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Assessment of the Ambient Air Pollution Intensity and Air Quality Status in Midnapur Town During Pre lockdown and lockdown period: - A Case Study

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Abstract: - Medinipur is a popular and chronicled town in South focal West Bengal of North eastern India having high populace thickness. In this study we utilized air quality record every day information given by CPCB and ascertains EF value for estimating air quality status of two years (2019 and 2020) during pre-lockdown and lockdown period. Results assess that air pollution relies upon populace number as well as human activities which enhanced air pollution intensity and air quality standards with adequate margins.

Keywords: - Midnapur town, Air pollution, Air pollutants, Exceedance factor (EF), Air Pollution Intensity, Air Quality Status.

Introduction: - Midnapore, the city of tribal tradition, also spelled Medinipur, is located in south-central West Bengal of north eastern India. One record assert that Medinipur was named after a nearby divinity "Medinimata" means "mother of the world", a Shakti manifestation. The town Midnapore extends over a territory of 18.65 square km, included in the municipality. An enormous advancement happens on the side of the road in the Municipality region. In the 2011 enumeration, Midnapore town had a populace of 169,264, approximately equal proportion of males and females. In 2020, the expected population exceeds about 2,35,000. As we knew that population growth and air pollution are interrelated because excess population growth is the cause of air pollution and air pollution is the result of reducing the rate of population growth by increasing the infamous health effects on living beings, including human. Is it always true? The answer is no. Because, in our research this question easily reveals it.

In this case study we find the intensity of ambient air quality using the Exceedance Factor (EF) formula [1]. EF is the ratio of annual mean concentration of the pollutant and annual mean standard of the corresponding pollutant which is the alternative method to measure ambient air quality status. We used two-year's (2019 and 2020) Air Quality Index (AQI) data of five major air pollutants (i.e. $PM_{2.5}$, PM_{10}, NO_2, SO_2, CO) which are collected from the Central Pollution Control Board (CPCB) of the Government of India during the pre-lockdown and lockdown period of Covid19 in Midnapore. In our research, we have noticed that air pollution is not only due to population growth, but also to human activities. The quality of the ambient air depends on the presence of various air pollutants in the atmospheric air such as particulate matter, carbon monoxide, sulphur oxides, trioxygen and nitrogen oxides which are standardized by the United States NAAQS (National Ambient Air Quality Standards) under the authority of clean air act, to human health protection and also environment protection with suitable edges.

Research methodology:

- **Study area**

  Latitude and longitude coordinates of Midnapore town are 22.4257° N and 87.3199° E.

***Figure A**: Graphical area of Midnapore town in West Bengal*

- **Materials and method**

To calculate the exceedance factor (EF), we first took daily data of AQI and different pollutants (i.e. $PM_{2.5}$, PM_{10}, NO_2, SO_2, CO) in Midnapore from 2019 to 2021 respectively through Air Visual Application, where the data is provided by WBPCB (West Bengal Pollution Control Board). Then we recognized the maximum value of each pollutant on monthly basis. Finally, the annual average concentration of each pollutant was calculated to estimate the exceedance factor. The standard value of each pollutant had been taken from the report of Central Pollution Control Board (CPCB). By the value of exceedance factor, the pollution level of Midnapore was estimated from the table 1.

Table 1: Significant EF value and pollution level

Sl. No.	EF value	Pollution Level
1	0-0.5	Low
2	0.5-1.0	Moderate
3	1.0-1.5	High
4	1.5 <	Critical

Result:

Table 2: Annual average concentration of different pollutants during pre-lockdown and lockdown phase.

Time	Annual mean concentration of different pollutants				
	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10}($\mu g/m^3$)	CO ($\mu g/m^3$)	NO_2($\mu g/m^3$)	SO_2($\mu g/m^3$)
Pre lockdown	168.84	317.04	21.11	761.41	378.41
Lockdown	39.18	157.58	8.79	160.58	105.25

Table 3: List of standard values of different pollutants

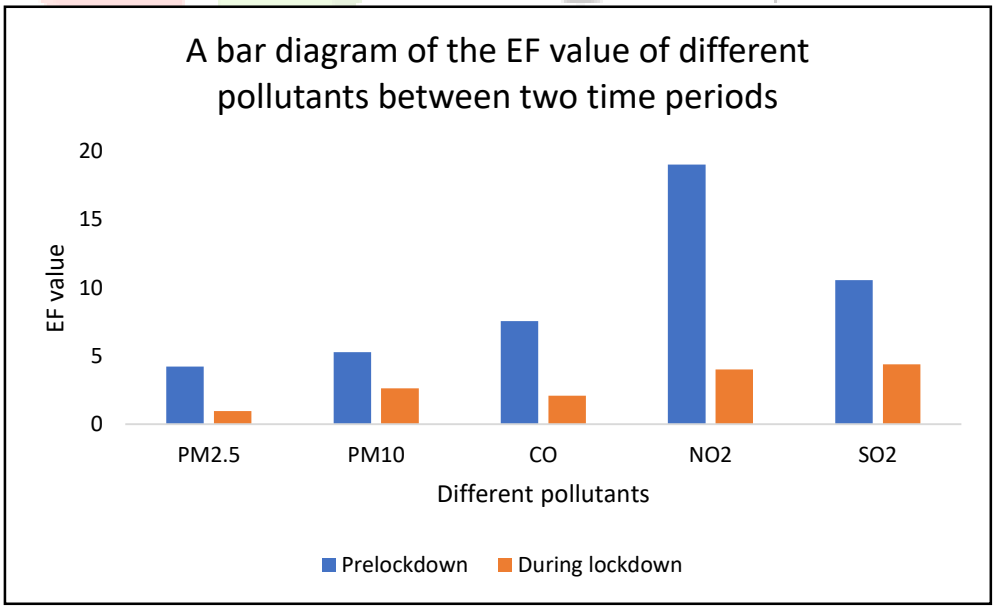
Pollutants	**Standard value ($\mu g/m^3$)**
$PM_{2.5}$	40
PM_{10}	60
CO	02
NO_2	40
SO_2	50

Exceedance Factor (EF) = x/y (where x = yearly average concentration of the pollutant and y = yearly standard for that pollutant)

From the data of table 2 and table 3, we calculate the exceedance factor of different pollutants. Here the pre- lockdown periods denote the time period between February 2019 to January 2020 and the lockdown periods denote the time period between February 2020 to January 2021.

Table 4: List of EF values of different pollutants during pre-lockdown & lockdown period.

Time	EF value of different pollutants				
	$PM_{2.5}$	PM_{10}	CO	NO_2	SO_2
Pre-lockdown	4.22	5.28	7.56	19.03	10.55
Lockdown	0.97	2.63	2.1	4.01	4.39



Discussion:

Here we divided our result into two phases, one in pre-lockdown phase (from February, 2019 to January, 2020) and the other is lockdown phase (from February 2020 to January 2021). In the lockdown phase, the exceedance factor of different pollutant (such as $PM_{2.5}$, PM_{10}, NO_2, SO_2, CO) are very much lower than the pre lockdown phase. During the lockdown phase, the EF value of CO is slightly higher than the other pollutants i.e. EF CO) is 4.39, while other values are much lower. CO is mainly released from burning of fossil fuels. Though all the daily activities were totally closed, it is thought that CO might be emitted from burning of fuels which are used for cooking. But EF values are too much higher before the lockdown phase when the life was as usual,

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All the pollutants have different kind of source but there is one common source i.e. vehicular emission. During the pre-lockdown phase, the EF value is too much higher in case of NO_2 and CO than the other pollutants.

Conclusion:

Concurring our study, we observed that all major air pollutant's concentration extremely critical except $PM_{2.5}$ during both pre-lockdown and lockdown period in the Midnapore town. In any case, $PM_{2.5}$ concentration moderately polluted during lockdown period in light of exceedance factor (EF) less than one. During lockdown period, deactivated of major sources of PM2.5 decline the levels of this pollutants but not so much. Before lockdown period, the high level of NO_2 is mainly due to vehicular emission as well as off-road. Whether it is lockdown or before lockdown, the intensity of air pollution in Medinipur is high in every case, as a result of open humanitarian activities, it may increase the risk of human health hazards by these pollutants which are associated with heart and lung diseases. Thus, we can conclude that Midnapore is under critical pollution as predicted from EF value.

Reference:

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