



BRIEF REPORT ON IMPACT OF CURFEW AND LOCKDOWN DUE TO COVID-19 PANDEMIC ON AMBIENT AIR QUALITY OF RAJASTHAN

In order to combat with the threatening spread of COVID-19 pandemic, nation-wide lockdown in the state of Rajasthan from 22nd to 31st March, 2020 was imposed by the Hon'ble Chief Minister of Rajasthan, Sh Ashok Gehlot and subsequently nation-wide Lockdown from 24th March, 2020 had been imposed in the country. As a result of stringent travel restrictions and shutting down of non-essential activities including those of air polluting sectors, air quality improvement has been noted in many towns and cities across the State.

The major sectors contributing to air pollution are transport, industries, power plants, construction activities, biomass & refuse burning, road dust re-suspension and residential activities. In addition, certain activities such as operation of DG sets, restaurant, landfill fires, etc. also contribute to air pollution.

Rajasthan State Pollution Control Board has a network of ten continuous ambient air quality monitoring stations (CAAQMS) in the state namely, three stations at Jaipur and one station each at Alwar, Ajmer, Bhiwadi, Jodhpur, Kota, Pali& Udaipur. A brief analysis of data generated from these CAAQMS stations regarding Air Quality Index (AQI) and prominent pollutants such as PM₁₀, PM_{2.5} and Nitrogen Dioxide in the state has been presented in this report.

I. Analysis of Air quality Data in terms of Air Quality Index (AQI)

To study the impact of lockdown on Air Quality Index (AQI), data of AQI for pre-lockdown and during lockdown days was analysed and a comparative statement of Air Quality Index of the ten Continuous Ambient Air Quality Monitoring Stations in Rajasthan has been summarized at Table-1. Similarly the Comparative Statement of Average Air Quality Index of the Monitoring Stations during period of Pre-Lockdown and Lockdown in Rajasthan has been summarized at Table -2.



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Table 1

Comparative Statement of Air Quality Index of Continuous Ambient Air Quality Monitoring Stations in Rajasthan

	Monitoring Dates	Ajmer-Civil lines	Alwar-Moti Doongari	Bhiwadi-RIICO Ind. Area III	Jaipur-Adarsh Nagar	Jaipur-Police Commission erate	Jaipur-Shastri Nagar	Jodhpur Collectorate	Kota - ShriNath Puram	Pali, Indra Colony Vistar	Udaipur-Ashok Nagar
<u>Air Quality Index</u>											
Pre-Lockdown	15.03.2020	88	NA	217	93	123	100	187	106	108	84
	16.03.2020	93	NA	245	110	133	124	118	97	84	86
	17.03.2020	88	NA	256	97	122	104	142	103	99	94
	18.03.2020	106	NA	259	85	139	86	163	99	93	88
	19.03.2020	NA	NA	262	75	134	99	214	91	106	106
	20.03.2020	124	90	226	94	135	98	230	85	110	89
	21.03.2020	94	73	136	86	NA	86	155	69	107	67
Nation-wide Janta Curfew & Lockdown in Rajasthan imposed by Hon'ble CM, Rajasthan	22.03.2020	104	78	196	82	81	91	118	94	117	60
Lockdown in Rajasthan imposed by Hon'ble CM, Rajasthan	23.03.2020	99	78	104	74	78	78	90	81	61	45
Lockdown	24.03.2020	87	82	103	63	81	73	95	86	86	47
	25.03.2020	75	82	54	53	64	61	85	74	80	45
	26.03.2020	54	83	42	44	40	201	162	44	54	45
	27.03.2020	NA	80	28	46	NA	49	60	33	51	51
	28.03.2020	NA	63	35	67	32	54	56	62	50	60
	29.03.2020	NA	54	48	81	43	76	91	64	59	69
	30.03.2020	71	60	59	65	46	86	79	74	70	62
	31.03.2020	74	44	57	65	54	79	96	81	66	83
	01.04.2020	87	51	55	65	83	54	144	91	140	68
	02.04.2020	71	41	56	58	53	78	70	NA	65	64
	03.04.2020	62	54	68	63	48	68	82	65	71	70
	04.04.2020	62	40	66	61	63	76	70	65	54	55
	05.04.2020	64	52	83	62	68	56	164	69	72	57
	06.04.2020	69	57	90	77	84	74	114	81	86	59
07.04.2020	76	58	85	73	77	82	96	80	85	76	

AQI	Remark	Possible Health Impacts
0-50	Good	Minimal impact
51-100	Satisfactory	Minor breathing discomfort to sensitive people
101-200	Moderate	Breathing discomfort to the people with lungs, asthma and heart diseases
201-300	Poor	Breathing discomfort to most people on prolonged exposure
301-400	Very Poor	Respiratory illness on prolonged exposure
401-500	Severe	Affects healthy people and seriously impacts those with existing diseases

Note:

	Pre-Lockdown
	Nation-wide Janta Curfew & Lockdown in Rajasthan imposed by Hon'ble CM, Rajasthan
	Lockdown in Rajasthan imposed by Hon'ble CM, Rajasthan
	Lockdown
	NA
	Not Available

Table-1: Comparative Statement of Air Quality Index of the ten Continuous Ambient Air Quality Monitoring Stations in Rajasthan



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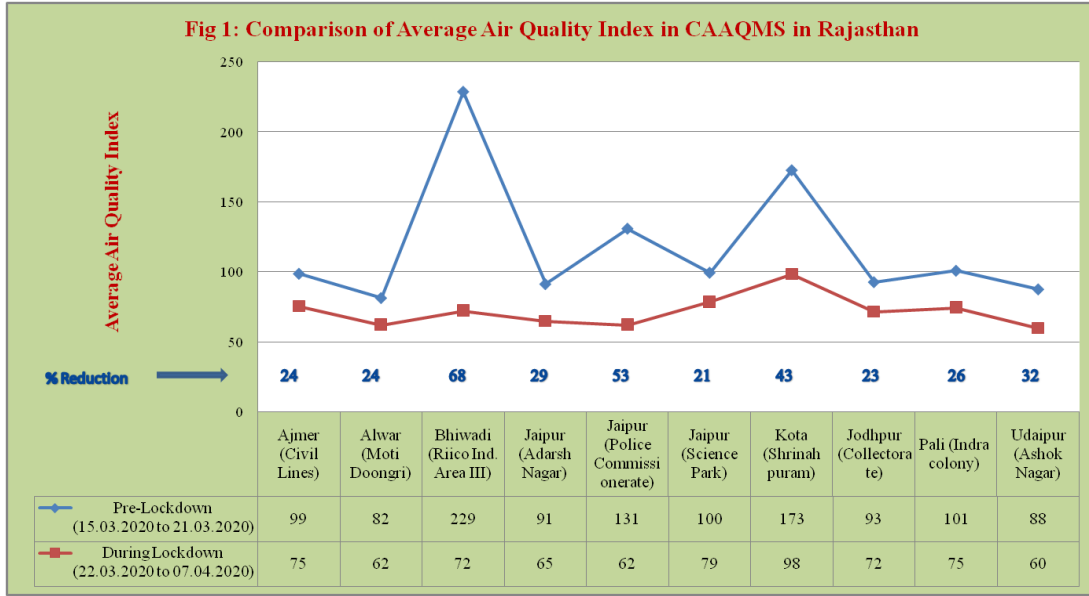


Fig. 1 Comparison of Average AQI between period of Pre-lockdown and Post-lockdown of Rajasthan

Table 2

Comparative Statement of Average Air Quality Index of Continuous Ambient Air Quality Monitoring Stations in Rajasthan

		Pre-Lockdown	Lockdown	Percentage Decrease between Period of Pre-Lockdown and Period of Lockdown (in %)
Monitoring Stations↓	Monitoring Dates→	15.03.2020 to 21.03.2020	22.03.2020 to 07.04.2020	—
<i>Ajmer- Civil lines</i>	Air Quality Index	99	75	24
<i>Alwar- Moti Doongari</i>		82	62	24
<i>Bhiwadi- RIICO Ind. Area III</i>		229	72	68
<i>Jaipur- Adarsh Nagar</i>		91	65	29
<i>Jaipur- Police Commissionerate</i>		131	62	53
<i>Jaipur- Shastri Nagar</i>		100	79	21
<i>Jodhpur Collectorate</i>		173	98	43
<i>Kota - ShriNath Puram</i>		93	72	23
<i>Pali, Indira Colony Vistar</i>		101	75	26
<i>Udaipur- Ashok Nagar</i>		88	60	32

Note:

AQI	Remark	Colour Code	Possible Health Impacts
0-50	Good	Green	Minimal impact
51-100	Satisfactory	Light Green	Minor breathing discomfort to sensitive people
101-200	Moderate	Yellow	Breathing discomfort to the people with lungs, asthma and heart diseases
201-300	Poor	Orange	Breathing discomfort to most people on prolonged exposure
301-400	Very Poor	Red	Respiratory illness on prolonged exposure
401-500	Severe	Dark Red	Affects healthy people and seriously impacts those with existing diseases

Table 2: The percentage decrease Average Air Quality Index between period of Pre-lockdown and during lockdown in Rajasthan.



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A comparison between the Period of Pre-Lockdown (15.03.2020 to 21.02.2020) and during Lockdown (22.03.2020 to 07.04.2020) as per Figure 1 reflects that, there has been a significant reduction in Average Air Quality Index at all the ten continuous ambient air quality monitoring stations. The percentage decrease at these stations has ranged between 21% (Shashtri Nagar, Jaipur) to 68 % (Bhiwadi-RIICO Ind. Area III).

II. Analysis of Air Quality Data in Terms of Specific Pollutants

An analysis has also been made to examine the impact of lockdown on specific important pollutants such as PM₁₀, PM_{2.5} and Nitrogen Dioxide. Data related to average concentration of these parameters for pre lockdown and during lockdown periods is tabulated in Table-3. As compared to the Period of Pre-Lockdown (15.03.2020 to 21.02.2020), significant percentage decrease in air quality parameters such as PM₁₀, PM_{2.5} and Nitrogen Dioxide has also been observed during the Lockdown period (22.03.2020 to 07.04.2020), at all monitored stations in the state.

Table 3

Comparative Statement of Air Quality Parameters of Continuous Ambient Air Quality Monitoring Stations in Rajasthan

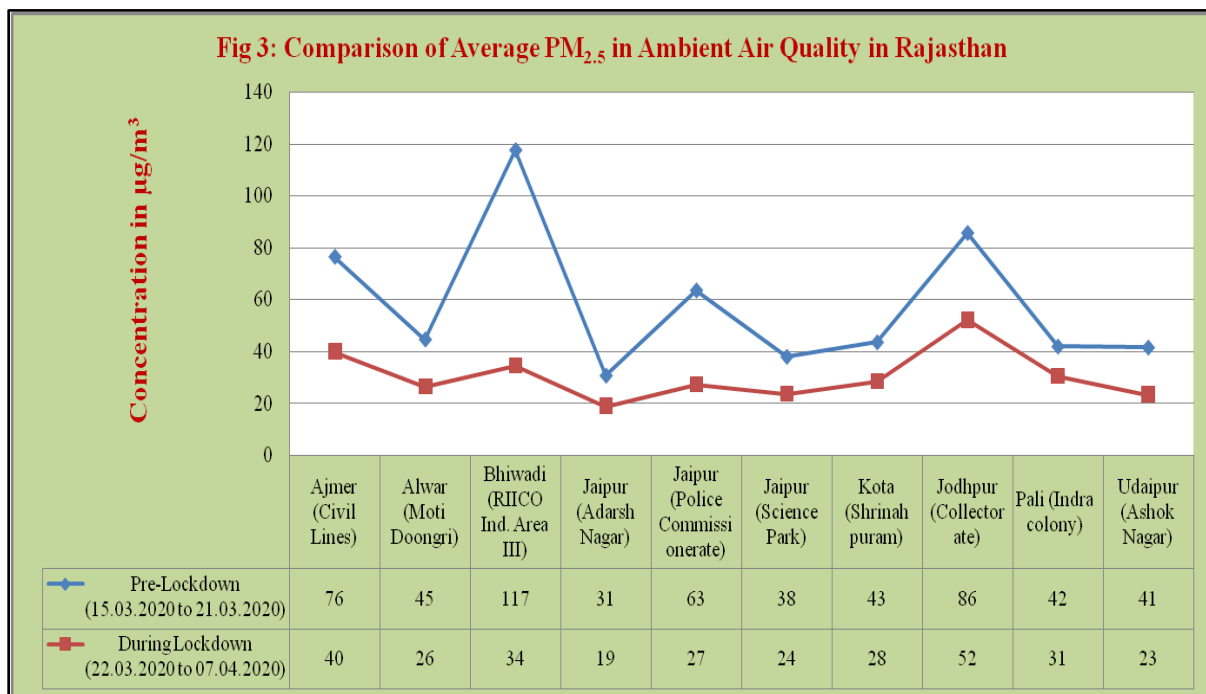
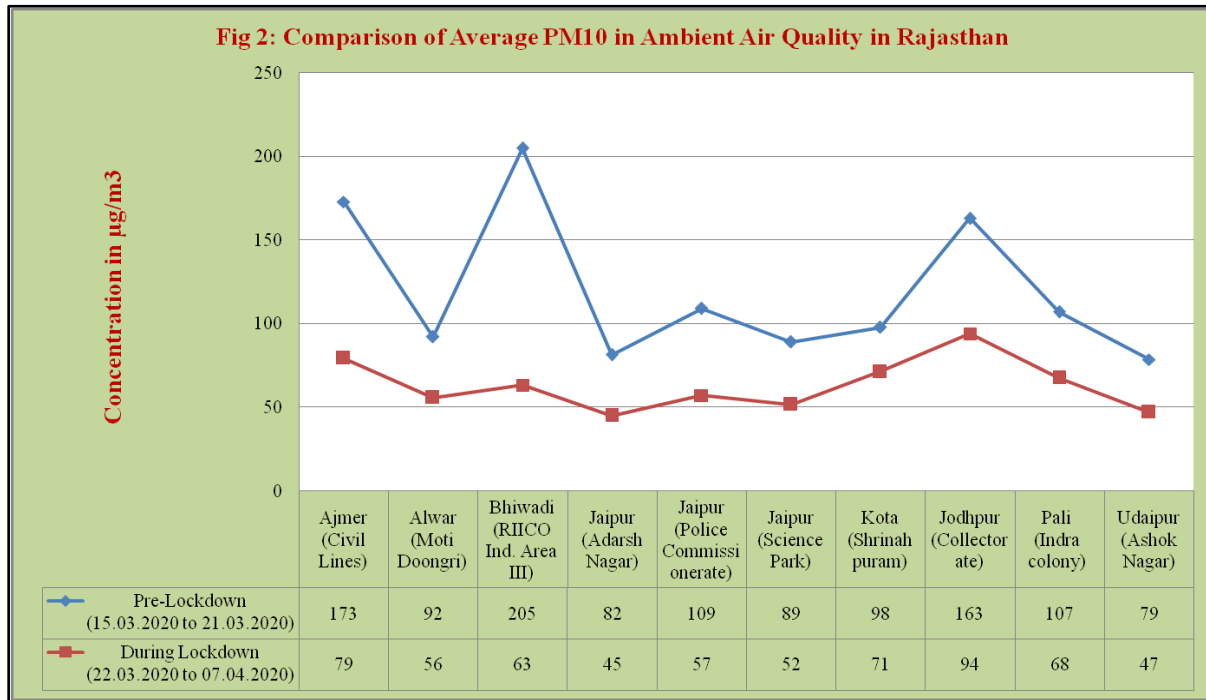
	Pre-lockdown			Lockdown			Percentage Decrease between Period of Pre-Lockdown and Period of Lockdown (in %)		
	PM 10	PM2.5	NO2	PM 10	PM2.5	NO2	PM 10	PM2.5	NO2
Monitoring Dates	15.03.2020 to 21.03.2020			22.03.2020 to 07.04.2020			—		
Ajmer (Civil Lines)	173	76	57	79	40	15	54	48	73
Alwar (Moti Doongri)	92	45	39	56	26	27	39	41	32
Bhiwadi (Riico Ind. Area III)	205	117	85	63	34	24	69	71	72
Jaipur (Adarsh Nagar)	82	31	32	45	19	11	45	38	64
Jaipur (Police Commissionerate)	109	63	47	57	27	16	48	57	65
Jaipur (Science Park)	89	38	32	52	24	14	42	38	57
Kota (Shrinath puram)	98	43	31	71	28	14	27	34	55
Jodhpur (Collectorate)	163	86	63	94	52	22	42	39	65
Pali (Indra colony)	107	42	27	68	31	22	37	27	21
Udaipur (Ashok Nagar)	79	41	24	47	23	6	40	43	76

Table-3: The average concentration of PM₁₀, PM_{2.5} and NO₂ for pre lockdown and post lockdown periods in the ten CAAQMS of Rajasthan



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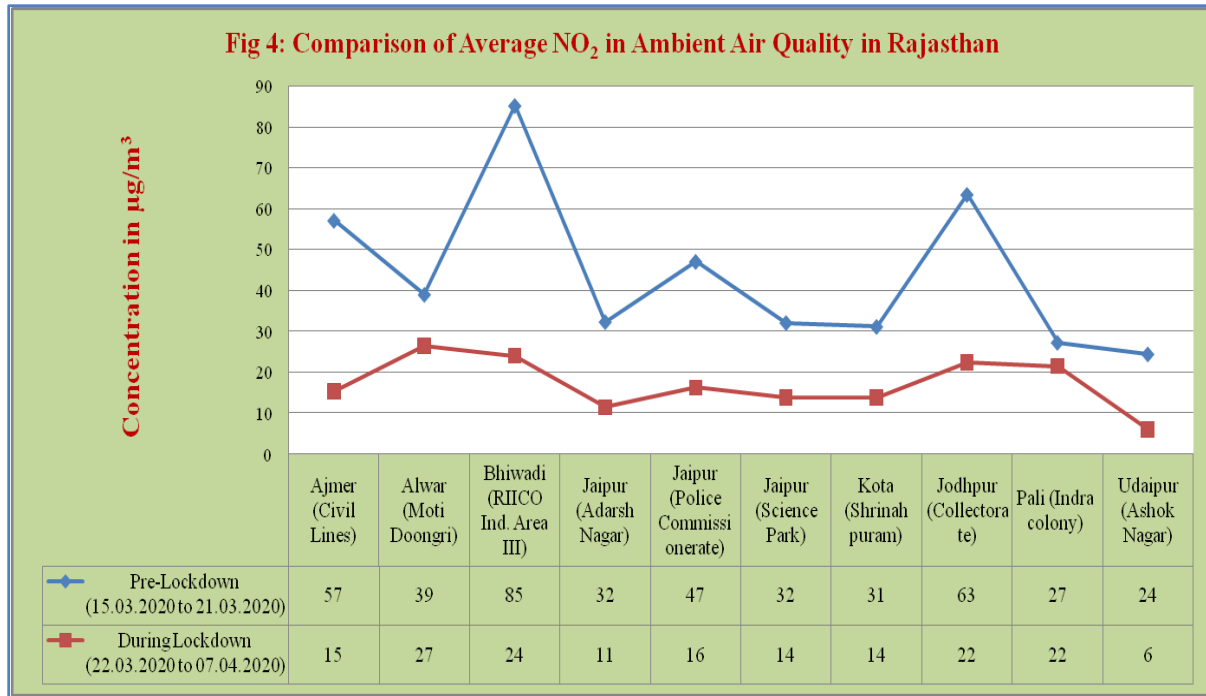
As per Fig.2, 4 and 5, the percentage decrease of PM₁₀ at these stations ranges between 27% (Kota- ShrinathPuram) to 69 % (Bhiwadi- RIICO Ind. Area III), while the percentage decrease of PM_{2.5} at these stations has ranged between 27% (Pali-Indira Colony) to 71 % (Bhiwadi- RIICO Ind. Area III), and the percentage decrease of NO₂ at these stations has ranged between 21% (Pali-Indira Colony) to 76 % (Udaipur- Ashok Nagar).





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Fig 4: Comparison of Average NO₂ in Ambient Air Quality in Rajasthan



The average Air quality index of Bhiwadi city has moved from Poor to Satisfactory levels while comparing between the period of Pre-Lockdown (15.03.2020 to 21.02.2020) and period of Lockdown (22.03.2020 to 07.04.2020), whereas cities namely Jodhpur, Pali and Jaipur (Police Commissionerate and Shastri Nagar) have moved from Moderate to Satisfactory levels. Rest of the monitoring stations in the state continue to remain Satisfactory as were before the Lockdown period.

It may be noted that Bhiwadi has been categorized as one of the critically polluted industrial clusters of Rajasthan by CPCB and the lockdown has resulted in substantial improvement in air quality in the city. This may primarily be due to non-operation of industries, DG sets, and reduced contribution of road dust re-suspension due to very less vehicular movement and very less vehicular emission as number of vehicles plying on the roads reduced significantly which are the major contributors to the ambient air quality at Bhiwadi.

The improvement in air quality of other cities such as Alwar, Ajmer, Jaipur, Jodhpur, Kota, Pali and Udaipur was also noted as most of the vehicles remained off road and non-essential industrial units closed during Janta Curfew and lockdown. These cities have also registered pronounced decrease in pollution levels due to stringent travel restrictions, movement of people, restricted vehicle movement & commercial activities, reduced contribution of road dust re-suspension & C & D activities, and MSW burning.

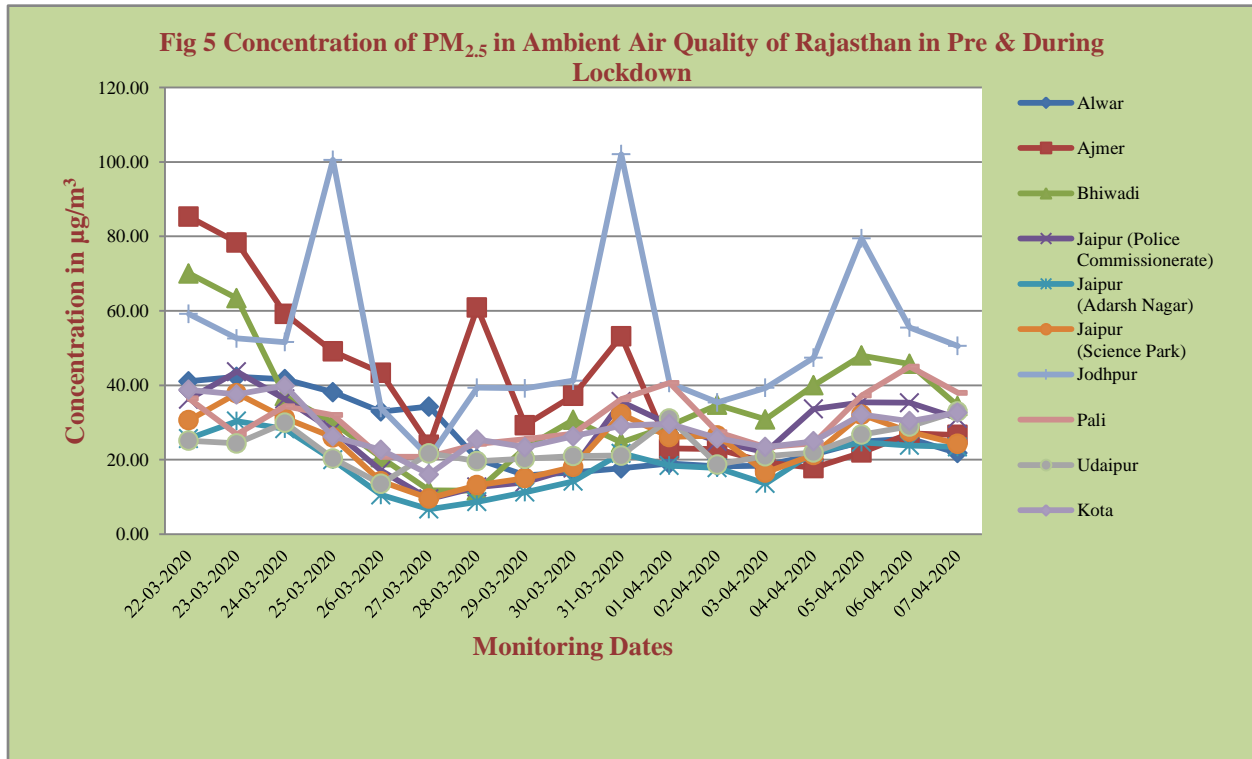


Fig-5 represents concentration of PM_{2.5} for the lockdown period for all the ten CAAQMS installed in the state. It is evident that the concentration of PM_{2.5} was higher in the initial period of lockdown which gradually decreased at all places except Pali and Udaipur as the lockdown became more effective. Lower values of PM_{2.5} in the later period may also be attributed to due rising ambient temperatures which might assist better dispersion.

III. Conclusions and Major Highlights

- i. The lockdown has tremendously helped in improving ambient air quality in the state. The Air Quality Index (AQI) at all the stations has now become “Satisfactory” which was earlier ranging from poor to satisfactory.
- ii. Air Quality Index (AQI) has improved as all the places, however, maximum improvement has been observed at Bhiwadi due to closure of industrial activities and subsequent reduction in vehicular traffic and re-suspension of road dust.
- iii. In terms of individual pollutants also, Bhiwadi has noticed very high reduction of around 70% in the concentration of PM₁₀, PM_{2.5} and Oxide of Nitrogen due to lock down.



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- iv. Other cities where the dominant source of air pollution is vehicular pollution and road dustre-suspension have also witnessed significant decrease in the major pollutants ranging from 27% to 73%.
- v. Reduction of PM_{2.5} is more pronounced in the later part of lockdown which may be due to effective enforcement of the lockdown assisted by rise in ambient temperatures at most of the places resulting in better dispersion of pollutants.

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