Measuring Air Quality during the Closure Period Due To COVID 19 in Baghdad

AsaadMousaHatroosh[1] ,Sadia AkulMenkhi[2]
[1,2]University of Baghdad, College of Arts, Department of Geography and Geographical Information Systems
[1] DhiQar Education Directorate
Email [1]: sadeea2013@coart.uobaghdad.edu.iq, Email [2]: asaad.mousa1107a@coart.uobaghdad.edu.iq

Received: 24 April 2022**; Accepted:** 3 June 2022**; Published online:** 17 June 2022

Abstract

China announced that a person had severe and strange pneumonia and that the speed of transmission of the virus drew the attention of the world. The virus was found to be from the Corona family, i.e., coronaviruses. This virus began to spread worldwide until the World Health Organization announced its registration as a worldwide pandemic. The countries in which the virus appeared and recommended closing in the event of the disease spreading severely to cut the chain of transmission of infection. Iraq recorded the first case of infection on February 24, 2020, and then the virus began to spread rapidly in all governorates of the country, and the Supreme Committee for Health and Safety imposed a curfew in all the governorates. In this research, the air quality during the pre-closure and during the closure period in Baghdad was based on the Sentinel-5P satellite/tropospheric monitoring instrument and Giovanni-Earthdata during six months, starting from (1/1/2021 to 30/6/2021), where it was found through the research that the study of air quality gases (pm2.5, pm10, NO2, O3) during the pre-closure period and the total and partial closure. The research proved a decrease in pm2.5 and pm10 during the closing period, and NO2 recorded a decrease. It is clear during the closure period due to the prohibition of movement by vehicles, which reduced the combustion rate of fossil fuels, which is the main source of NO2. The research also proved that there is an inverse relationship between NO2 and O3, as the decrease of NO2 leads to an increase in O3 concentration ratios. We proved this with tables and figures and through research. We find that the air quality has improved significantly during the closure period in Baghdad, and this is a positive thing.

Introduction

In Wuhan, one of the cities of Hubei Province in China, the first case of Covid 19 was recorded on December 31, 2019 An injury in Iraq was for a student of religious sciences, and after a few days he moved to all governorates of Iraq despite the preventive measures taken by the Supreme Committee for Health and Safety, as they were strict and reached the point of curfew in cities except for emergency cases, and the measures reached the point of general closure and the disruption of industrial and

commercial facilities And tourism and the prevention of gatherings in all its forms, where the focus in the research was on air quality and how the concentrations of air quality gases and compounds are reviewed and compared with their concentrations during the closure period, and how the lack of emissions contributed to a significant improvement in air quality in Baghdad, according to the tables and fees in the research.

The effect of general and partial closures on air quality in Baghdad, the capital of Iraq

Iraq is located in the Middle East between latitudes 29°- 37° 22° north and longitudes 42° 38° - 45° 48° east in southwest Asia. The area of Iraq is (435052) square kilometers and its population is In the last statistic for the year 2021 in the Central Statistical Organization (41190685), the first infection of Covid 19 appeared on February 24, 2020 in the Najaf governorate for a religious science student of Iranian origin and two days later, from this announcement, the Iraqi government took a set of measures, including the closure of universities and schools Public and private gatherings were prohibited and strict measures were taken to cut the chain of infection and quickly undermine the spread of the virus. During the period of the spread of Covid 19, decisions were taken to close public and partial in stages, including in the year 2020 and 2021, where in the year 2021 there were four partial and total closures, namely

The date of obtaining the data during the partial and total closure period for the year 2021

First / From 1/1 to 17/2/2021 Total closure
Second / from 18/2 to 16/03/2021 total closure
Third / From 17/3/ to 11/5/2021 Total closure
Fourth / from 12/5 to 30/6/2021 partial closure

We will discuss through the research the study of air quality in Baghdad during the periods of total and partial closure. We used the data available during the study. We did not obtain complete data due to the closure, as some monitoring tools for air quality were disrupted even in global platforms to monitor air quality, so we used the available data for the year 2020 and 2021. Obtained through the platforms for measuring air quality that relied on the satellite sntinel-e5p by the Giovanni-Earthdata monitoring tool, as we study the concentrations of air quality gases and compounds (PM2.5, PM10, NO2, O3, SO2, CO) and compare them before Closure and during closure, we get the percentages of air quality improvement, by searching the study site (Baghdad governorate), we find that the average concentration of these gases has decreased, as we will discuss all of this in detail for Baghdad, the location of the study area.

Baghdad

It is located in the center of Iraq and is the capital of the Republic of Iraq. It has an area of 2042 km2 rising from sea level 34m and a population of (8780422), which constitutes 21.3% of the total population of Iraq. In the year 2020 or in 2021 for the total gases (PM2.5, PM10, NO2, O3, SO2, CO) we will deal with each type of pollutant separately.

Particles PM2.5, PM10

In the study of particles in Baghdad, we make a comparison between the period before the closure and a period during the closure, and we measure the air quality during this period, that is, before the closure and during the closure. Starting from 1/1/2021 to 17/2/2021, PM2.5 was recorded in Baghdad (50) µg/m3, and PM10 was recorded (109) µg/m3, as we note that PM 2,5 increased from the rest of the periods due to the lack of closure and normal movement The burning of fuel for cars, generators, power plants, and waste incineration that did not stop. As for PM10, it was recorded during the same date (109) mcg / m3 , which is the percentage of concentration before the closure. As for the period of total closure, which starts from 18/2/2021 to 16/3 / 2021, different concentrations were recorded in Baghdad, PM2.5, PM2.5 (41) µg / m3, and PM10 was recorded during the same date (106), which is a low concentration compared to the previous period, and this is clear from the data. As for the closure period From 3/17/ to 5/11/2021, it recorded a concentration of PM2.5 (36) mcg/m3, and a concentration of PM10 was recorded.

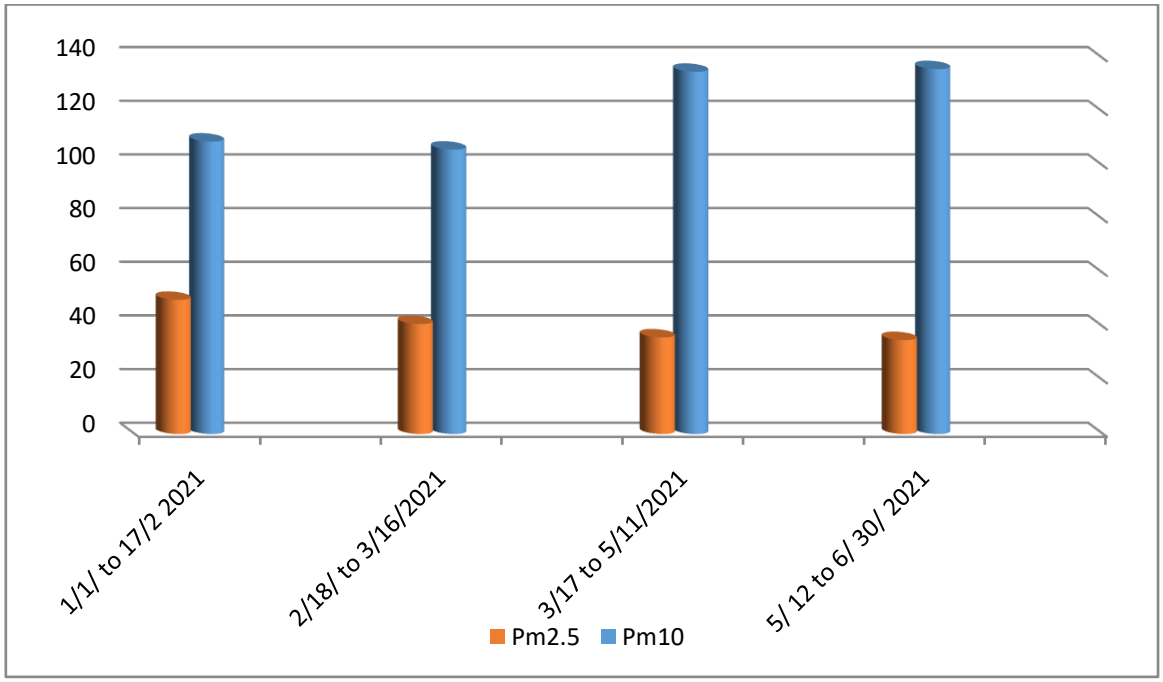
(135) micrograms / m3. We note a clear decrease in the concentration of particles due to the total closure and the increase in the number of injuries significantly, as the number of injuries during this period reached an average of 15,000 daily injuries, which called on citizens to adhere to the closure instructions. As for the partial closure that starts from 13/ From 5 to 30/6/2021, it recorded pm2,5 concentration (35) mcg / m3 and PM10 concentration (136) mcg / m3, which is a low concentration that clearly improves air quality during closure and improves the health status of citizens.

Table (4-1) particle concentration in Baghdad 2021 during the closure periods

Date	**PM2**	**PM10**	closing period
1/1/ to 2/17/2021	50	109	before closing
2/18/ to 3/16/2021	41	106	Total
3/17/ to 5/11/ 2021	36	135	Total
12/5/30/6/2021	35	136	partial

Source: sntinel-e5p satellite via the Giovanni-Earthdata monitoring tool

Figure (4-1)Particle concentration in Baghdad before and during the 2021 closure



Source: From the researcher's work based on Table (4-1)

Nitrogen dioxide N02

NO2 is one of nitrogen oxides that greatly affects air quality, and car exhaust is one of the most important confiscations that affect its concentration in the air. Cities that are characterized by high population density have a high NO2 ratio, as Baghdad is one of the largest cities in Iraq in terms of population density, where swallowed The number of residents in it, according to the latest statistic carried out by the Central Statistical Organization in the year 2021, amounted to (8780422) people, and the number of cars in Baghdad has reached, according to the latest statistic announced by the General Traffic Directorate on January 22, 2021, amounting to (2000,500) cars as the percentage of air pollution increased Largely as a result of this huge population momentum and the amount of fossil fuels that are burned daily by vehicles on the street, and after the outbreak of Covid 19 in Baghdad, the Supreme Committee for Health and Safety headed by the Prime Minister announced preventive measures that obligate citizens to sit at home and personal and public distance from gatherings to break the transmission of Covid 19 between People, therefore, announced the general closure in Baghdad and the provinces, and the result of this closure was the cessation of the movement of vehicles on the street, and thus the amount of emissions of fossil fuels into the air decreased, which The air quality increased significantly, and NO2 gas became at lower rates than it was before the closure and we will show this in numbers. The closure, as it was recorded during the total closure for the period from 1/3/2020 to 4/21/2020 a concentration of (86) micrograms / m3, which is a concentration less than the pre-closure period by five units, which is a good percentage that greatly affects the air quality and we will notice a gradual decline in the concentration Gas during the closure periods, where NO2 recorded during the period from 22/4/ to 23/5/2020 a

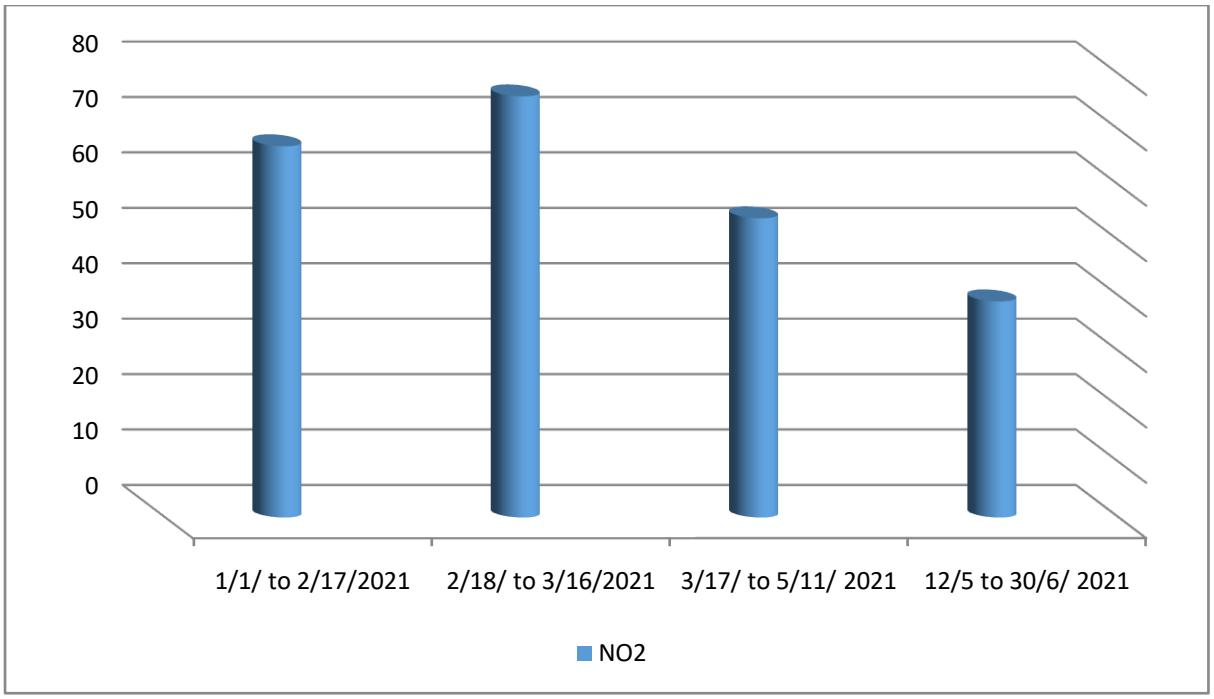
concentration of (85) µg/m3, which is less than the previous closing period, and this indicates a gradual improvement in air quality as a result of the closure periods resulting from the outbreak of Covid 19. The total closure period, starting from 5/25 to 6/13/2020, recorded a concentration of (84) mcg/m3, which is a concentration lower than the previous concentration, and during the period from 6/14 to 7/24/2020, the gas recorded a concentration of (73) mcg. / m3, which is a significant drop in the gas concentration rate resulting from the successive closing periods, and compared to the gas concentration in the pre-closing period, where it was recorded leaving (90) mcg / m3 n Note the large difference in gas concentration, as the difference was 13 mcg / m3, which is a big difference that affects air quality significantly during the closure periods for the year 2020

Table (4-2) NO2 Concentration in Baghdad 2020

closing date	N02 µg/m3	closing period
From 1/16/ to 2/2/2020	91	before closing
From 1/3 to 21/4/2020	86	Total
From 22/4/ to 23/5/2020	85	partial
From 25/5 to 13/6/ 2020	84	Total
From 06/14/ to 7/24/2020	73	partial

Table from the work of the researcher Source satellite sntinel-e5p by Giovanni-Earthdat monitoring tool

Figure (4-2) NO2 µg/m3 Concentration in Baghdad 2020



Source: From the researcher's work based on Table (4-2)

As for the gas concentration during the closure periods 2021, the research focused on the closure periods and compared them with the pre-closure period. NO2 was recorded

during the period between 1/1 and 17/2, which is before the closure a concentration of (67) mcg/m3 although the period is Not closing, but the concentration remained low because the reason for this is that this gas rises and falls gradually, as we noticed in the year 2020, and as we will notice during the year 2021, in the period from 18/2 to 16/3/2021, the gas recorded a concentration of (76) Micrograms / m3 We notice a rise in the concentration and the reason is due to the accumulation of gas concentrations for the period before the closure. / m3 We notice a very strong drop in gas concentration and the reason is due to the total closure that was during this period. Gas recorded a concentration of (39) mcg / m3. We note that gas recorded during this period of closure a very low concentration compared to the non-closure period in 1/1 to February 17, 2021, where the concentration of (67) mcg / m3 was recorded, with a decrease of 27 units, and this had a significant impact on the On air quality, the closure had a significant impact on improving air quality in Baghdad, which leads to the health of the environment in general.

Table (4-3) NO2 µg/m3 Concentration in Baghdad 2021

Date	NO2 µg/m3	closing period
1/1/ to 2/17/2021	67	before closing
2/18/ to 3/16/2021	76	Total
3/17/ to 5/11/ 2021	54	Total
12/5/30/6/2021	39	partial

Table from the researcher's work based on the sntinel-e5p satellite through the Giovanni-Earthda monitoring tool.

O3. Ozone gas

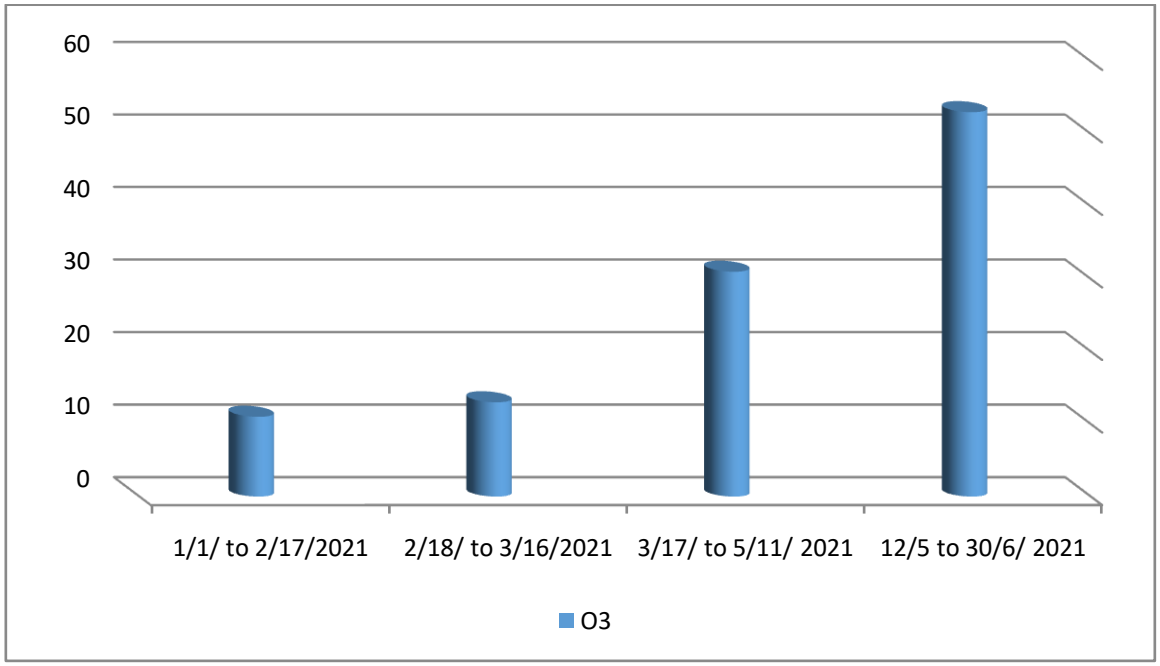
Ozone gas is one of the gases that enters the air quality, and it affects human health, especially on the health of the heart, arteries and respiratory system. For the Supreme Committee for Health and Safety to issue instructions for general closure and a decrease in fossil fuel emissions, ozone rates have increased, as this gas works inversely with the rest of the other gases that affect air quality. We note this from the research and how the percentage increased during the closure in Baghdad and according to the closure periods. It was recorded during the year 2021. We will compare the values of ozone gas concentration before the closure and during the closure. In the time period from 1/3 to 29/2/ 2021, which is the period before the closure, the gas recorded a concentration of (11) mcg / m3. We note that the value of this period is low Compared with the last closure in the year 2020, which recorded a concentration of (50) µg / m3, it was noted that the difference in concentration is large and as is evident from the values. During the first total closure, the gas recorded a concentration of (13) µg m / m3, which is a higher value than the previous value, i.e. the pre-closure period. During the second total closure, ozone recorded a concentration of (31) mcg / m3, and we note the gradual rise in the weight values during the last closure periods during the year 2021.

Table (4-6) O3 concentration µg/m3 during the closing periods 2021

Date	O3 µg/m3	shutdown period
1/1/ to 2/17/2021	11	before closing
2/18/ to 3/16/2021	13	Total
3/17/ to 5/11/ 2021	31	Total
12/5/30/6/2021	53	partial

Table from the researcher's work based on the sntinel-e5p satellite through the Giovanni-Earthda monitoring tool.

Figure (4-3) O3 µg/m3 during and before the closure period in Baghdad 2021



Source: From the researcher's work based on Table (4-6)

Conclusions

1- It was found through the research that the amount and fossil fuels that are burned through the work of vehicles in the three governorates of Baghdad, Basra and Kirkuk leads to an increase in the concentration of air pollutants.
2- The shutdown period, which reduced the movement of vehicles to a large extent, reduced the amount of fuel burned, and thus improved the air quality.
3- Ozone is inversely proportional to nitrogen dioxide
4- The decrease in particles was at a lower rate than the rest of the gases and vehicles due to dust storms and generators of governmental and local electric power.

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