



Epidemiological Curves Of The Emerging Corona Pandemic (Covid 19) In Iraq Geomedical Study

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Abstract

The current study is concerned with monitoring the temporal trends of the Corona Covid 19 pandemic in Iraq by using the epidemiological curves as graphic processing tools in modeling the spread of the disease and following its monthly and daily paths in order to know the pattern of its spread among the population since the beginning of the epidemic in Iraq. Similar to the general epidemiological curves in their different stages, and it was found that both infections and deaths were increasing steadily despite the relative fluctuation that occurred. Clear, but there were small increases recorded in the last days of each of the months mentioned, and there is no reason to explain this.

Keywords: the epidemiological curve, Borderline Discipline , objective approaches

المنحنيات الوبائية لوباء كورونا المستجد (كوفيد 19) في العراق دراسة جغرافيا طبية
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المستخلص

تهتم الدراسة الحالية برصد الاتجاهات الزمانية لجائحة كورونا كوفيد 19 في العراق باستخدام المنحنيات الوبائية كأدوات معالجة بيانية في نمذجة انتشار المرض ومتابعة مساراته الشهرية واليومية بغية معرفة نمط انتشاره بين السكان منذ بدأ ظهور الوباء في العراق ، وقد اتضح ان المنحنيات الوبائية الشهرية لجائحة كورونا كوفيد 19 في العراق كانت مماثلة للمنحنيات الوبائية العامة بأطوارها المختلفة وتبين ان كل من الإصابات والوفيات كانت في زيادة مطردة برغم التذبذب النسبي الحاصل وكانت هناك اشهر سجل فيها ارتفاعا ملحوظا بسبب دخول سلالات جديدة فضلا عن رفع إجراءات الحظر التي تم فرضها في بداية الجائحة ، وعلى المستوى اليومي فليس ثمة اتجاهات واضحة بل كانت هناك زيادات بسيطة تسجل في الأيام الأخيرة لكل من الأشهر المذكورة وليس ثمة سبب يفسر ذلك .

الكلمات المفتاحية: المنحنى الوبائي ، الانضباط الحدودي ، المناهج الموضوعية

Introduction

Mc Glashan defines medical geography as a Borderline Discipline that expresses a conceptual overlap between the approaches of geography and medicine in the study of health problems. Human, while they differ in that epidemiology* is concerned with studying the pathological phenomenon, its characteristics, and methods of treatment and prevention from it, while medical geography is



concerned with studying the characteristics of the pathological phenomenon and the characteristics of the ground on which that phenomenon arises with all its natural and human variables, and here medical geography is one of the branches of human geography **that is more comprehensive. In regards to the study of the phenomena of health and disease and the interpretation of their spatial and demographic behaviors and so on.

The objective and methodological approaches between both the medical and geographical disciplines enable researchers in them to use the same tools, standards, and quantitative and technical treatments. The epidemiologist can use the map, which is one of the most important tools of the geographer. The geographer can use some of the methods and technologies used by the physicians in their epidemiological studies. These approaches to geological studies of many health and disease phenomena for both geographers and physicians alike.

* Epidemiology is one of the branches of medicine that deals with the study of

** There is a branch of epidemiology under the name of spatial epidemiology, which is similar in its contexts and objectives to medical geography.

Research objective and hypothesis

This study aims to monitor the temporal trends of the Corona Covid 19 pandemic in Iraq by using epidemiological curves as graphic processing tools in modeling the spread of the disease and following its monthly and daily paths in order to know the pattern of its spread among the population since the outbreak of the epidemic in Iraq. It assumes that the epidemiological curve model taken by this pandemic in Iraq may be similar or simulate one of the forms of the epidemiological curve adopted in epidemiological studies.

The spatial and temporal limits of the study

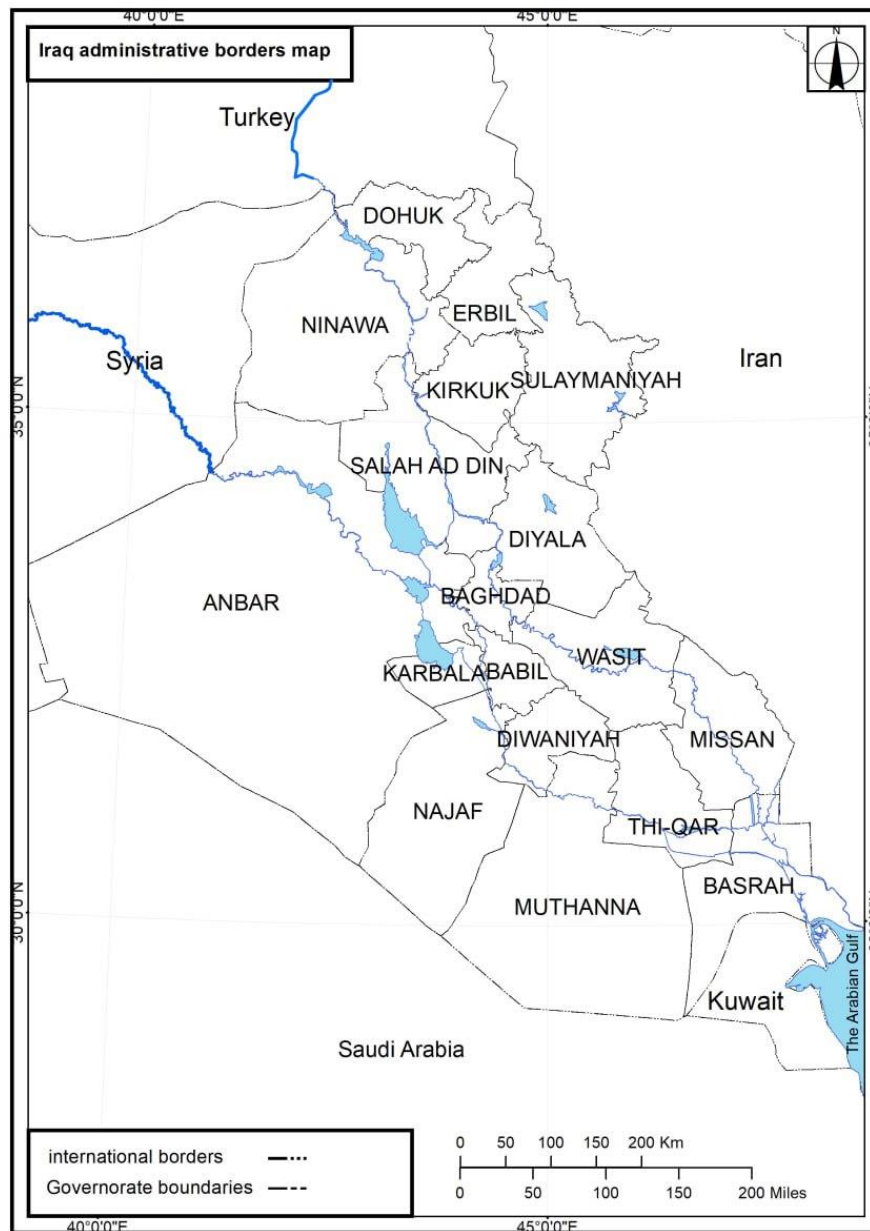
The spatial boundaries of the study were represented by the Republic of Iraq, which is astronomically located between latitude 29.05 - 37.30 N and arc C longitude 38.45 - 48.45 E. Geographically, Turkey borders it to the north and Iran to the east, but to the west it is bordered by Syria, Jordan and part of the Kingdom of Saudi Arabia. Saudi Arabia is bordered to the south by Kuwait and the Kingdom of Saudi Arabia - a map(1) - (Al-Maliki, 2016, 25-26). As for the temporal limits of the study, it was limited to the period from February 2020 to December 2021.

Study sources, methodology and analysis methods



The study relied on the data provided by the Department of Public Health in the Iraqi Ministry of Health, and adopted the descriptive analytical approach associated with quantitative treatment through the use of some statistical methods such as standard values.

map (1)



Source: Department of Public Survey, Iraq Administrative Map, 2010



First- Defining the epidemiological curve

The epidemiological curve is a visual graphic representation of pathological conditions, and it is considered an essential tool in measuring the temporal course of the widespread pathological phenomenon, and through it it is possible to infer valuable epidemiological information about the epidemic, such as the size, mode of transmission, incubation period, time and pattern of its spread. Epidemiological curves generally show the frequency of new cases compared to the date of disease onset (Gordis, 2009,27).

The use of the epidemiological curve in medical studies dates back to 1840, when the English physician William Farr discovered that epidemics rise and fall almost in the form of a curve in the form of a bell, and he developed a mathematical law stipulating that the dynamics of the epidemic can be described as a relationship between two mathematical ratios (Barrios, 2020, 5).

The epidemiological curve consists of three phases (Abdul Masih et al., Bala, 270-272):

- 1- The phase of evolution, which is represented by the ascending line of the curve, which is either a sudden or rapid ascending line, or a gradual line
- 2- Phase of peak, and the peak is either pointed, flattened, or flat, and the latter rarely occurs.
- 3- Phase of Decline, which is represented by the descending line of the curve, which is either a rapid descending line or a gradual descending line. Each of these three phases takes several forms that differ according to certain factors, which are the nature of pathogens in terms of causes, hosts, and the surrounding environment.

The epidemiological curves are divided into types, the most important of which is the explosive type, in which the ascending and descending lines appear in most cases almost vertical with a pointed top, and this picture is given by epidemics of diseases that are transmitted to humans through a medium such as contaminated water or food. There is the progressive type, in which the ascending and descending lines appear in a gradual manner with a flattened top. This picture appears in epidemics of diseases that spread through direct or indirect contact.

Second - the historical emergence of epidemics

For thousands of years, epidemics and pandemics have ravaged human life, and throughout history they have caused great losses to humanity, as their victims amounted to millions, such as smallpox, plague, typhus, yellow fever, typhoid,



cholera, influenza ... etc., as vaccines and vaccines against them had not yet been discovered. Among the oldest epidemics mentioned in history is the epidemic of Athens, which was described by Tokodis of Athens 460-395 BC. AD, which most researchers suggested was smallpox, while others thought it was typhoid (Attia, 1992, 89). The plague also appeared and swept the world with three epidemics that claimed the lives of tens of millions of people, as the black plague in the fourteenth century AD killed about 100 million people in the continent of Europe alone and caused The Spanish flu of 1918 killed more than 50 million people in the world (Al-Kaabi, 2012, 115-117)

The epidemics did not disappear and continued to sweep the world's population from time to time, so SARS, Mers, Ebola, and Swaine (swine flu) appeared, the latest of which was the new Corona epidemic, Covid 19, which turned into a pandemic that spread on a wide global scale and caused the infection of nearly 230 million people of the world's population and the death of about 4.2 million people (WHO, 2021 , -), and the emerging corona disease is a highly contagious transmissible disease called Chinese pneumonia or Corona Wuhan, the Chinese city in which the first cases of the disease were recorded, caused by the Covid 19 virus of the coronavirus family, the researchers believed that the source of the virus was from snakes, I think Others say it comes from bats.

Cold, humid climate conditions help increase the activity of viruses that cause the disease, and crowded atmospheres provide opportunities for the transmission of infection between people. Transmission and travel are among the most important means of spreading infection from one place to another. The seriousness of the complications resulting from it, which leads to a high death rate among those infected with it if they are not treated in a timely manner, especially the elderly, those with chronic diseases, and the young, and all of these groups are most exposed to the risks of the disease due to weak immunity.

Third - The monthly temporal course of the Corona-Covid-19 pandemic in Iraq

1- The monthly curve of cases with the Corona Covid 19 pandemic in Iraq

The first cases with the Corona virus (Covid 19) appeared in Iraq at the end of February, when the first infection was recorded for a man coming from Iran, then other cases appeared among citizens who were returning from travel, then the disease took on a rapid epidemiological spread among the population over the subsequent months of 2020 and 2021, From the data of Tables (1) and (2), the following observations can be made:



- A rapid and frequent rise in the number of cases for the period from February to September of the year 2020, when 12 cases were recorded during February, while the number of recorded cases reached 128,276 in September, followed by a gradual decrease in the number of cases starting from the months of October, November and December, when it reached The number of recorded cases among them is 110,680, 79,711, and 42,442, respectively. Based on these data, the epidemiological curve of the Corona Covid 19 pandemic in Iraq for the year 2020 has appeared in its three phases, which are (the emerging phase), which is represented by the ascending line from February to August and (The peak phase) that appeared in the month of September, then (the fallout phase) that appeared in the months of October, second and December. The epidemiological curve for this period was characterized by an explosive type, as the ascending and descending lines appeared in a semi-vertical shape with a pointed top, as shown in Figure (1).

As for the monthly course of cases during the period from January to December of the year 2021, it is noted that the number of cases began to rise rapidly and frequently as well. The number of cases recorded in January reached 24,344, which rise in April to 214,266, followed by a slight decline during the months of May and June. And the number of cases amounted to 136,153 cases and 143,972 cases then it returned to rise again in the months of July and August, remarkably to 280,745 cases and 261,450 cases, respectively, then it began to decline to record a noticeable decrease in the months of October, the second and December, to reach the lowest number of cases in the month of December, with only 12628 cases, the figure shows (2) The epidemiological curve of Covid 19 in Iraq for the period from January to December of the year 2021, and it is noted here that it is irregular due to the increase and decrease in the number of cases, as it appeared

It has two upward lines with two peaks, one in April and the other in July, so its phases cannot be clearly distinguished, in addition to the continuation of the pandemic and its never-ending, and the continuation of the occurrence of infections. The prevalence rates calculated per 100,000 people varied during the aforementioned periods of 2020 and 2021. The lowest prevalence rate recorded in February 2020 amounted to 0.03 infected people per 100 thousand people, and the highest prevalence rate recorded in September 2020 amounted to 320.7 infected people per 100 thousand people. In the year 2021, the lowest prevalence rate recorded in December amounted to 31.6 infected people per 100 thousand people of the population, and the highest prevalence rate recorded in July amounted to 701.9 infected people per 100 thousand people of the population. When comparing the two aforementioned periods, it is noted that the epidemic prevalence rates are higher In the year 2021, including in the year 2020, and in general, the reason for this is due to the entry of new strains of the disease, as well as the decline in



preventive measures and the lifting of the comprehensive ban that was imposed at the beginning of the pandemic.

- It became clear through figures (3) and (4) that the general trend line of cases is on the rise for the two periods from February to December of the year 2020 and January to December of the year 2021, and this means that the number of cases with the epidemic is constantly increasing. Despite some declines in the number of cases recorded in some months.

- The results of the statistical analysis using standard values showed that the months February, March, April, May, June and December of the year 2020 recorded cases with standard values below the average, and the lowest was in February with a standard value of -1,590, while injuries were recorded in the months July, August, September, October and the second with standard values. Above average and the highest was in the month of September with a standard value of 1.518. With regard to the year 2021, the months January, February, September, October, the second, and December recorded standard values below the average, and the lowest was in December, with a standard value of -1.20. As for the months March, April, May, June, July, and August, they recorded standard values above the average and were the highest. In the month of July 1.70.

Table (1) Monthly distribution of the number of cases of Corona Covid 19 pandemic, prevalence rates and standard values in Iraq for the year 2020

Month	No. cases	Prevalence rate per 100,000 i	Z .score
Feb.	12	0.03	-1.095
Mar.	665	1.7	-1.081
Apr.	1391	3.5	-1.067
May	4354	10.9	1.006
Jun.	42864	107.2	-0.222
Jul.	70438	176.1	0.340
Aug.	110524	276.3	1.156
Sep.	128276	320.7	1.518
Oct.	110680	276.7	1.159
Nov.	79711	199.3	0.529
Dec.	42442	106.1	-0.231
Total	591357		

Source: Ministry of Health, Public Health Department, Daily Epidemiological Report of the Corona Pandemic, 2020.



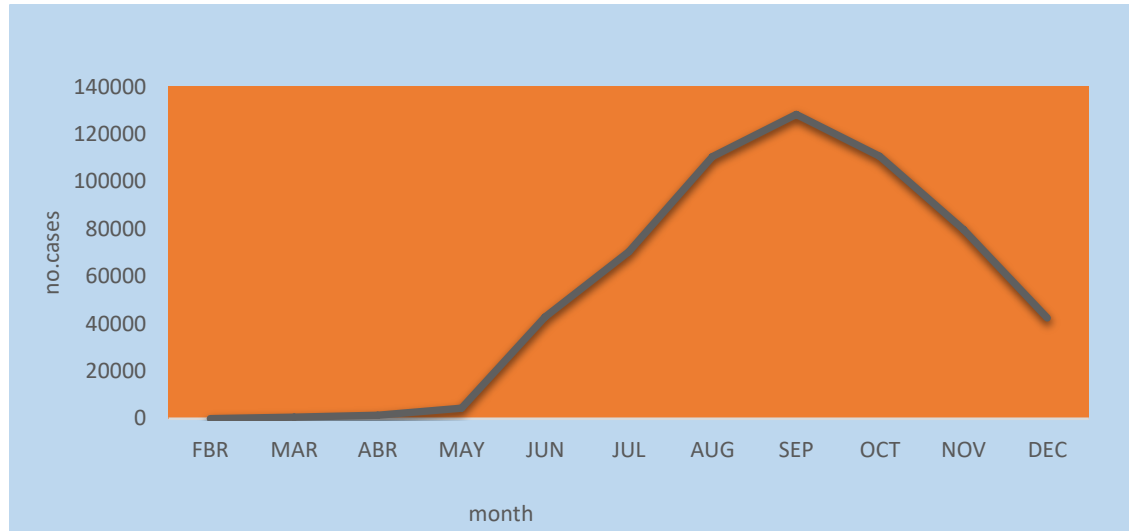
Table (2) Monthly distribution of the number of cases of Corona Covid 19

Month	No. cases	Prevalence rate per 100,000	Z .score
Jan.	24344	60.9	1.1-
Feb.	75653	189.1	0.54-
Mar.	155441	388.6	0.33
Apr.	214266	535.7	0.97
May	136153	340.4	0.12
Jun.	143972	359.9	0.20
Jul.	280745	701.9	1.70
Aug.	261451	653.6	1.50
Sep.	115534	288.8	0.10 -
Oct.	51338	128.3	0.80-
Nov.	28911	72.3	1.05-
Dec.	12628	31.6	1.20-
Total	1500436		

pandemic, prevalence rates and standard values in Iraq for the year 2021

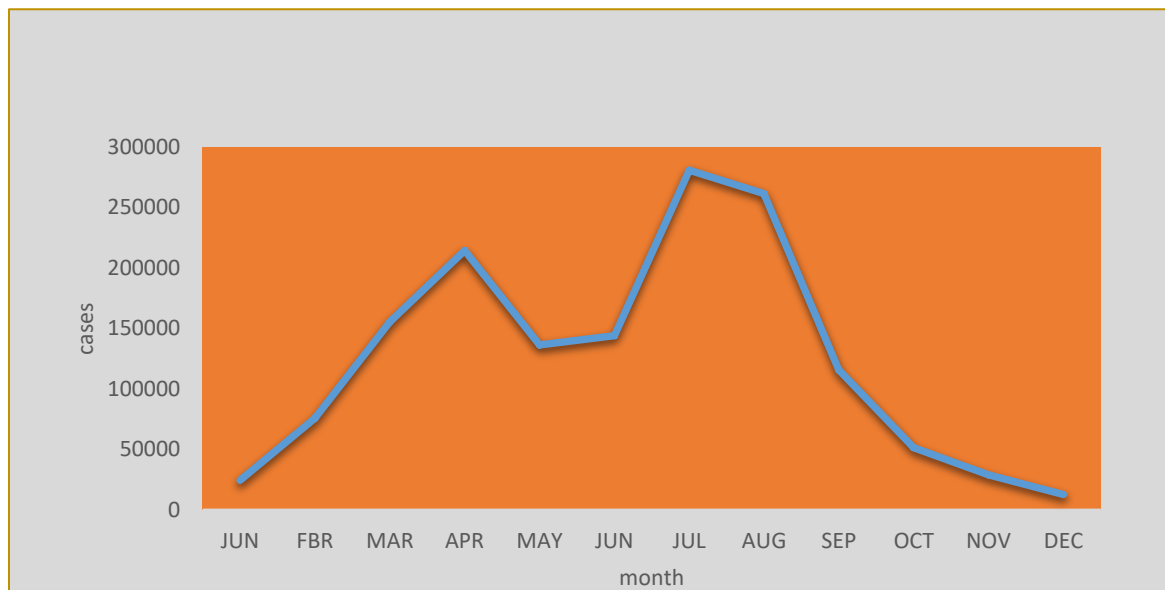
Socers;Ministry of Health, Public Health Department, Daily Epidemiological Report of the Corona Pandemic, 2021.

Figure (1) The monthly (explosive) epidemiological curve of cases of the Corona Covid 19 pandemic in Iraq for the year 2020



Source: Table (1)

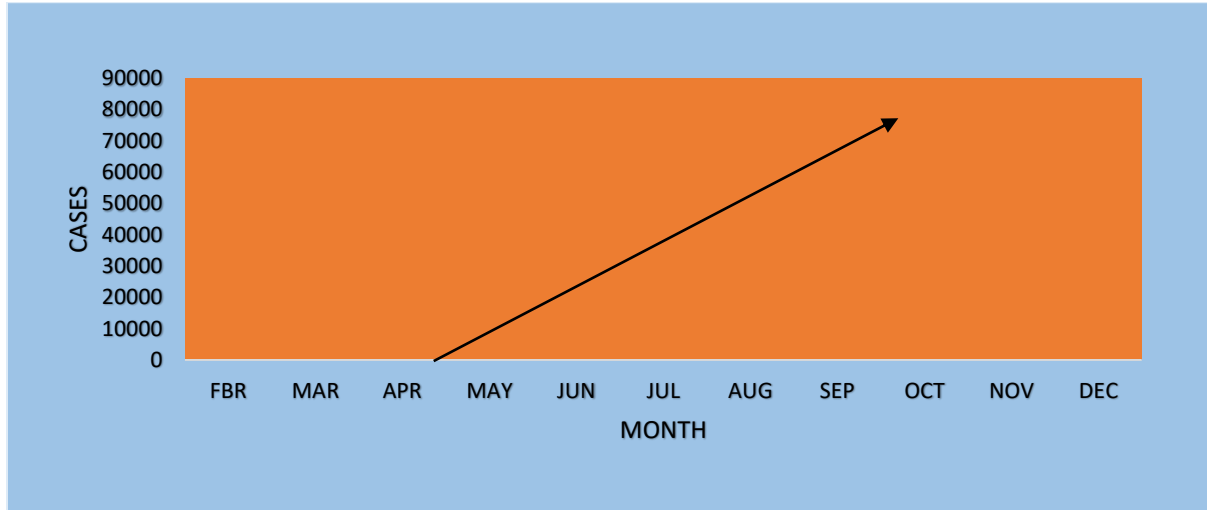
Figure (2) The monthly (explosive) epidemiological curve of cases of the Corona Covid 19 pandemic in Iraq for the year 2021



Source: Table (2)

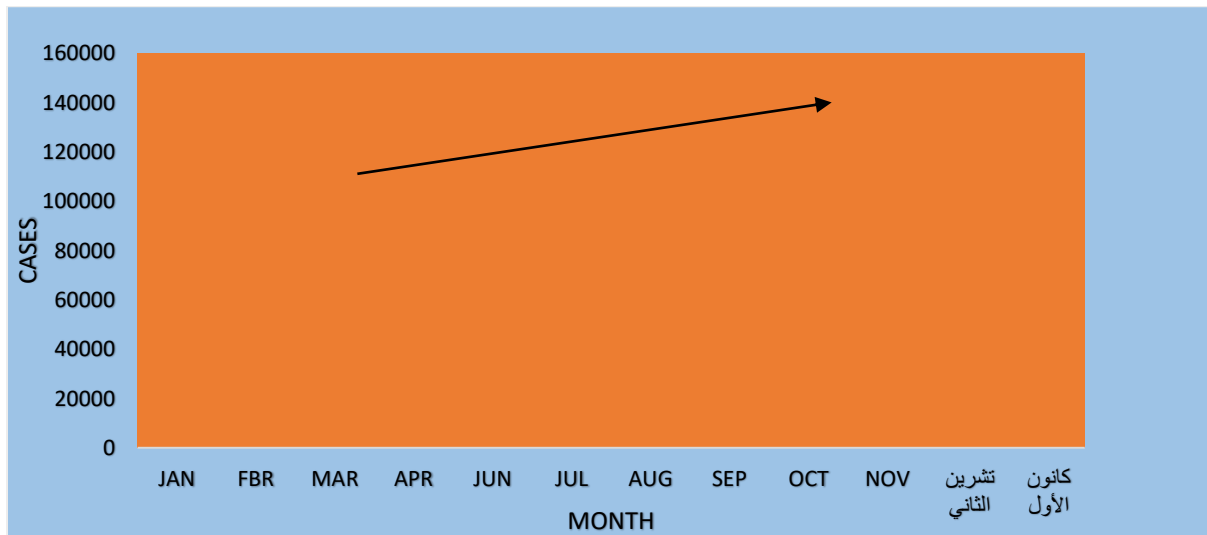


Figure (3) The general trend line for Corona Covid 19 cases in Iraq for the year 2020



Source: Table (1)

Figure (4) The general trend line for Corona Covid 19 cases in Iraq for the year 2021



Source: Table (2)

2- The monthly death curve of the Corona Covid 19 pandemic in Iraq

Through the data contained in tables (3) and (4) that show the monthly course of the number of deaths from the Corona Covid 19 pandemic, its prevalence rates and its standard values, the following can be noted:



- A very rapid rise in the number of deaths during the months from March to July of the year 2020, to record the highest in July 2797 deaths, then a relative gradual decrease to reach 550 deaths in December 2020, and here the epidemiological curve of deaths from the Corona Covid 19 pandemic in Iraq for the year 2020 has appeared In its three phases, namely (the emerging phase), which is represented by the ascending line from March to July (the peak phase) and then (the cascade phase), which started from the months of August and September, October, the second, and December. The epidemiological curve of deaths for the year 2020 was characterized by an explosive type, as the two upward lines appeared And the descending is almost vertical with a pointed top, as it appears from Figure (5). As for the year 2021, it is noted that the number of deaths in the pandemic was not regular, up or down, but there was a relative fluctuation in the number of recorded deaths, as a frequent increase in the number of deaths appeared during the months of January 234 deaths until April, 1142 deaths, then a relative decrease in it during the months of May and June, followed by a rise in July and August, when the highest number of pandemic deaths was recorded in August, 2100 deaths, followed by a gradual decrease during the following months. The epidemiological curve of the deaths of the Corona pandemic during the year 2021 was regular, and its three phases could not be clearly distinguished due to the relative increase and decrease in the number of deaths during the months from January to December, as shown in Figure (6).

- The calculated prevalence rates per 100,000 population varied during the aforementioned periods of 2020 and 2021. The lowest death prevalence rate recorded in April 2020 was 0.10 deaths per 100,000 population, and the highest prevalence rate recorded in August 2020 amounted to 5.6 deaths per 100,000 population. population, but in the year 2021, the lowest prevalence rate recorded in January amounted to 0.60 deaths per 100,000 population, and the highest prevalence rate recorded in August amounted to 5.3 deaths per 100,000 population. When comparing the two aforementioned periods, it is noted that the death prevalence rates are higher in 2020 In the year 2021 and in general, the reason for this is due to the use of new treatment protocols that will save the lives of many people infected with the epidemic.

Table (3): The monthly distribution of the number of deaths from the Corona Covid 19 pandemic and its prevalence rates and its standard value for the year 2020



Month	NO. CASES	Prevalence rate per 100,000	Z SCORE
Feb.	-	-	-
Mar.	48	0.12	1.20-
Apr.	42	0.10	1.21-
May	112	0.28	1.14-
Jun.	1738	4.3	0.44
Jul.	2797	7.0	1.48
Aug.	2279	5.6	0.97
Sep.	2132	5.3	0.83
Oct.	1723	4.3	0.43
Nov.	1378	3.4	0.96
Dec.	550	1.4	0.71
Total	12799	32.0	-

Socers;Ministry of Health, Public Health Department, Daily Epidemiological Report of the Corona Pandemic, 2020.

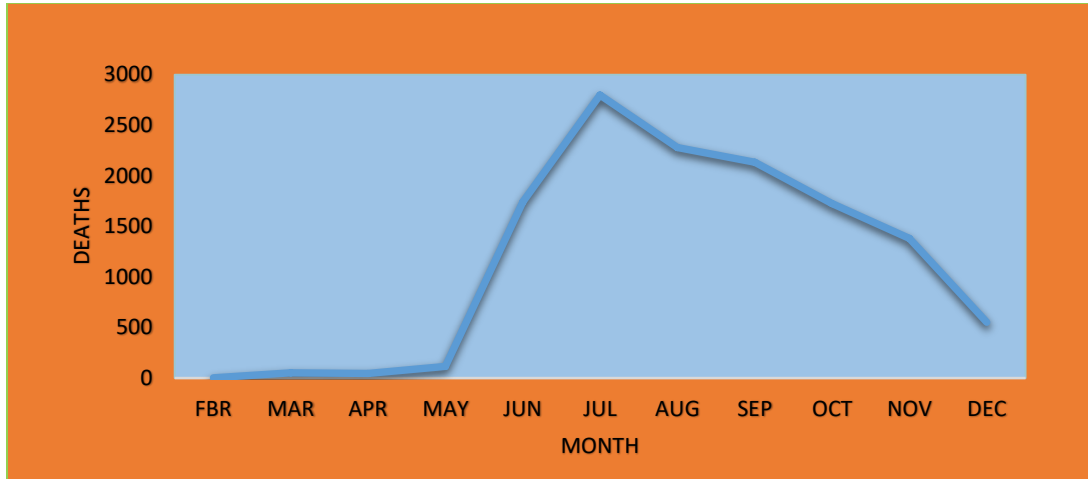
MONTH	NO. CASES	Prevalence rate per 100,000	Z SCORE
JAN.	234	0.60	1.30-
FBR.	359	0.90	1.06-
Mar.	919	2.3	0.01-
Apr.	1142	2.9	0.40
May	907	2.3	0.03-
Jun.	823	2.1	0.20-
Jul.	1471	3.7	1.02
Aug.	2100	5.3	2.21
Sep.	1290	3.2	0.86
Oct.	906	2.3	0.03-
Nov.	618	1.5	0.85-
Dec.	343	0.85	1.10-
Total	1112	-	-

Table (4): The monthly distribution of the number of deaths from the Corona Covid 19 pandemic and its prevalence rates and its standard value for the year 2021



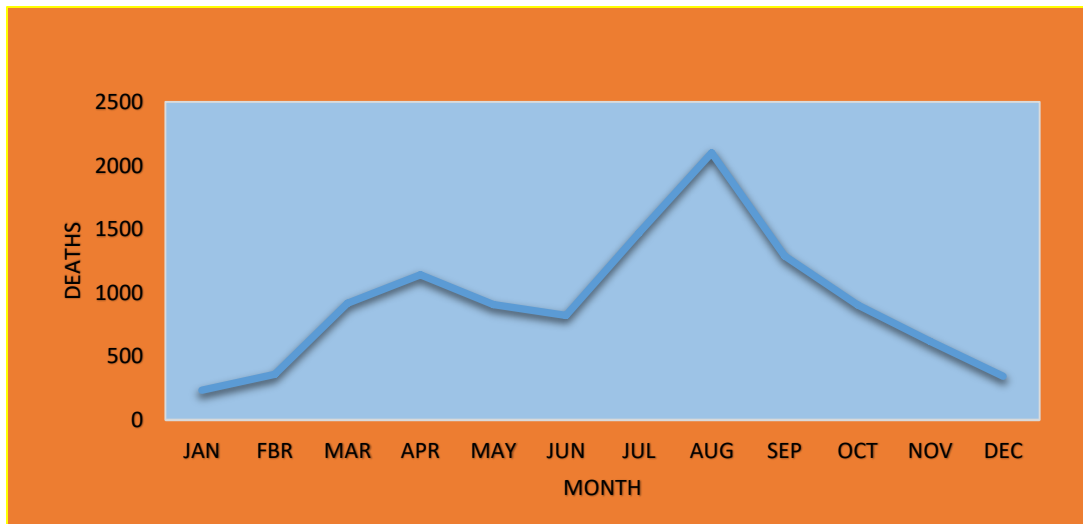
Socers;Ministry of Health, Public Health Department, Daily Epidemiological Report of the Corona Pandemic, 2021.

Figure (5) The monthly epidemiological curve of deaths from the Corona Covid 19 pandemic in Iraq for the year 2020



Source: Table (3)

Figure (6) The monthly epidemiological curve of deaths from the Corona Covid 19 pandemic in Iraq for the year 2021



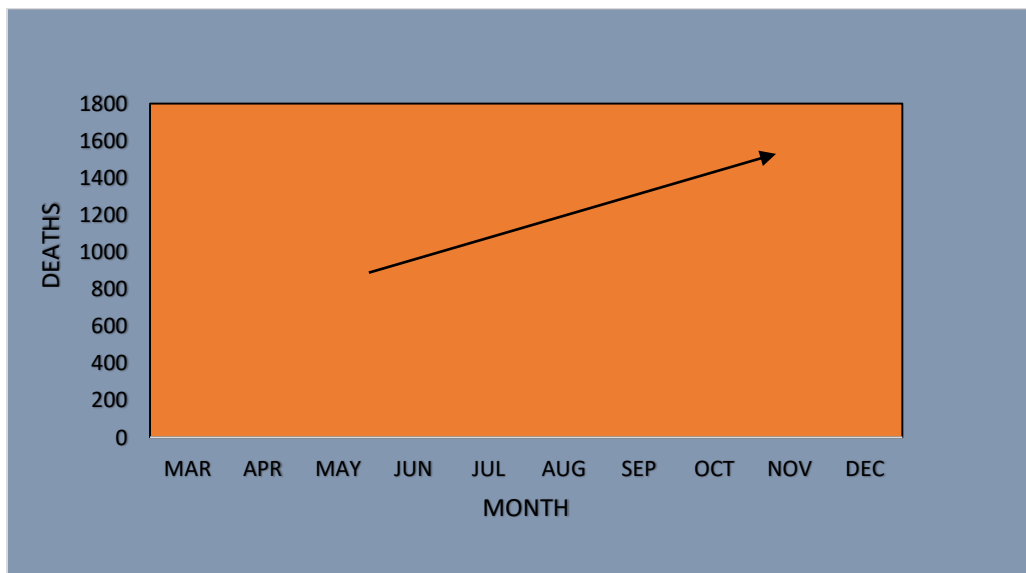
Source: Table (4)



- It became clear through figures (7) and (8) that the general trend line of deaths is on the rise for the two periods from February to December of the year 2020 and January to December of the year 2021, and this means that the number of deaths is increasing despite Some declines in the number recorded in some months.

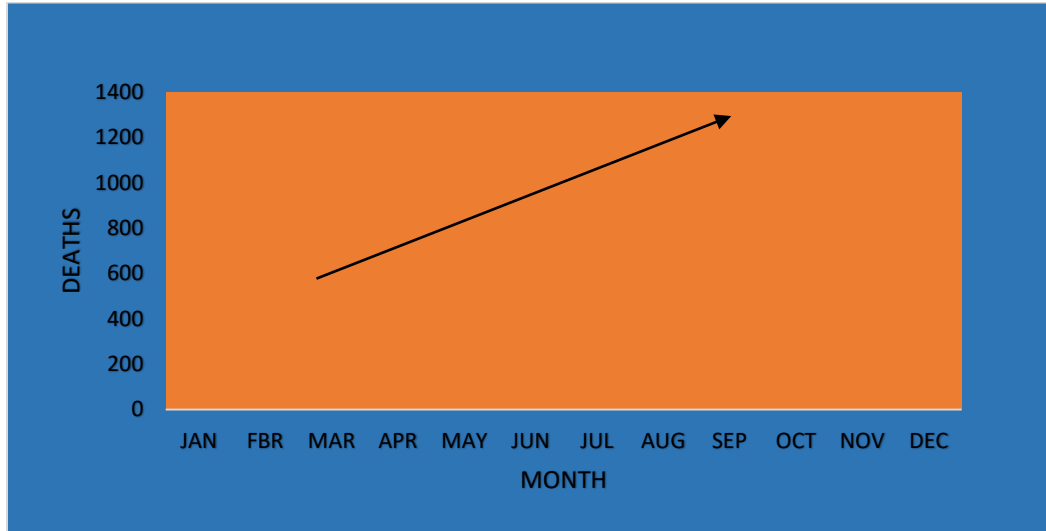
- The results of the statistical analysis using standard values showed that the months of March, April and May of the year 2020 recorded deaths in standard values below the average, and the lowest was in the month of April with a standard value of -1.21, while deaths in the remaining months of the year recorded standard values above the average, and the highest was in July with a value standard of 1.48. As for the year 2021, deaths were recorded for eight months: January, February, March, May, June, October, the second, and December, standard values below the average, and the lowest was in December, with a standard value of -1.10. As for the months April, July, August, And September, in which deaths recorded standard values above the average, and the highest was in the month of August, with a standard value of 2.21.

Figure (7) The general trend line for Corona Covid 19 deaths in Iraq for the year 2020



Source: Table (3)

Figure (8) The general trend line for Corona Covid 19 deaths in Iraq for the year 2021



Source: Table (4)

Fourth- The daily temporal respectively of the Corona-Covid-19 pandemic in Iraq

The data of tables (5) and (6) and figures (9) (10) (11) (12) show the daily course of cases and deaths from the Corona Covid 19 pandemic in Iraq for the months of May and September of the year 2020 and the months of February and July of the year 2021, and through it it is possible to notice a fluctuation. The values of cases and deaths during the days of the aforementioned months did not show a clear trend. The number of recorded cases increased in the late days of May 2020, as the highest number of cases was recorded on the 29th, reaching 416 cases. As for the deaths, they were in a state of fluctuation and ranged between one death at the beginning of the month and eight days. Deaths on the 24th, and there were days in which no deaths were recorded for the aforementioned month. As for September 2020, there was a large and clear relative convergence in the number of recorded cases and deaths. As for the month of February 2021, it became clear that the number of recorded cases and deaths, despite the relative convergence, tended to increase in the days of the second half of the month and the same situation, and to some extent in July of the year 2021, as the highest cases were recorded in the days 26, 27, 28, 29 and 30, and they ranged Between 12180 and 13515 cases. As for



deaths, they were very close between the days of the month and did not have a clear trend.

Table (5) The daily distribution of COVID-19 cases and deaths in Iraq for the months of May and September 2020

SEPTEMBER		MAY		DAY
DEATHS	CASES	DEATHS	CASES	
81	3871	1	68	1
78	3732	1	66	2
74	4755	2	77	3
84	5036	1	50	4
63	4644	4	85	5
90	3651	-	49	6
77	4314	-	63	7
68	4864	2	60	8
75	4243	3	76	9
82	4597	2	88	10
67	4254	1	51	11
60	4106	2	95	12
73	3531	3	119	13
72	4169	-	111	14
80	4224	2	50	15
82	4357	4	67	16
84	4326	2	144	17
76	4305	4	150	18
89	3907	4	57	19
64	3438	3	113	20
70	3821	6	153	21
57	4724	7	87	22
72	5055	5	308	23
45	4471	8	197	24
63	4598	3	163	25
68	4270	6	216	26
55	3481	6	287	27
62	4116	4	322	28
70	4724	6	416	29
51	4691	10	306	30



-	-	10	260	31
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Source: Ministry of Health, Public Health Department, Daily Epidemiological Situation of Corona Pandemic, 2020

Table (6) The daily distribution of COVID-19 cases and deaths in Iraq for the months of May and September 2021

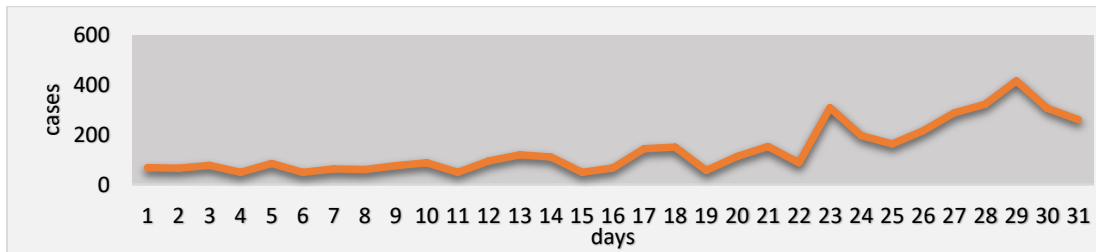
july		february		day
deaths	Cases	deaths	cases	
30	7554	10	984	1
40	6378	11	1135	2
25	5375	11	1317	3
35	6264	12	1150	4
29	8030	12	1534	5
31	8818	8	1660	6
37	8777	9	1134	7
31	9189	6	1713	8
32	8636	8	1994	9
39	6871	6	2282	10
33	7616	4	2369	11
44	9149	13	2530	12
38	9046	7	2190	13
47	9635	15	2224	14
30	9337	6	2798	15
44	8336	7	3332	16
38	8149	12	3375	17
41	8698	16	3896	18
62	9883	12	4024	19
59	8922	13	3273	20
69	8320	27	3187	21
81	8106	23	3864	22
66	8905	16	4181	23
65	7653	13	4306	24
55	9147	27	4074	25
60	12180	14	4336	26
71	12185	18	3543	27
66	13515	23	3248	28



49	13259		-	29
62	12597		-	30
62	10215		-	31

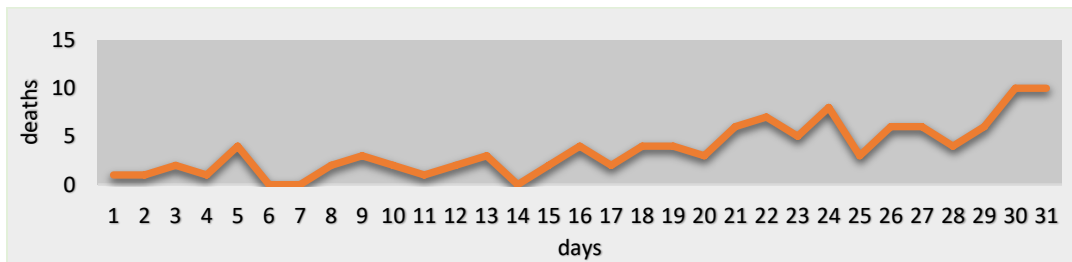
Source: Ministry of Health, Public Health Department, Daily Epidemiological Situation of Corona Pandemic, 2021

Figure (9) The daily curve of Corona Covid 19 cases in Iraq for the month of May 2020



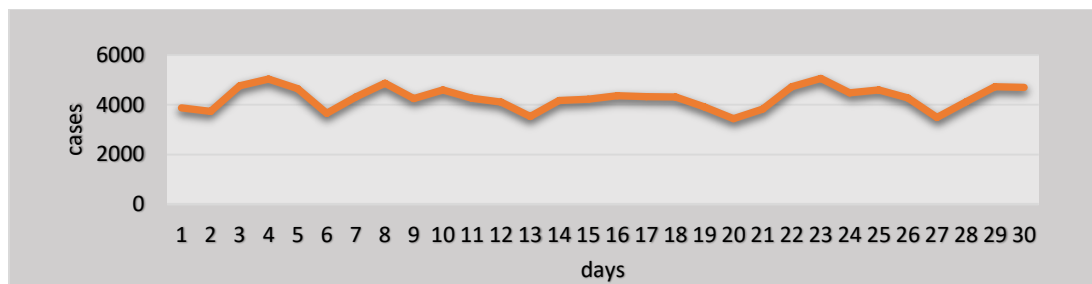
Source: Table (5)

Figure (10) The daily curve of Corona Covid 19 deaths in Iraq for the month of May 2020



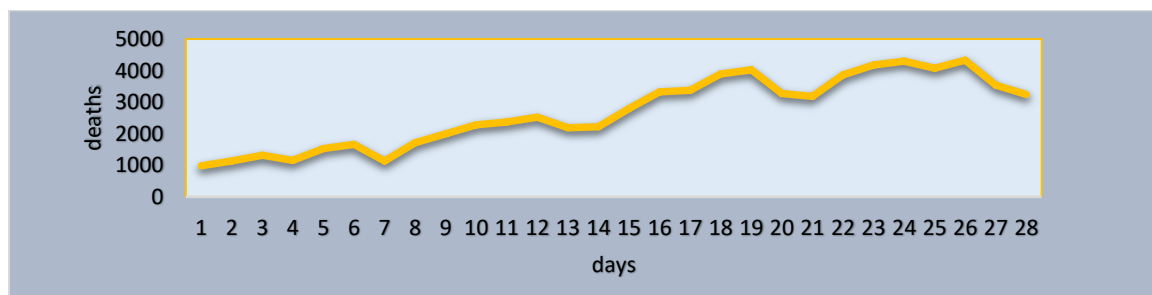
Source: Table (5)

Figure (11) The daily curve of Corona Covid 19 cases in Iraq for the month of September 2020



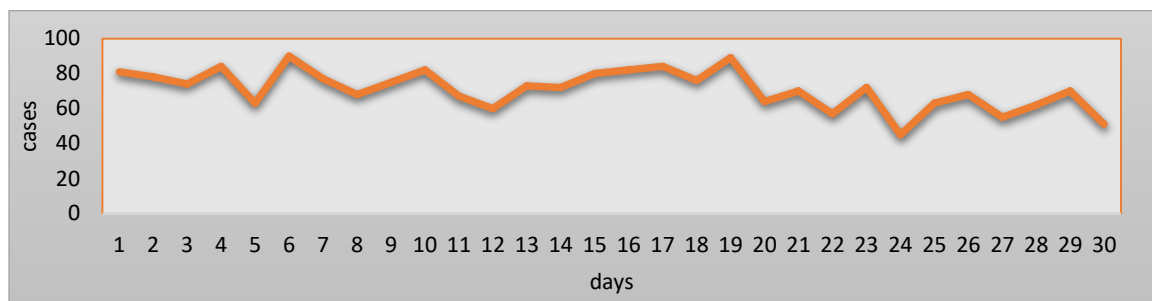
Source: Table (5)

Figure (12) The daily curve of Corona Covid 19 deaths in Iraq for the month of September 2020



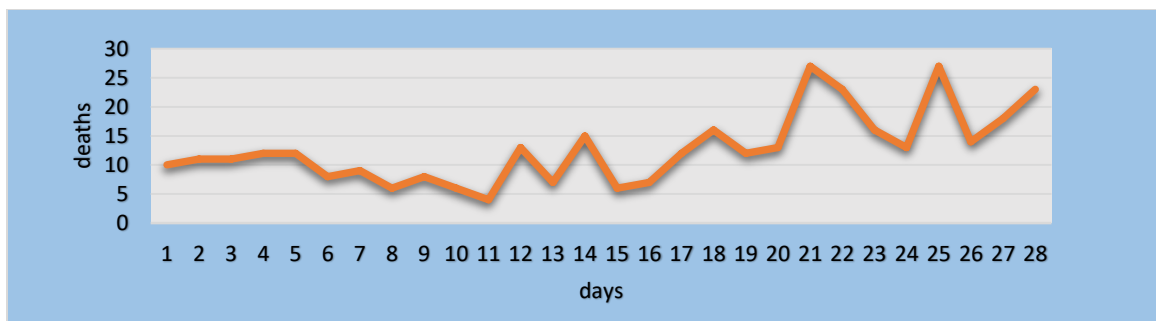
Source: Table (5)

Figure (13) The daily curve of COVID-19 cases in Iraq, February 2021



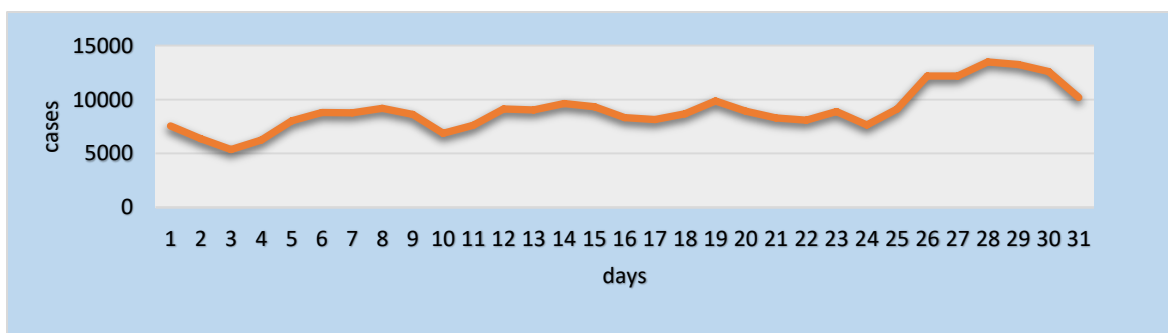
Source: Table (6)

Figure (14) The daily curve of COVID-19 deaths in Iraq, February 2021



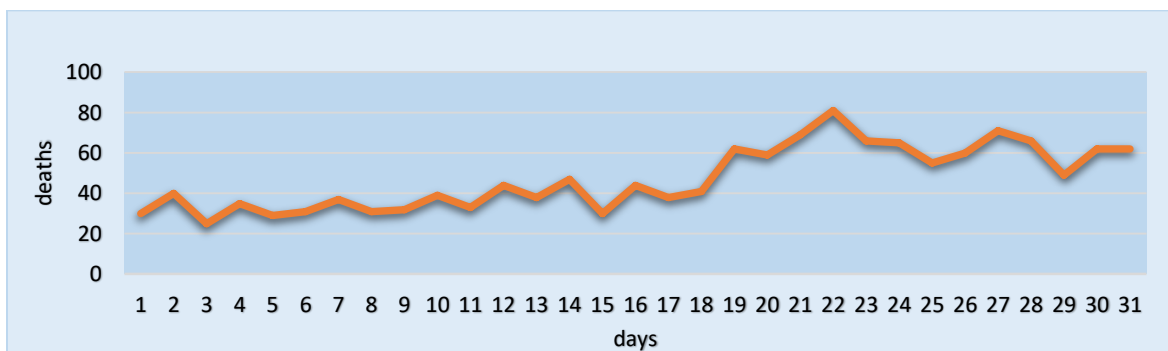
Source: Table (6)

Figure (15) The daily curve of COVID-19 cases in Iraq for the month of July 2021



Source: Table (6)

Figure (16) The daily curve of COVID-19 cases in Iraq for the month of July 2021



Source: Table (6)



conclusion

It became clear through the study that the monthly epidemiological curves of the Corona Covid 19 pandemic in Iraq were similar to the general epidemiological curves in its various phases. The ban measures that were imposed at the beginning of the pandemic, and on the daily level, there are no clear trends, but there were small increases recorded in the last days of each of the mentioned months, and there is no reason to explain this.

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