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Case Study

A STUDY OF EFFECT OF RESTRICTIONS IMPOSED DUE TO COVID- 19 ON AMBIENT AIR QUALITY OF AJMER, RAJASTHAN, INDIA

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ABSTRACT

This study presents a trend analysis of variation in monthly average concentration of three pollutants namely PM_{10}, $PM_{2.5}$, NO_2 at Civil Lines, Ajmer, Rajasthan, India between period of pre lockdown and lockdown i.e. from February 2020 to April 2020. The analysis of the data shows that the monthly average concentrations of all the three pollutants show a decreasing trend over the study period. The study also shows that concentration of $PM_{2.5}$ was approximately halved, from 50.03 $\mu g/m^3$ in February to 24.95 $\mu g/m^3$ in April and it was found that the percentage decrease in PM_{10} and NO_2 from February to April 2020 was 45.28% and 71.98%. The study also shows that the maximum decrease during the study period was observed for NO_2 followed by $PM_{2.5}$ and then PM_{10}.

Keywords: Lockdown, Air pollution, Ambient Air Quality, COVID

1. INTRODUCTION

Air Pollution is a common problem in both developed and developing countries. India is a developing country and thus industries, Power Stations, Construction Activities, Transport sector and all other sectors contributing to the development of country are making progress day by day.

Moreover the population of India is second highest in the world after China. With such a high population and continuous progress in various sectors air quality is being deteriorated progressively due to emissions from various industries, construction activities, vehicles etc. These emissions mainly include particulate matter, oxides of nitrogen, Sulphur dioxide, carbon monoxide, Pb etc. All these pollutants affect human health in one or the other way [1-5]. Particulate matter causes respiratory diseases like asthma, reduction in visibility and even cancer. Oxides of nitrogen cause respiratory problem, asthma, lung irritation and pneumonia. Oxides of sulphur cause bronchitis, acid rain and reduced atmosphere visibility. Combination of SO_2 and particulate matter is more harmful than either of them present separately. Carbon monoxide combines with haemoglobin forming carboxyhaemoglobin which decreases oxygen carrying capacity of blood [6]. Higher concentrations of these pollutants are even fatal. It was observed that in 2010, out of 3.3 million deaths due to outdoor $PM_{2.5}$, 0.65 million deaths were in India [7]. But if a situation arises where the sources of these pollutants, the vehicles, industries etc. come to a halt then it will surely lead to improvement of air quality and thus impact on human health will also decrease.

The global Coronavirus pandemic which first hit Wuhan, China has caused lockdown in various countries all over the world. In India, to curb the combat of corona virus, the first nationwide Janta curfew was of 14 hours on March 22nd which was followed by a lockdown all over India from 25th march, 2020. This lockdown had brought a situation where all the pollution causing activities had been stopped and made people sit at their homes thus reducing vehicular emissions. So a study on improving air quality due to the lockdown becomes necessary.

Thus in this paper, an attempt has been made to study the variation of namely 3 pollutants PM_{10}, $PM_{2.5}$, NO_2 before lockdown and during the period of lockdown that is from the month of February to April at Civil lines, Ajmer.

A similar study on changes in ambient air quality as compared to previous year due to the nationwide lockdown has also been done in 22 different cities of India [8].

2. MATERIAL AND METHODS

2.1.Study area

Ajmer is a city in the state of Rajasthan known for its heritage and pilgrimage places like Ajmer Sharif Dargah, Pushkar, Taragarh fort and many others.

The city lies on the geographical coordinates of 26°27'N and 74°38'E and has a total area of around 55.76 sq. km. Total population of Ajmer according to 2001 census was 2,181,670which was increased to 2,583,052 according to 2011 census and is still increasing day by day.

2.2.Site description

Civil lines, Ajmer was selected as monitoring site in the study area. It is amongst one of those areas of Ajmer which experience heavy traffic due to nearby schools, colleges, City Bus stand, Sessions court and various restaurants making it highly prone to large number of vehicular emissions and other pollutants.

2.3.Data Set

The data used in this study is secondary data and was collected from Central Pollution Control Board (CPCB) website for Ajmer city for the months of February to April 2020 for the single monitoring station which is at Civil Lines, Ajmer for air quality monitoring.

3. RESULTS AND DISCUSSION

Monthly Average Concentration of Pollutants over the study period as obtained from data by CPCB Website are given in table 1 and graph between concentration of pollutants versus time are plotted in fig. 1, 2 and 3.

Table 1: Monthly average concentration of pollutants from February to April 2020

Month	Concentration of pollutants		
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
February	109.30	50.03	34.27
March	85.75	40.88	15.18
April	59.80	24.95	9.60

From table 1 and fig. 1, 2 and 3, it can be concluded that the monthly average concentration of all the 3 pollutants, namely PM_{10}, $PM_{2.5}$ and NO_2 shows a decreasing trend over the whole study period.

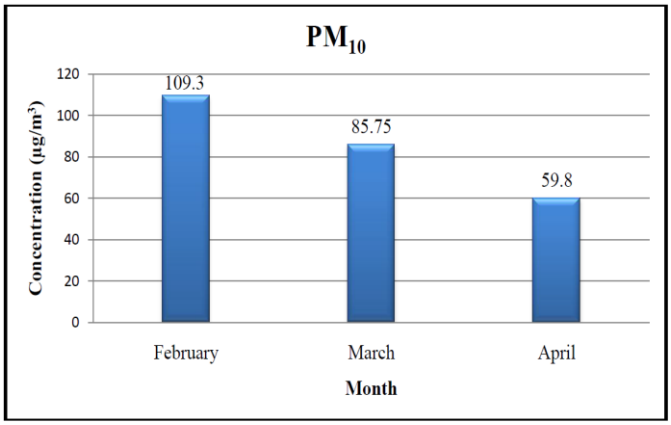

Fig. 1: Variation in Concentration of PM10 from February to April 2020

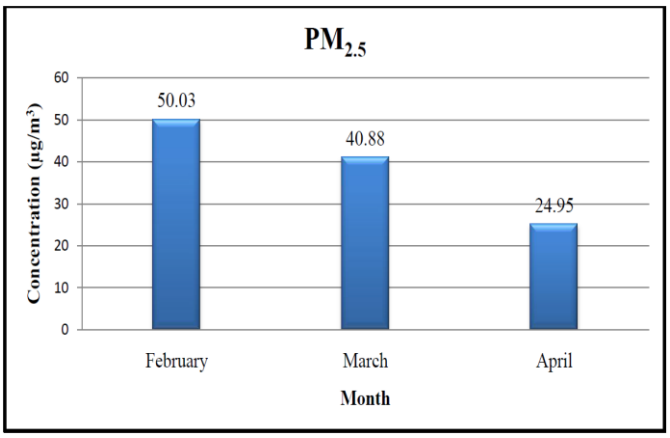

Fig. 2: Variation in Concentration of PM2.5 from February to April 2020

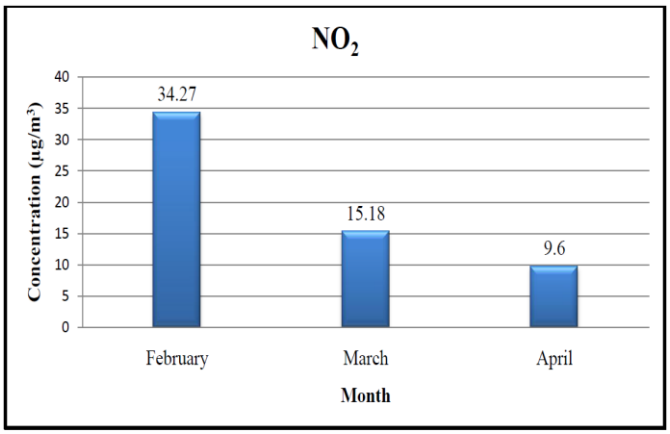

Fig. 3: Variation in Concentration of NO2 from February to April 2020

Fig.1 also shows that the percentage decrease in monthly average concentration of PM_{10} from February 2020 to

March 2020 is 21.54 % and from March 2020 to April 2020 is 30.86 %. It was found from fig. 2 that the percentage decreases in $PM_{2.5}$ from February to March and then to April 2020 is 18.28% and 38.96%. The percentage decrease in NO_2 as observed from Fig. 3 is 55.70% from February to March 2020 and 36.75% from March to April.

This decrease in concentration of air pollutants over the study period may be attributed to the lockdown imposed all over India from 25th March, 2020 to contain the global Coronavirus pandemic. Lockdown caused most of the industries, private businesses; construction activities, offices, malls, theatres, religious places, shoots and all the educational institutions to shut down completely which led most of the people to sit at their homes. Buses, trains, flights were also suspended and even the trucks used for to and fro transport of goods and raw materials at various factories was just limited to transport of essential goods. This had caused a major decrease in the sources of these pollutants like vehicular and industrial emissions, fuel combustion etc. Thus the Air Quality has progressively improved from February to April. This has been proved in a report published by Rajasthan State Pollution Control Board which shows that the Air Quality Index (AQI) is decreased from pre lockdown period (15th March-21st March) to the period of lockdown (22nd March- 3rd May 2020) [9].

Although this change is temporary but it proves that if strict regulations are formed on emission of pollutants from various sources, the nation can have a better quality of air to breathe in.

4. ACKNOWLEDGEMENT

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