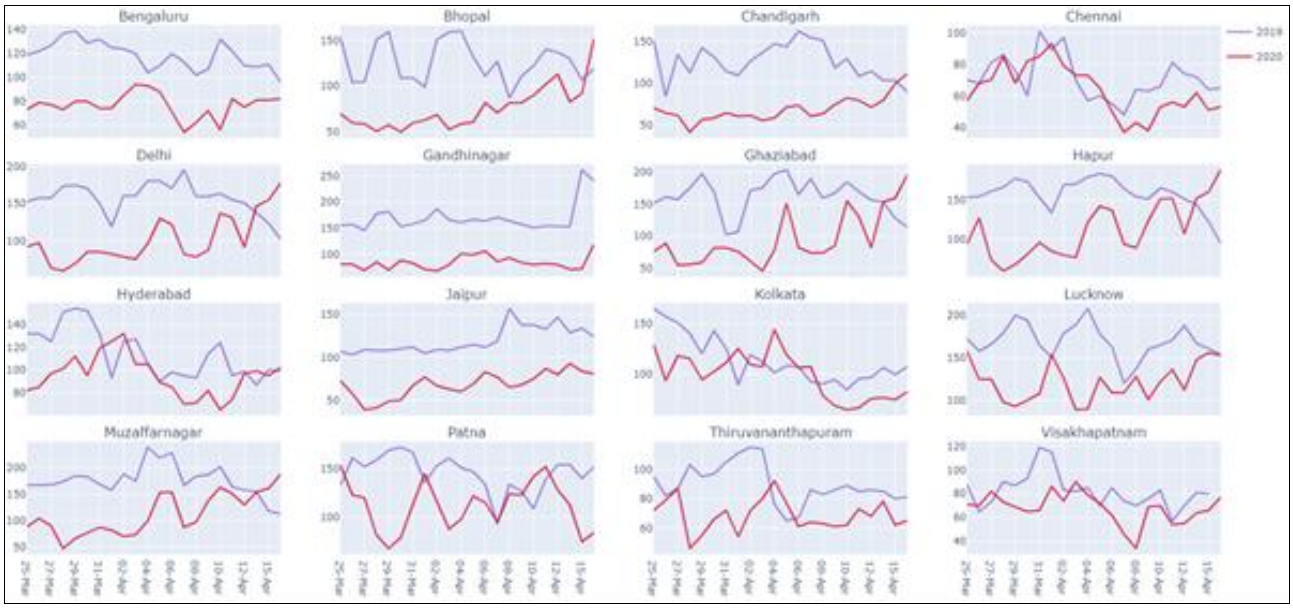

Fig 1: showing PM2.5 of different cities and their comparison with last year.

By measuring Maximum, minimum and median for data of all we are come with the box plot graph, with the help of graph we observe the distribution of standard variation in 2019 and 2020. We see only the lockdown period (during the study) that is, March to April for a clearer result. And this give an indication of larger variation for pollution in the lockdown period for 2020.
We can say that the mark in the graph are not overlapping by which we can make a conclusion that with a confidence interval of 95%, the true median will change or differ.
An important thing to note that even the area where there is not a proper lockdown policy or people are not following

due to less number in cases of COVOID-19, which lead to less restriction or prohibition for gathering, working due to which traffic is there and does not have much variation in pollution when compared to the AQI level with 2019.

As shown in table 2, City are shown with their number of COVOID-19 Hotspots area during the study period.

Maximum - Number of hotspot area is more than 50% of their total area in the city.

Moderate - Number of hotspot area is between 25% to 50% of the total area.

Minimum - Number of hotspot area is 25% or less than 25% of the total area.

Table 2: City with their respective COVOID-19 hotspot area count.

City	Hotspot	City	Hotspot	City	Hotspot
Bengaluru	Maximum	Muzaffarnagar	Maximum	Kolkata	Moderate
Bhopal	Maximum	New Delhi	Maximum	Gandhinagar	Minimum
Delhi	Maximum	Trivantampura	Maximum	Ghaziabad	Minimum
Hyderabad	Maximum	Vishakhapatnam	Maximum	Hupur	Minimum
Jaipur	Maximum	Chandigarh	Moderate	Lucknow	Minimum
Mumbai	Maximum	Chennai	Moderate	Patna	Minimum

We are using a boxplot graph as shown in the fig 2, since they are the standardized way of displaying the data analysis. We came up with five summaries from the data that are (minimum, 1st quartile Q1, median, third quartile Q2 and maximum).

A middle number between the smallest number is the 1st Quartile. (Q1/25th Percentile) [1].

Median is what the middle value of the data set. (Q2/50th Percentile) [1].

The middle number between the median and the highest number is the third quartile. (Q3/75th Percentile) [1].

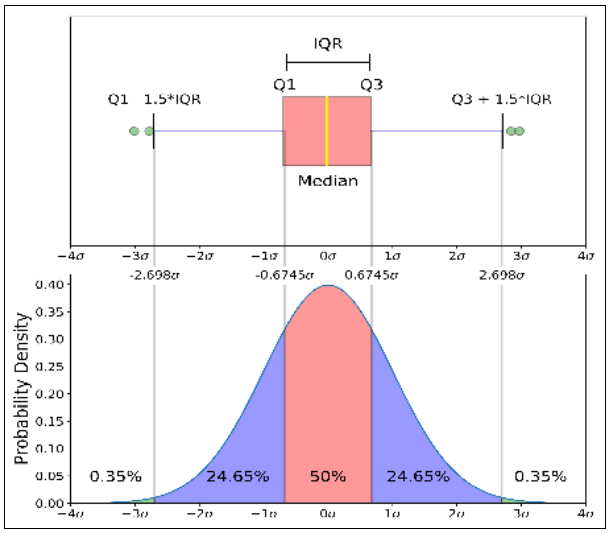

Fig 2: showing standard boxplot [1]

The next step it to compare the change in variation of pollution level in lockdown period of 2020 in India and compare it with 2019 as shown in Fig 3.

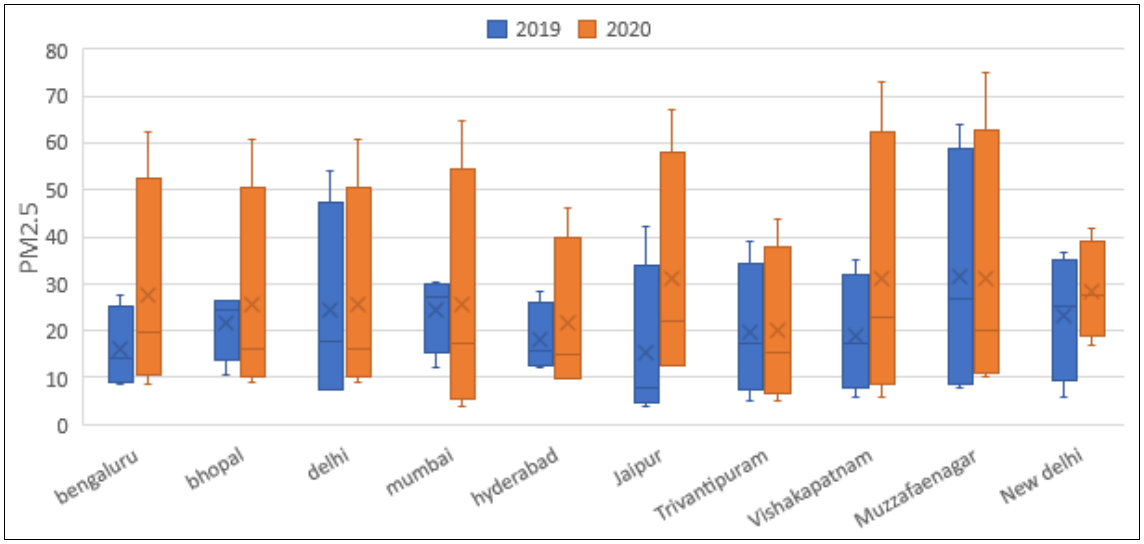

Fig 3: Monthly variation of Air quality of different city and comparison with last year.

Then, for better clarification or understanding what we do, we separate the city concerning the hotspot declared for COVOID-19 in the city during the study period. More number of hotspots in the city indicate much strictness in lockdown gives result in less gathering, thus indication for a larger drop in the AQI level. As shown in fig.4

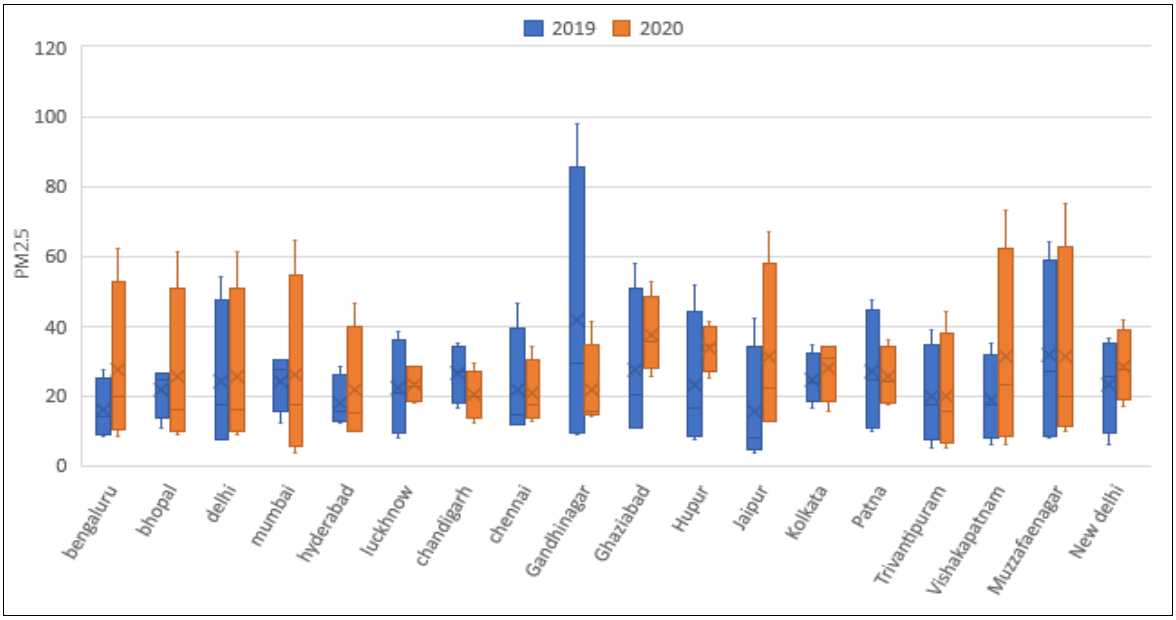

Fig 4: Monthly variation in Air quality of city with maximum hotspot area and comparison with last year.

Lockdown affects on ganga

An IIT BHU professor stated that one-tenth of the pollutants in the Ganga comes from industries nearby Hotels & other sources, with all of these Shut the Quality of water has improved by 40% to 45%. There is a 34% reduction in Faucal Calceiform and 20% reduction in biochemical oxygen demand. After a long time, the Water Quality of the river hangs has become good for RITUAL SIPPING (ACHMAN). Also due to less pollution, the South Asian River Dolphin has been spotted by local people [13].

4. Results & Discussion

As we mainly focus on PM2.5AQI concentration because they play a major role in effecting the pollution. AQI is an elementary and treasure, easy tool for the data interpretation for the pollution effects on health or in the environment. As we see in Fig. 1 and 2 there is the declination of AQI level in 2020 compared to 2019 in most of the cities of India. In 2020 especially from march there is a sharp decline. And these are the month of 2020 when there is lockdown due to a pandemic COVOID-19 has been start.

For more clarification or confirmation, we conduct observation via boxplot graph as shown in figure 3 & 4 shows a specific 2 months variability. That was observed, more in 2020. And more specifically in the area where the lockdown is strictly followed that is the city with more COVOID-19 hotspot area. By these all observation we can see there are many declinations in the AQI level and PM2.5 concentration that is far good for the Indian people. And, the drop in the water pollution these both are high achievement of us.

By various observation, we came with this result that after lockdown there is much reduction in the pollution level of the environment. There is an approximate 55-60% reduction in the pollution level for metro cities and a 20-30% reduction in the city with less industrialized or less prone to traffic after lockdown. And 40-45% improvement in water pollution.

5. Recommendations

Since, after lockdown open there is an abrupt increase in-crowd, traffic, industrial work for that we must take a necessary stand to maintain this environment that is much more favorable for our health. These are -

- To understand that from where the pollution comes from:
- So that pollutant-free if possible, the vehicle can be made to reduce exhaust fumes that are the major cause for increasing pollution.
- Enforce stricter emission standards.
- Retrofitting of heavy vehicles, cabs.
- Subsidies for electric vehicle.
- Cutting speed limit in polluted motorway areas.
- Focus in waste reduction and increase incineration.
- Training to driver for pollution awareness
- Encourage active travel where possible.
- Routinely testing or service of vehicle
- Stop having campfire in city
- Planting as much as possible and care for trees.
- Become a champion for clean air, by reporting any concern you encounter.
- Reduce the number of car trips.
- Odd-even system must be followed in the places of higher AQI.
- Also promote travelling by public convenience.
- To control water pollution
- Use less plastic
- Reuse items
- Do not throw oil, chemicals, medicines in water.
- Use environmentally friendly detergents

6. Conclusions

After observing, analyzing or evaluate the data set, we scrutinize the lockdown effect on the environment of India especially the air quality which has major benefits in our social, physical, mental health. We observe that such type of step that is lockdown have a drastic effect in the environment. We came up with the result that after lockdown there is about 55-60% declination in the air quality level of India when compared with 2019. Even the area where people are following lockdown partially also have some drop in pollution.

The change in environment was mainly seen in the area of more industrialized, the city prone to traffic. And that is the

reason for the higher mortality rate in these areas due to pollution. According to the Health Benefits Institute there are 24000 to 36000 death in monthly basis due to air pollution which is, much large in magnitude than the death due to COVOID-19 in India (during the study period). This will be averted by that much declination in environment and furthermore also if we maintain it. Even air pollution also has an adverse effect in morbidity, effect on daily lifestyle main effect in the internal organ of the body that is Lungs. And the pandemic COVOID-19 also has the same target so to reduce the risk in future we must take a step to maintain this level of air quality.

At the end, our estimation on averted in many deaths are not based on real mortality data but the focus is that due to COVOID-19 we are already suffering a major problem, and this will not easily end. But by maintaining the air quality level we can hold the spread of respiratory infection, due to infection also it will make a positive effect in the environment. So, after lockdown, it is our own duty to preserve the environment so to reduce the burden of pollution.

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