

# A STUDY OF AMBIENT AIR QUALITY OF AJMER CITY, RAJASTHAN, INDIA

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**Abstract :** This study presents an analysis of the variation of concentration of air pollutants namely NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> at civil lines in Ajmer city, Rajasthan, India from January 2019 to December 2019 and their comparison with the National Ambient Air Quality Standards to assess the ambient air quality at study area. The analysis of the data shows that the concentrations of NO<sub>2</sub> and SO<sub>2</sub> were always below the permissible limits of CPCB while PM<sub>2.5</sub> crosses the permissible only once in the month of May and it was found that more than 50% of the time concentrations of PM<sub>10</sub> were violating the National Ambient Air Quality Standards. The study also shows the PM<sub>10</sub> has the highest concentration among all the pollutants while NO<sub>2</sub> has the lowest concentration of all. This shows that PM<sub>10</sub> is a critical pollutant polluting the ambient air quality of Ajmer city.

**Keywords-** Air Pollution, Ambient Air Quality, NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>

## I. INTRODUCTION

Rapid Urbanization, Industrialization and increasing population has become a major environmental concern for both developed and developing countries.

In India, Ambient air quality has progressively deteriorated due to rapid urbanization, industrialization, exponential growth of vehicles, increased construction activities, burning of agricultural waste, domestic cooking and dust storms.

In recent years, Ajmer city has been visualising rapid growth in population, urbanization and industrialization. This leads to increase in number of vehicles, construction activities, cleaning of land due to deforestation, domestic release of pollutants like CFCs, methane, etc.

All this leads to increase in levels of various pollutants most prominent of which are oxides of nitrogen, SO<sub>2</sub>, Particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), CO, Pb, etc. Increased levels of these pollutants have a direct impact on health of human being and animals.[1-6]

Particulate matter is major cause of all kinds of respiratory problems, increased level of Sulphur dioxide and oxides of Nitrogen enhances symptoms of chronic bronchitis and CO in haemoglobin hampers oxygen supply to brain which in some cases is fatal.

In this paper an attempt was made to study the effect of namely four pollutants i.e. SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> at a specified location in Ajmer city for a period of one year from January 2019 to December 2019 by comparing their monthly average concentration with the National Ambient Air Quality Standards (NAAQs) as specified by Central Pollution Control Board (CPCB). Table 1 shows the National Ambient Air Quality Standards.

Table 1- National Ambient Air Quality Standards (2009)

Sr. No.	Name of Pollutant	Time Weighted Average	Concentration in Ambient Air	
			Industrial, Residential, Rural & Other Area	Ecologically Sensitive Area (notified by Central Government)
1	SO <sub>2</sub> (µg/m <sup>3</sup> )	Annual	50	20
		24 hours	80	80
2	NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual	40	30
		24 hours	80	80
3	PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual	60	60
		24 hours	100	100
4	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Annual	40	40
		24 hours	60	60

## II. MATERIALS AND METHODS

### 2.1 Study Area:

Ajmer is a city and an administrative centre in the state of Rajasthan. The city of Ajmer lies in a semiarid, hot and hilly region at a distance of about 355km in southwest part of New Delhi, the capital of India.

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 city was found to be 5,42,321 according to 2011 census.

The climate of Ajmer city is semiarid and hot and city experiences more than 55 cm of rain annually.

## 2.2 Site Description:

Civil Lines, Ajmer was selected as the monitoring site in the study area and it falls under the category of Industrial, Residential, Rural & Other Area according to CPCB. The site lies in and around the heart of city with a distance of just 700m from central bus stand, 500m from Collectorate, Ajmer, 800m from Sessions Court and is also near to various colleges and schools making it a highly busy area prone to vehicular emissions and other pollutants.



## 2.3 Data Set:

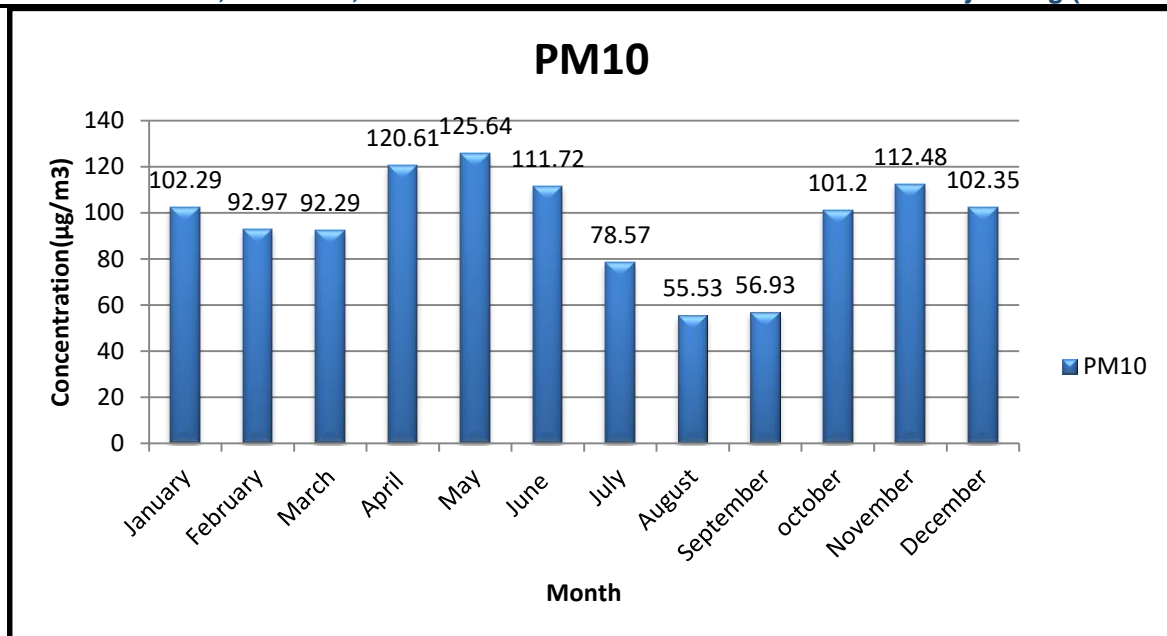
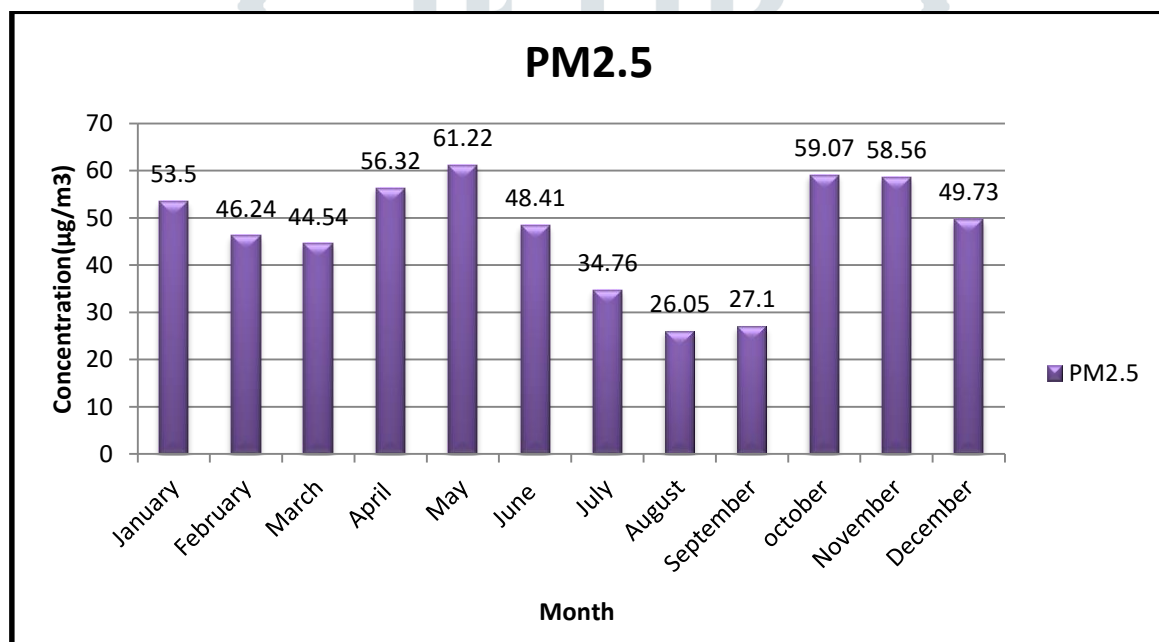
The data used in this study is secondary data and was collected from Central Pollution Control Board (CPCB) website for Ajmer city from the months of January to December-2019 for the single monitoring station which is at Civil Lines, Ajmer for air quality monitoring.

## III. RESULTS AND DISCUSSION

Monthly average concentration of different pollutants as obtained from data by CPCB Website are summarised in table 2 and the corresponding graphs of concentration of each pollutant with time are plotted (Fig. 1 to 4).

Table 2- Monthly average concentration of various pollutants

MONTH	Name of pollutants			
	PM 10 ( $\mu\text{g}/\text{m}^3$ )	PM2.5 ( $\mu\text{g}/\text{m}^3$ )	SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )
January	102.29	53.50	7.45	35.07
February	92.97	46.24	6.45	26.13
March	92.29	44.54	8.62	24.33
April	120.61	56.32	8.55	26.18
May	125.64	61.22	6.40	20.46
June	111.72	48.41	6.17	17.71
July	78.57	34.76	7.54	16.01
August	55.53	26.05	5.82	17.45
September	56.93	27.10	6.53	15.78
October	101.20	59.07	7.17	33.14
November	112.48	58.56	6.20	26.44
December	102.35	49.73	6.72	31.82

Figure 1- Variation of Concentration of PM<sub>10</sub> from January to December 2019Figure 2 - Variation of Concentration of PM<sub>2.5</sub> from January to December 2019

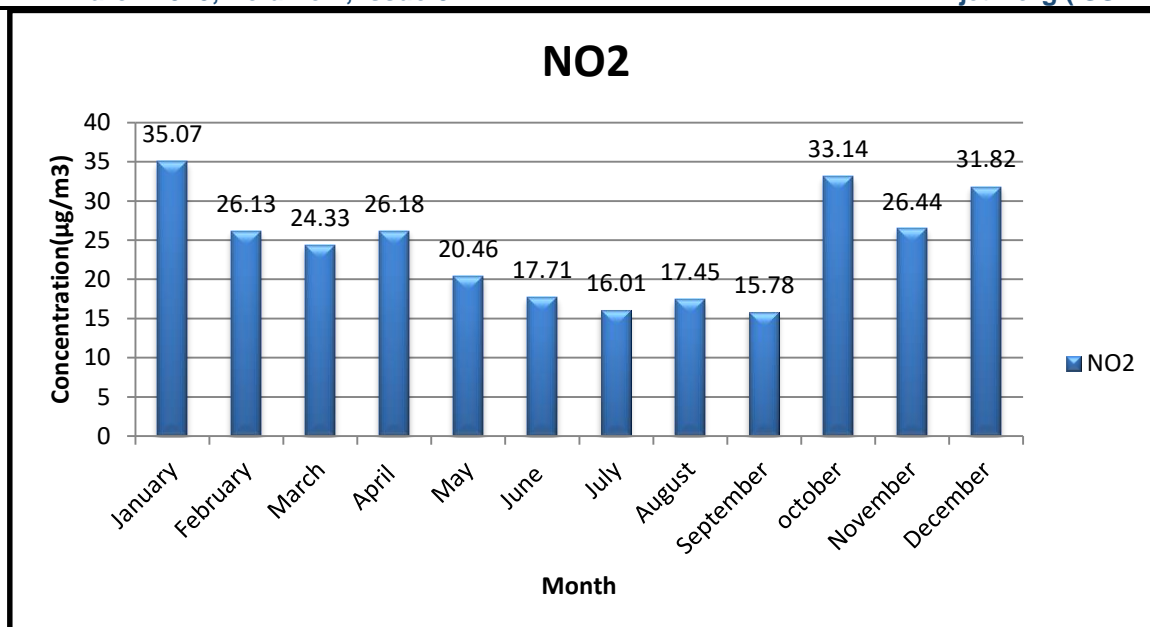
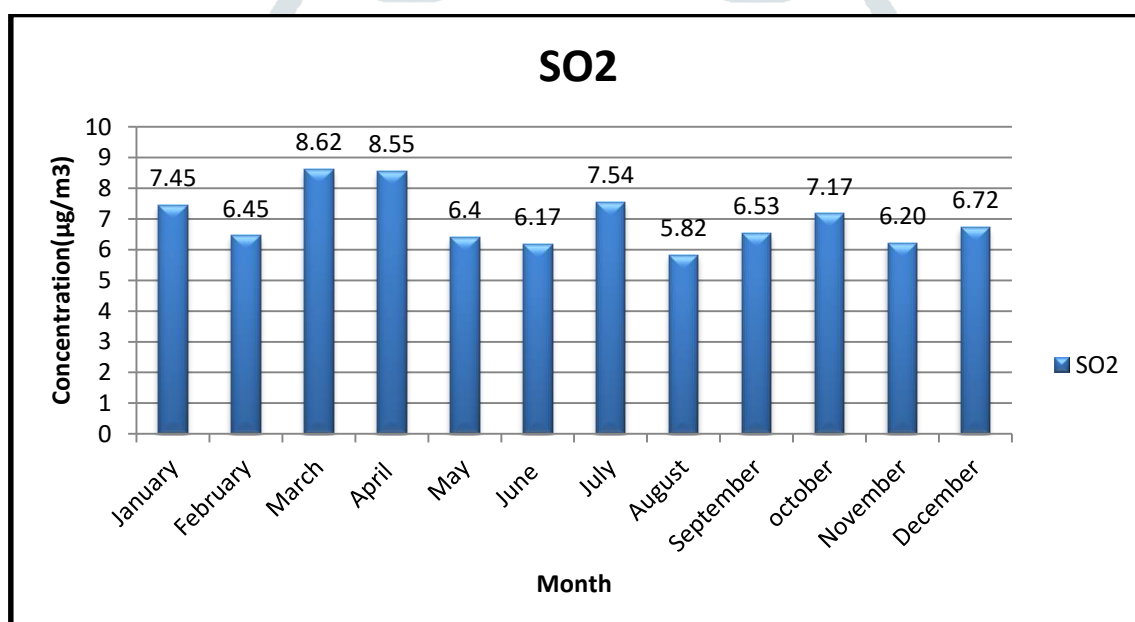
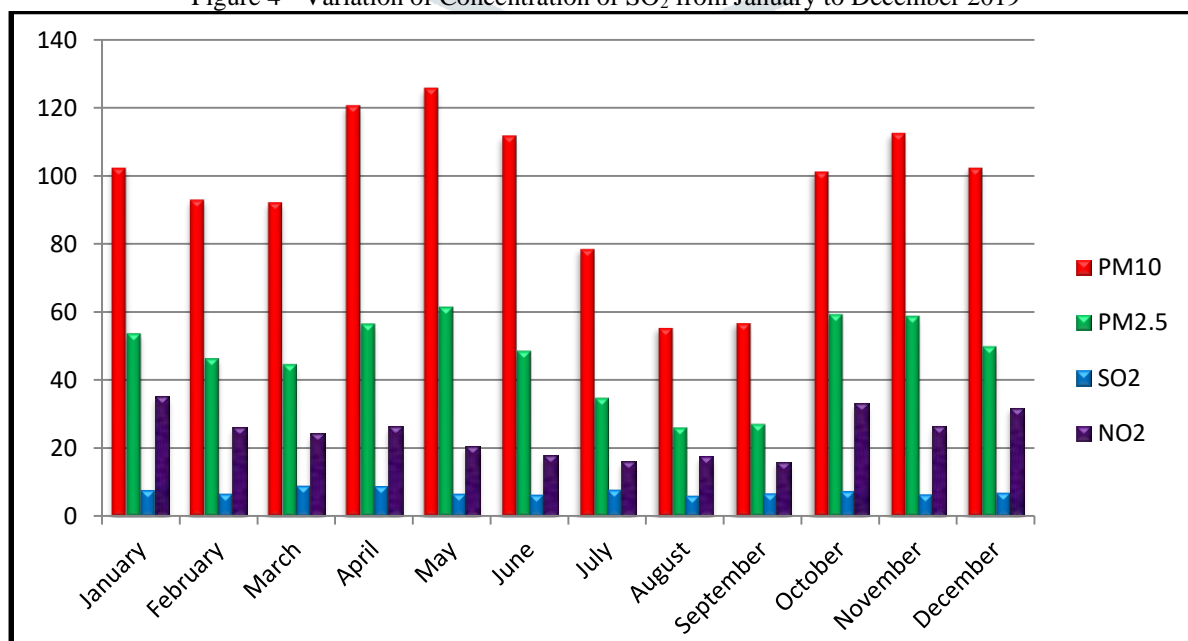
Figure 3 - Variation of Concentration of NO<sub>2</sub> from January to December 2019Figure 4 - Variation of Concentration of SO<sub>2</sub> from January to December 2019

Figure 5 – Comparison of monthly average concentration of different pollutants from January to December 2019

From table 2 and fig 1, it was found that the minimum concentration of  $PM_{10}$  ( $55.53\mu g/m^3$ ) was recorded in the month of August and the maximum concentration ( $125.64\mu g/m^3$ ) was observed during the month of May. It also shows that the concentration of  $PM_{10}$  crossed the National Ambient Air Quality Standards as prescribed by CPCB in the months of January, April, May, June, October, November, December. High  $PM_{10}$  concentration might be due to heavy transport activity in study area apart from industrial emission dust from paved roads, garbage burning in open, use of conventional fuels like wood, cow dung, etc., for cooking and other domestic purpose.

Fig.2 indicates that the maximum ( $61.22\mu g/m^3$ ) and the minimum concentration ( $26.05\mu g/m^3$ ) of  $PM_{2.5}$  was recorded in months of May and August. The concentration of  $PM_{2.5}$  has crossed the permissible limit only in the month of May. The present study coincides with the results of Study for Jaipur<sup>[7]</sup> Ahmedabad<sup>[8]</sup> and Bikaner City<sup>[9]</sup>

The minimum and maximum average concentration of  $SO_2$  was found to be  $5.82\mu g/m^3$  in the month of August and  $8.55\mu g/m^3$  in the month of March. It was also found that concentration of  $NO_2$  was in the range of  $15.78\mu g/m^3$  in September to  $35.07\mu g/m^3$  in January. Concentration of both  $SO_2$  and  $NO_2$  is well below the permissible limits as specified by CPCB.

It is also observed that the concentration of  $PM_{10}$ ,  $PM_{2.5}$ , and  $SO_2$  was found minimum during the month of August and of  $NO_2$  during September i.e. during monsoon months. This might be due to washout by rainfall.

Since the highest concentration among all the four pollutants is observed for  $PM_{10}$  thus it can be concluded that  $PM_{10}$  is a prominent pollutant at the site specified in Ajmer city. Similar results were obtained during a study in Ajmer in 2016<sup>[10]</sup>

#### IV. ACKNOWLEDGMENT

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