Air Quality of Chitrakoot during Covid-19 Pandemic Lockdown

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***Abstract*: A nationwide COVID-19 pandemic lockdown was imposed in India from 22 march 2020. The covid-19 has caused a reduction in routine anthropogenic activity. Lockdown have reduced Air Pollution level in all over the India. Air Pollution level comes with a health benefits. This research briefed the air quality status during pandemic lockdown period at chitrakoot area with the considering of mainly four pollutants (PM_{10}, $PM_{2.5}$, SO_2 and NO_x). National Air Quality Index refer to show the spatial pattern of air quality status in pre phase of lockdown and during-lockdown. It is demonstrated and confirmed that during lockdown air quality is significantly improved. Among the selected pollutants, concentrations of Particulate Matter have witnessed maximum reduction in compare to the pre-lockdown phase.**

***Keywords*: Air Pollution, PM_{10}, $PM_{2.5}$, SO_2, NOx and AQI.**

Introduction-

Air pollution can be very severe. It is considered a significant risk factor for a number of health conditions, especially heart disease, Chronic obstructive pulmonary disease (COPD), respiratory infections, stroke and lung cancer **(Reilly *et. al*., 2011).** In month of On December 31, 2019, China informed to the World Health Organization about cases of pneumonia in Wuhan City. On 09 January 2020, the WHO released a statement. Now the Covid has defined to new definition of success. Corona virus is a large family virus named for the halo spiked proteins on there surface resembling a crown under microscopic study. The new corona virus called SARS-Cov-2 it stands for severe acute respiratory syndrome corona virus2. As a newly pandemic virus no one has antibody against it. Now a days everyone is at risk for catching as well as spreding one person to another. There are seven types of corona virus known to effect humans. Covid -19 causes moderate to severe respiratory illness. The virus would spread by oral drop it may caused by coughing, sneezing which people can take through nose or oral medium. The virus can also be spred through touching a contaminated surface. Ones it enters in the body it travels quickely and sticked in mucous membrane. Symptoms appears after 5 days of infection with symbol to dry cough, sore throat and fever. Symptoms become more severe if virus reach on respiratory tract and causing inflammation in human lungs resulting difficulty in breathing. The lockdown presumes effective alternative measure to controlling air pollution. Present work intended to explore the degree of air quality improved during lockdown period. Impacts of lockdown played a significant role on restoration of air quality. Air pollution exposure is associated with numerous adverse health effects, including cardiovascular disease, diabetes, and lung cancer **(Brook et al., 2010, Pope *et al*.,2009, Strak *et al*.,2017).** The present study aim an effort to assess the usefulness of the lockdown period as an alternative strategy to curb air pollution level. The main objectives of the study is-

- To monitor and compare the atmospheric pollutants levels at Chitrakoot M.P. area during pre-lockdown and during lockdown period.
- Integrated air quality quantifying through study.
- To collect the level of AQI of the study area.

It should be noted that very severe on future and ease to go there native. It is considered a significant risk factor for a number of health conditions.

Study area:

It is situated at latitude 25.1477° North; longitude 80.8546° East. Chitrakoot is a famous pilgrimage center of district Satna Madhya Pradesh, India. It is a seen sights places, cultural importance, situated in Bundelkhand region. Madhya Pradesh and Uttar Pradesh is known for a number of temples, memories of lord rama as well as scriptures.

Methodology-

Ambient Air Quality monitoring at Chitrakoot has been investigated for the period of one month period on weekly interval. The sampling was carried out using respirable dust sampler (Envirotech model APM 460-BL) and gaseous pollutants sampler (Envirotech model APM-443) for 8 hours in a day. Average monitoring flow rate of 1.5 LPM as per the standards of CPCB.

All parameters monitoring was carried out once in a week. Samples for determination of gaseous pollutants SO_2 and NOx were collected by bubbling air in Sodium tetra chloromercurate (TCM) and Sodium hydroxide arsenate absorbent solutions respectively in impingers. Average flow rate of 1.5 LPM set. These samples were analyzed for SO_2 and NO_X through spectrophotometer. SO_2 was analyzed through Improved West and Gaeke Method and NOx was analyzed through Jacob & Hocheiser modified ($NaOH$-$NaAsO_2$) Method. **(Chaurasia *et. al*., 2013).** Air Quality Index was also calculated using online software of CPCB.

Table- 1. AQI before and during lockdown in (µg/m3)

Ambient Air quality of Chitrakoot Before Lockdown (February 2020)					Ambient Air quality of Chitrakoot During Lockdown (April-2020)				
Date	Parameter				Date	Parameter			
	PM_{10}	$PM_{2.5}$	SO_2	NOx		PM_{10}	$PM_{2.5}$	SO_2	NOx
03/02/2020	138.40	72.60	14.70	26.70	09/04/2020	52.10	26.70	6.70	13.40
10/02/2020	142.80	78.90	17.30	32.40	16/04/2020	58.80	32.90	8.10	15.80
17/02/2020	167.20	85.30	21.20	38.80	23/04/2020	64.70	38.20	10.40	17.40
24/02/2020	171.50	96.40	23.60	44.20	30/04/2020	67.20	39.40	11.30	19.50
Average	**154.98**	**83.30**	**19.20**	**35.53**	**Average**	**60.70**	**34.30**	**9.13**	**16.53**

Table- 2. AQI of before and during lockdown

Week	Before Lockdown	During Lockdown	% Air quality improved
1	140.56	52.10	62.93
2	162.04	58.80	63.71
3	183.86	64.70	64.81
4	219.41	67.20	69.37
Average	**176.47**	**60.70**	**65.21**

Table- 3. Air Quality standards prescribed by CPCB.

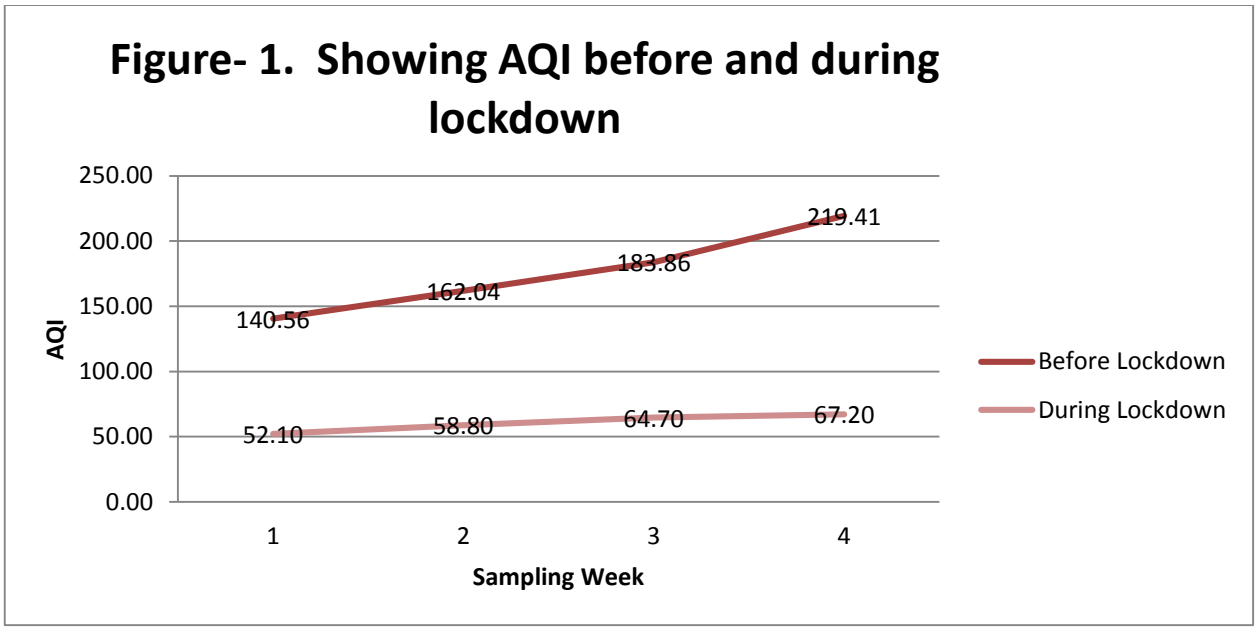
(0–50) Good	Minimal body Impact in livings	**(201–300) Poor**	Breathing discomfort with prolonged exposure
(51–100) Satisfactory	Minor breathing discomfort may appear to sensitive people	**(301–400) Very Poor**	Respiratory illness on exposure level.
(101–200) Moderate	Breathing discomfort with heart and lung disease symptoms in children and older adults.	**(>401) Severe**	Respiratory effects on people even on healthy people

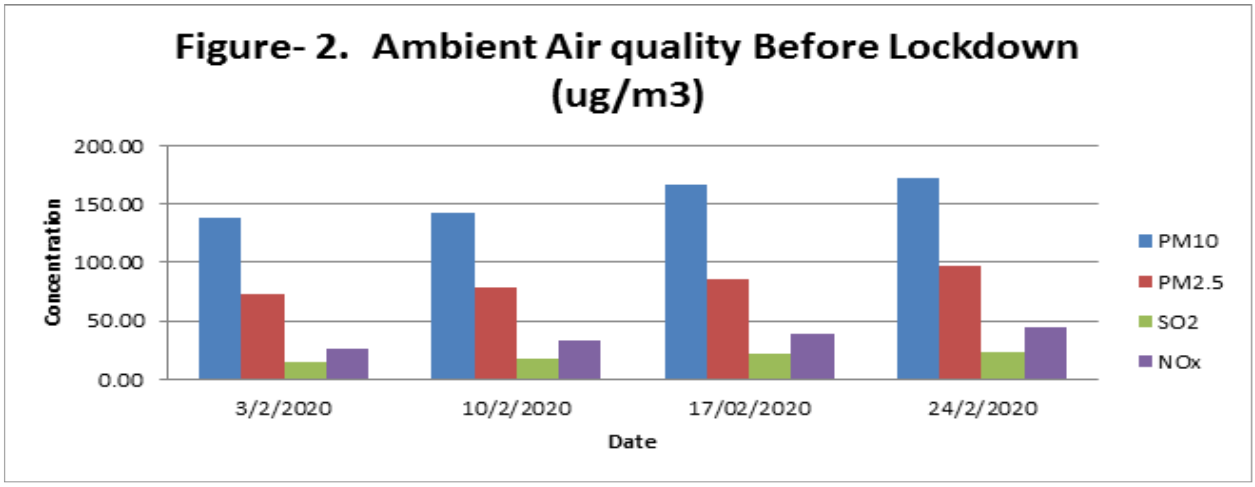
Source; CPCB (2014)

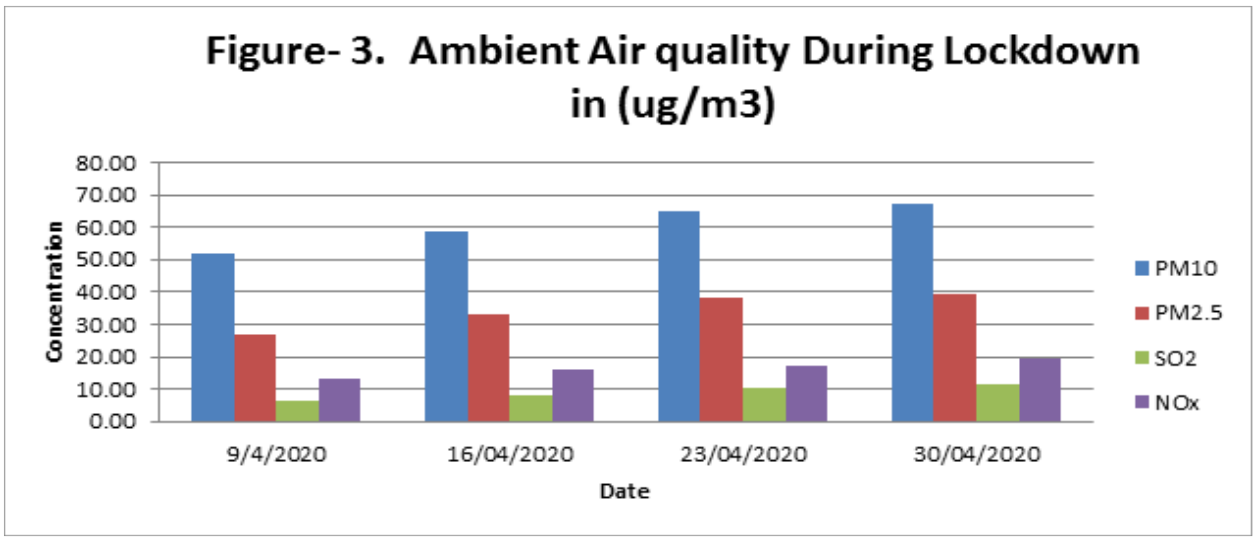
Table- 4. National ambient air quality Standards

Parameters	**Average Time Weighted**	**Ambient Air Concentration in Residential, Industrial, Rural and other Areas**	**Measurement Method**
Particulate Matter (Less than 10 µm in size) or PM_{10}, µg/m3	24 hours **	100	Gravimetric method
Particulate Matter (Less than 2.5µm in size) or $PM_{2.5}$ in µg/m3	24 hours **	60	Gravimetric method
Sulphur dioxide (SO_2) in µg/m3	24 hours **	80	West and Gaeke Method Improved
Nitrogen dioxide (NOx) in µg/m3	24 hours **	80	Modified Jacob & Hochheiser ($NaOH\text{-}NaAsO_2$) Method
** 24 hourly monitored values as applicable, shall be complied with 98% of the time in a year.			

Source; CPCB (2014)







Results and Discussion-

The Ambient Air quality of Chitrakoot was monitored for PM_{10},$PM_{2.5}$, SO_2 and NOx before and during lockdown period the result obtained are given in **Table-1**

Particulate Matter (PM_{10}): PM_{10} was ranged from 171.50 - 138.40 µg/m^3 before lockdown period. The permissible limit for PM_{10} is 100 µg/m^3 (Table-4). The PM_{10} values observed higher than the limit on all the sampling dates while during lockdown PM_{10} was ranged from 52.10 - 67.20 µg/m^3 all the values found within the permissible range.

The average of PM_{10} was found 154.98 µg/m^3 before lockdown and 60.70 µg/m^3 during lockdown.

Particulate Matter ($PM_{2.5}$): $PM_{2.5}$ was ranged from 72.60-96.40 µg/m^3 before lockdown period. The permissible limit for $PM_{2.5}$ is 60 µg/m^3(Table-4). The $PM_{2.5}$ values observed higher than the limit on all the sampling dates while during lockdown $PM_{2.5}$ was ranged from 26.70 – 49.40 µg/m^3 all the values found within the permissible range. The average of $PM_{2.5}$ was found 83.30 µg/m^3 before lockdown and 34.30 µg/m^3 during lockdown.

Sulphur Di Oxide (SO_2)- SO_2 was ranged from 14.70 – 23.60 µg/m^3 before lockdown period. The permissible limit for SO_2 is 80 µg/m^3(Table-4). During lockdown SO_2 was ranged from 6.7 – 11.30 µg/m^3. Before and during lockdown SO_2 value were observed within the standard limit.

Nitrogen Oxides (NO_x)- NO_x was ranged from 26.70 – 44.20 µg/m^3 before lockdown period. The permissible limit for NO_x is 80 µg/m^3(Table-4). During lockdown NO_x was ranged from 13.40 – 19.50 µg/m^3. Before and during lockdown NO_x value were observed within the standard limit.

AQI-

AQI values are given in Table-2, Fig-1 and AQI categories are described in Table-3. The average AQI was observed 176.47 before lockdown and 60.70 during lockdown (Table-2). The improvement in average AQI was found 65.21%. Before lockdown air quality was observed in Moderate range while during lockdown period it was observed in satisfactory range. The improvement in air quality may be the reason due to lockdown.

Conclusion and Recommendation-

The overall study reported improvement in air quality during the lockdown. However, in order to implement short term 2-5 days lockdown as an alternative policy measure for pollutants reduction. The focused finding of this study is that the improvement in the air quality level immediate and did not require more time to prepare strategy and planning to curb. It is also implies that the pollution in the Chitrakoot is caused by the day to day activities.

The Lockdown has given us an opportunity to understand the impact of man made activities on the open atmosphere. This research highlights the capacity of nature to quickly reverse in real form. The damage and initiate to healing as soon as may be possible. Policy and strategy makers, researchers, subject specialist professionals can emphasize on this aspect while formulating their own actions.

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