International Journal of Recent Advances in Multidisciplinary Topics
Volume 2, Issue 4, April 2021
https://www.ijramt.com | ISSN (Online): 2582-7839

Impact of Lockdown on Air Quality in Chennai During COVID-19 Pandemic 2020

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***Abstract*: We all know that, the lockdown was announced in India on 22nd March 2020, because of spreading COVID-19 Pandemic all over the world. We know that atmospheric contamination, the Particulate matter (PM) causes severe damage for human diseases. Due to the lockdown, the air pollution levels have dropped across the nation. In this paper, I present an analysis of Air Quality Index. During this strict lockdown period, the air quality has improved significantly than before years.**

***Keywords*: COVID-19, Air quality, Lockdown, Particulate matter, Chennai.**

1. Introduction

In 2020 most of the countries in the world are severely affected by COVID-19. The 1st case in the world identified at Wuhan city, China during December 2019, slowly rest of the world is affected by COVID-19. The Government of India issued that travelers from foreign nations are quarantined for 14 days. Due to this pandemic the daily cases in India are raising rapidly. The 1st case in India identified on Jan 30th 2020. Prime Minister of India announced National wide lockdown on 22nd march 2020 for 21 days. As Urban and industrial growth made significant progress, many new legislations introduced to prevent and control of pollution. Presence of various pollutant in the emission and effluent in excess of prescribed standards will enhance these levels in ambient environment and introduce many risks to environment and consequent health implications. Recently wang et al. released the analysis of PM2,5 during COVID-19 in China and he found that reduction in air pollution. Due to lockdown, all types of vehicular movement got reduced and all non-essential activities including those air polluting sectors were shut down. The aim of this paper is to study the impact lockdown in Chennai on air quality. To ascertain the impact of lockdown on air quality index. I made a clear graphical representation of the Air quality index with pre-lockdown (01st March to 24th March 2020), lockdown 1 (24th March to 14th April 2020) and lockdown 2.0 (15th April to 3rd day 2020).

2. Air Quality Index

Air Quality Index (AQI) is a tool for effective communication of air quality status of an area to people. It transforms complex air quality data of various pollutants into a single number, nomenclature and colour, which fall in one of the six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor and Severe with their associated health impacts.

3. Air Quality Monitoring in Chennai

Continuous Ambient Air Quality Monitoring Station (CAAQMS) operated by TNPCB at six locations in Chennai city. They are located in Gummidipoondi, Kodungaiyur, Koyembedu, Manali, Perungudi and Royapuram. CAAQM stations at Alandur, Velachery and Manali.

Table 1
AQI categories

AQI Category	Color	AQI Range	Associated Health Impact
Good	Green	0-50	Minimal Impact
Satisfactory	Yellow	51-100	Minor breathing discomfort to sensitive people
Moderate	Orange	101-200	Breathing discomfort to the people with lungs, asthma and heart diseases
Poor	Red	201-300	Breathing discomfort to most people on prolonged exposure
Very Poor	Purple	301-400	Respiratory illness on prolonged exposure
Severe	Maroon	401-500	Affects healthy people and seriously impacts those with existing diseases

4. Study of Air Quality During Pre-Lockdown and Lockdown 1

Table 2
Air Quality Monitoring

S. No.	TNPCB CAAQM Stations	Site Classification
1	Royapuram	Mixed Residential
2	Koyambedu	Traffic Interaction
3	Gummidipoondi	Industrial
4	Perungudi	Residential
5	Kodungaiyur	Mixed Residential
6	Manali	Industrial

The data's collected from 6 stations of TNPCB in Chennai have been considered for analysis. I have taken the pre-lockdown period from 1st March 2020 to 23rd March 2020 of 23 days, Lockdown 1 period from 24th March to 14th April 2020 of 22 days and lockdown 2.0 from 15th April 2020 to 3rd

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May 2020. Average AQI for all 6 stations for a single day and Mean AQI are calculated.

By this analysis, data reveal that lockdown made improvement of Chennai air quality in most of its recorded stations, from the Air Quality Index.

Mean Values of all 6 stations revealed that the AQI is from 60.53 and 38.95 ,33.21. It reduced nearly 48% compared to pre-lockdown.

Fig. 1. Lockdown (PC: thehindubusinessline.com)

Table 3
AQI recorded in six CAAQM stations during pre-lockdown period (01 March – 23 March 2020)

Station/Data	01-Mar	02-Mar	03-Mar	04-Mar	05-Mar	06-Mar	07-Mar	08-Mar	09-Mar	10-Mar	11-Mar	12-Mar
Perungudi	54	56	74	78	52	43	35	31	33	31	28	28
Koyambedu	68	63	89	91	67	56	51	44	39	46	49	49
Gummidipundi	92	89	111	116	96	92	111	107	75	70	58	75
Kodungaiyur	72	52	-	-	69	52	-	33	-	-	-	56
Royapuram	66	82	60	78	64	42	-	42	37	35	56	38
Manali	106	101	62	77	54	88	35	25	82	75	62	59
Mean	76.33	73.83	61	77.5	67	62.17	35	47	59.5	55	59	50.83

Station/Data	13-Mar	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar	21-Mar	22-Mar	23-Mar	Mean
Perungudi	42	57	61	45	45	44	51	45	45	35	42	45.87
Koyambedu	39	53	65	67	44	51	50	61	53	42	46	55.78
Gummidipundi	102	114	130	78	87	104	103	86	76	89	63	92.35
Kodungaiyur	43	-	-	46	46	44	50	45	52	56	49	48.5
Royapuram	38	48	49	40	39	43	43	43	40	48	44	42.69
Manali	69	93	94	82	122	107	78	90	89	57	86	77.96
Mean	55.5	70.5	71.5	59.67	63.83	65.5	62.5	61.67	59.17	54.5	55	60.53

Table 4
AQI recorded in six CAAQM stations during Lockdown period (24 March – 14 April 2020)

Station/Data	24-Mar	25-Mar	26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	31-Mar	01-Apr	02-Apr	03-Apr	04-Apr
Perungudi	45	28	31	35	44	41	38	43	49	48	48	48
Koyambedu	48	34	31	36	45	43	38	43	36	51	52	52
Gummidipundi	100	60	46	48	120	70	47	61	67	64	68	62
Kodungaiyur	53	51	50	50	-	-	-	-	-	48	52	38
Royapuram	34	26	27	41	42	54	55	64	41	60	64	69
Manali	64	50	71	66	76	60	67	77	90	96	63	46
Mean	57.33	41.5	42.67	46	59	57	61	70.5	65.5	61.17	57.83	52.5

Station/Data	05-Apr	06-Apr	07-Apr	08-Apr	09-Apr	10-Apr	11-Apr	12-Apr	13-Apr	14-Apr	Mean
Perungudi	40	26	21	18	18	22	21	22	25	35	33.91
Koyambedu	-	33	20	20	22	-	-	29	-	28	28
Gummidipundi	53	41	29	33	32	38	30	34	26	45	53.36
Kodungaiyur	45	-	-	-	-	35	40	-	-	-	37.5
Royapuram	34	30	60	21	42	-	18	21	20	31	22.5
Manali	53	48	38	48	44	40	42	48	50	49	58.45
Mean	46.25	39	49	34.5	43	40	32.5	34.5	35	40	38.95

Table 5
AQI recorded in six CAAQM stations during Lockdown 2.0 period (15 April – 3 May 2020)

Station/Data	15-Apr	16-Apr	17-Apr	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr	24-Apr
Perungudi	31	22	21	19	19	18	21	18	21	18
Koyambedu	34	27	19	16	13	13	15	27	16	12
Gummidipundi	37	32	30	37	25	21	29	27	28	-
Kodungaiyur	-	-	-	-	-	-	-	-	-	-
Royapuram	26	22	14	24	21	18	19	16	21	15
Manali	44	34	37	34	37	27	49	39	30	42
Mean	35	28	25.5	29	29	22.5	34	27.5	25.5	28.5

Station/Data	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	01-May	02-May	03-May	Mean
Perungudi	18	27	21	18	19	23	21	33	29	21.95
Koyambedu	20	24	19	16	7	26	24	39	31	20.95
Gummidipundi	-	35	22	31	21	36	35	47	46	34.13
Kodungaiyur	-	-	-	-	-	-	-	-	-	-
Royapuram	19	20	15	15	15	23	27	37	31	20.95
Manali	59	67	62	57	47	41	56	56	46	45.47
Mean	39	43.5	38.5	36	31	32	41.5	46.5	38.5	33.21

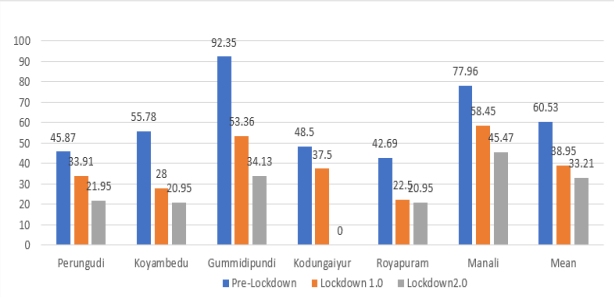

Fig. 2. Average Air Quality Index in six CAAQM stations in Chennai

Many relaxations in industrial, commercial and small business trade activities brought into force, so I didn't calculate the Air quality index for lockdown 3.0. The AQI values for the Kodungaiyur stations is not available for the Lockdown 2.0 in TNPCB website. Despite kodungaiyur values are not available, the mean AQI was less compared to Lockdown 2.0.

5. Recommendations

There should a be change in technology in expansion of clean fuel automobiles. A frequent inspection in the vehicle emission must be done. Promote digital method of class for school, college, workspace to reduce mobility. Expansion of clean fuel infrastructure to ensures availability in industry areas and reduce emissions from industrial clusters. Implement free access to LPG cylinders for cooking to women in poor households, use of biomass pellets. Proper public outreach to increase mass interaction on health impact of open burning.

6. Conclusion

The AQI that calculated are presented in table 2-4. The results reveal that all six stations values of air quality index during pre-lockdown period is mostly Good or Satisfactory category, except in Gummidipundi and Manali area where the values are Moderately polluted due to the Industries occupied in that area. AQI values moved to Satisfactory or Good category during Lockdown 1, in some days the Moderately polluted status occurred in Gummidipoodi station. Datas reveal that during lockdown 2.0 all the stations recorded as Good category air status except one or two days in Manali station. Lockdowns appears to show improvement in air quality over highly populated city. These results will make the government to ponder on at what basis to minimize vehicular and industrial pollution in India and to improve air quality which help to sustain good health.

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