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COVID-19 Pandemic: Extent and Variation of Epidemiological Parameters in Iraqi Governorates

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Abstract

Background: COVID-19 is a dramatic event that covered almost all countries, regions and territories across the world. Characteristically, the disease has high incidence rate, high mortality and enormous impact on life and health.

Objective: This article describes the main epidemiological features of COVIUD-19 in Iraq during one year period.

Methods: The data used in this study were record-based related to confirmed cases of COVID-19 over a one-year period of time (February 24, 2020 to February 23, 2021). Data were compiled in an inventory containing numbers of cases confirmed by the Ministry of health official outlets supported by two more sources to affirm the consistency in numbers of daily cases. Excel sheets and functions were used to prepare epidemic curves. The tables were prepared manually. The study was approved by The Council of College of Medicine (Order No 7/37. 2656 on October 5, 2020), and by the Central Research Committee at Directorate General of Basrah Health Services

Results: The results at national and governorate levels showed an early low scale incidence rate with subsequent characteristics wavy pattern, with two major waves the first started by the end of May 2020 and the second by the end of January 2021. Apart from the fluctuation, no other uniform feature could be identified across different governorates. In general incidence rate and cause-specific mortality rates steadily increasing with time. The cases fatality ratio was declining with time. Governorates showed great variation in the three epidemiological parameters (incidence rate, case-fatality ratio and cause-specific mortality rate.

Conclusion: The behaviour of COVID-19 in Iraq as elsewhere in the world is difficult to understand. The characteristic fluctuations are likely to reflect factors related to virus behaviour, population behaviour and public health interventions.

Key words: COVID-19, Iraq, epidemiology, Corona

Introduction

After almost a year and a half since the start of COVID-19 pandemic in all parts of the world, [1,2] the outlook of the pandemic at global level still not clear yet despite the cautious optimism that the pandemic may come under control. The number of cases and resulting fatalities are increasing and almost all countries are fighting the virus. At one stage or another a number of countries have shown some features of evident containment after rapid spread of infection like China, South Korea, New Zeeland, Italy, Iran, Spain, France, Turkey, United Kingdom, Germany and most other European countries but resurgence did occur every now and then with devastating situation in some countries. The United States, Russia, Brazil, India, Peru and Mexico and many others, are examples of countries experiencing severe wave of cases and deaths and occupying top ranks in reported cases.[3] Countries in the Eastern

Mediterranean Region (EMR) are among many countries in which the pandemic started as modest daily cases but most of these countries experienced escalation with time and only few could succeed in suppressing the epidemic curve. In Iraq, the epidemic started as sporadic cases passing into cluster transmission and then into community transmission. The scale was very modest until the beginning of June 2020, when the epidemic curve showed exponential escalation. This escalation was followed by a clear decline by the beginning of October 2020, but a new severe wave started again by the end of January 2021. There was a good opportunity in Iraq to suppress the epidemic but this opportunity was undermined by defected adherence to protective and preventive measures. Unfortunately, the risk is rising and the outlook is unclear. Few studies have been published on COVID-19 in Iraq. [4-7] The field is very raw for further scientific research to understand, monitor and ameliorate the burden of the disease; and to document the changing situation for future benefits. The measures against the COVID-19 pandemic in the foreseeable future may need extensive reconsideration to encompass not only health aspects but also the consequences of the epidemic on population living and country economics.[8,9] A careful planning to COVID-19 exit is needed but this must be based on thorough analysis of the situation. The present study attempts to build upon existing research work and to further explore the epidemiological features of COVID -19 in Iraq at national and governorate levels. Specifically, the study is an attempt to document the two main characteristics of epidemic situations; the time trend and the geographical variation. Specific outcome indicators were used in this context:

1. To describe the extent of the pandemic at national level and at governorate level.
2. To measure the incidence, case fatality and cause specific mortality as final point outcome and comparative across governorates and time.

Methods

The data used in this study were record-based related to confirmed cases of COVID-19 over a one-year period of time (February 24, 2020 to February 23, 2021). Data were compiled in an inventory containing numbers of cases confirmed by the Ministry of health official outlets. Two more sources were used to affirm the consistency in numbers of daily cases. [3,10] Total daily cases at national and governorate levels were compiled and used in this paper. Excel sheets and functions were used to prepare epidemic curves. The tables were prepared manually. The study was approved by The Council of College of Medicine (Order No 7/37. 2656 on October 5, 2020), and by **the** Central Research Committee at Directorate General of Basrah Health Services

Results

Incidence rates

The incidence rate is an epidemiological parameter that reflects the interaction among host factors, agent factors and environmental conditions to facilitate activation and transmission of the causative agent among susceptible population. This is true for COVID-19 infection. Table 1 and Figure 1 Show a great variation in the incidence rate of COVID-19 cases reported during the year extending from 24 of February 2020 to 23 of February 2021. The highest incidence rate was in Dahuk governorate (27,305.9 per Million) and the lowest was in Al-Anbar governorate (4, 571.3 per Million). Seven governorates have a rate greater than the national level. These are Dahuk, Wasit, Baghdad, Karbala, Kirkuk, Najaf, Erbil

Case fatality ratio

The case fatality ratio (Table 1 and Figure 2) was also very variable among governorates. The highest was for Sulaimaniyah (5.38%) and the lowest was for Al-Anbar (0.85%). The case fatality ration at the national level was 1.97% as of February 23, 2021.

Cause-specific Mortality rates.

The cause specific mortality rate is shown in Table 1 and Figure 3. Sulaimaniyah also have the highest cause-specific mortality rate (832.28 per Million) and Al-Anbar have the lowest rate (39.05 per Million). At national level the cause-specific mortality rate was 347.29 per Million as of February 23, 2021.

Table 1 Estimated population, Reported new cases and deaths of COVID-19 in Iraqi governorates over the period Feb 24,2020 - February 23 2021

Governorate	Population	Total cases	IR/Million	Total deaths	CFR (%)	CSMR /Million
Baghdad	8, 340,711	207,741	24,906.9	2951	1.42	353.81
Najaf	1, 510,338	30,391	20,122.0	345	1.14	228.43
Erbil	1 903 608	37,484	19,691.0	930	2.48	488.55
Basrah	2,985,073	45,924	15,384.5	921	2.0	308.54
Sulaimaniyah	2, 219,194	34,355	15,480.8	1847	5.38	832.28
Karbala	1, 250, 806	30,297	24,222.0	564	1.86	450.91
Thi Qar	2,150, 338	27,761	12,910.1	869	3.13	404.12
Muthanna	835 797	13,756	16,458.5	246	1.79	294.33
Kirkuk	1, 639, 953	35,641	21,732.9	814	2.29	496.36
Diyala	1 680 328	24,489	14,573.9	278	1.14	165.44
Dahuk	1,326, 562	36,223	27,305.9	733	2.02	552.56
Wasit	1 415 034	36,233	25,605.7	476	1.31	336.39
Babylon	2 119 403	24,019	11,332.9	624	2.60	294.42
Diwaniah	1 325 031	21,635	16,327.9	432	2.00	326.03
Nineva	3 828 197	26,703	6,975.3	497	1.86	129.83
Missan	1 141 966	19,070	16,699.3	448	2.35	392.31
Anbar	1 818 318	8,312	4,571.3	71	0.85	39.05
Salah Al-Din	1 637 232	15,948	9,722.5	265	1.66	161.86
Total	38 327 889	675,982	17,636.8	13311	1.97	347.29

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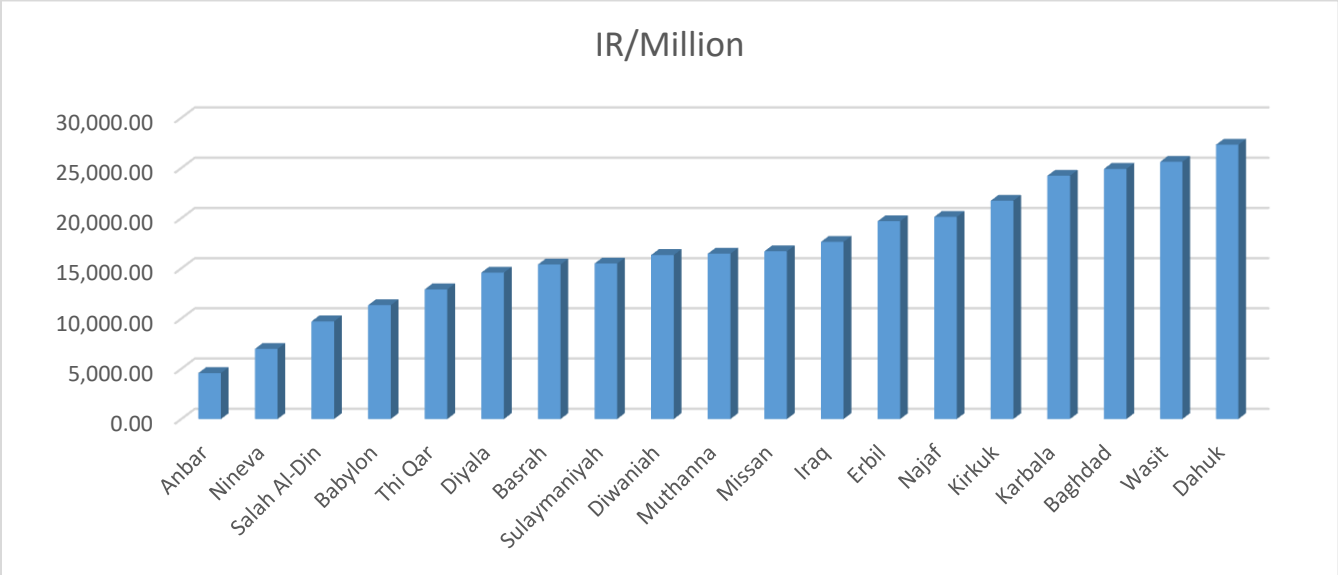

Figure 1: Incidence rate per Million population of COVID -19 infection in Iraqi governorates over a one- year period.

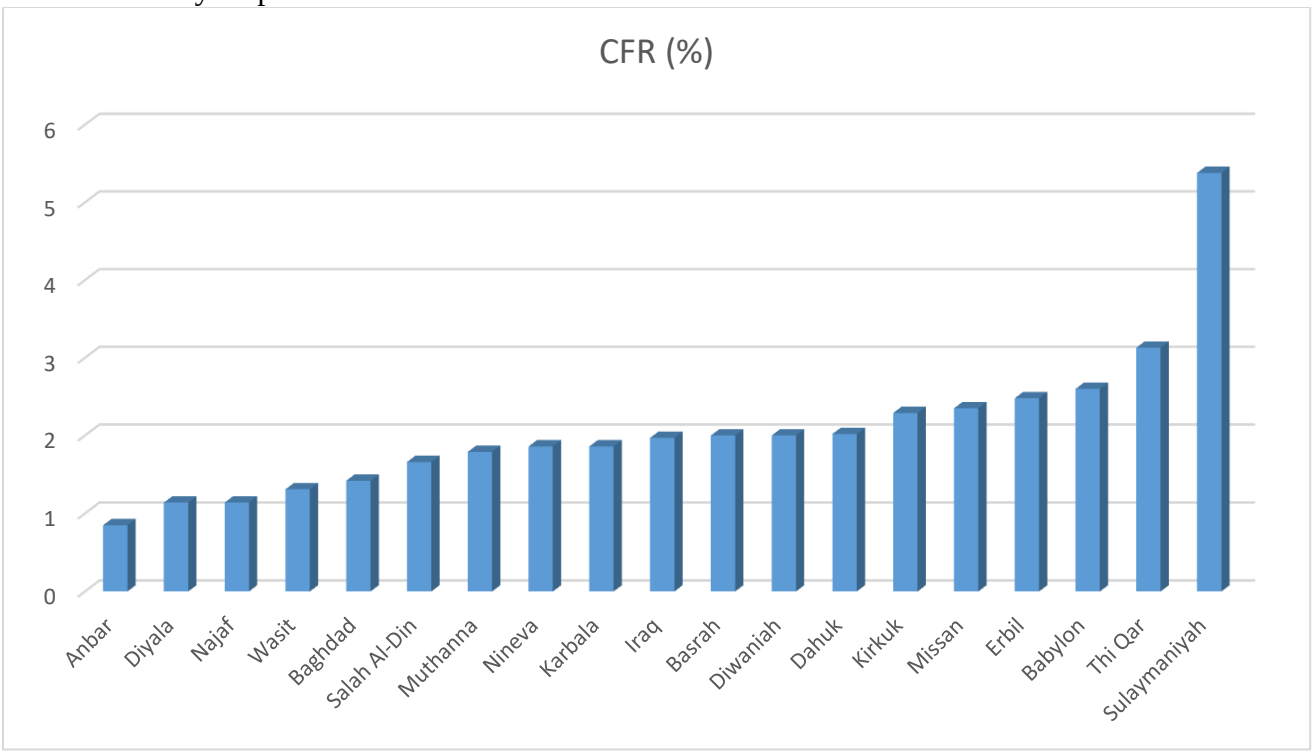

Figure 2: Case fatality ratio (%) of COVID-19 infection in Iraq governorates over a one-year period.

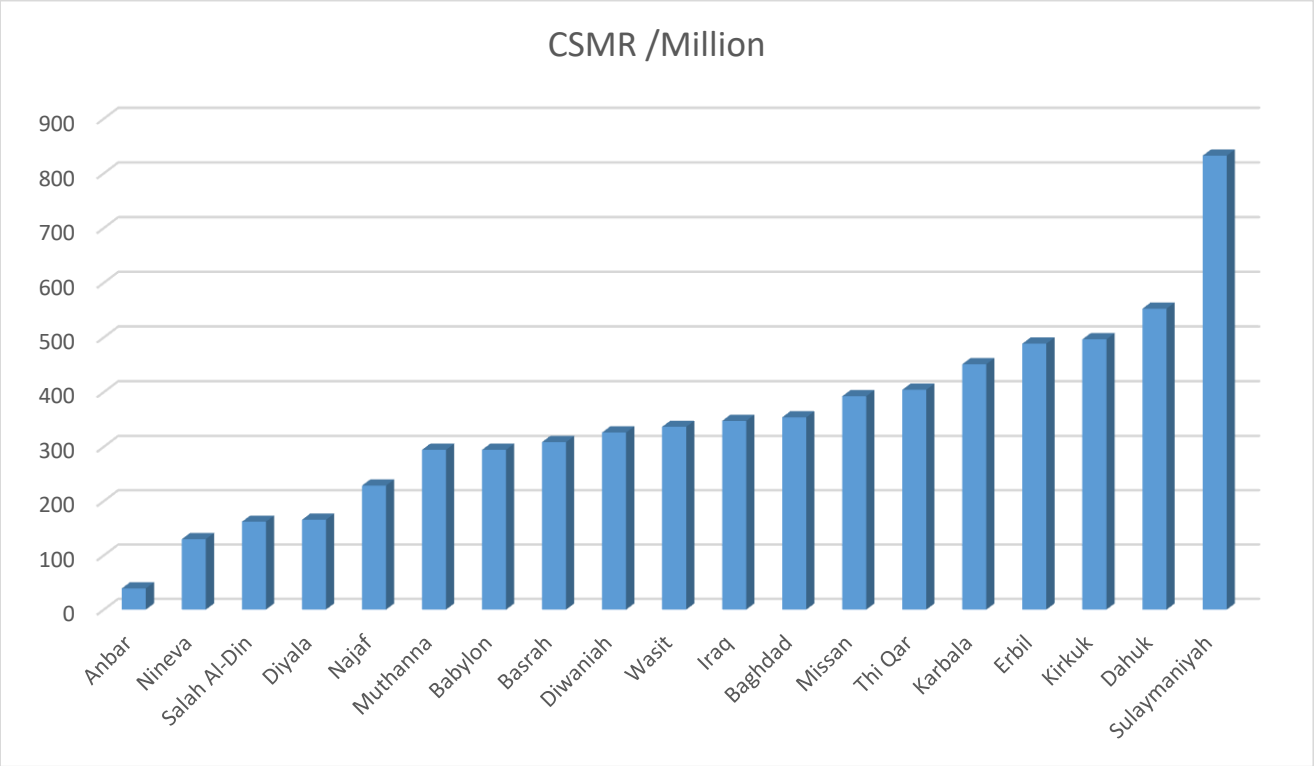

Figure 3: Cause-specific mortality rate per Million of COVID-19 infection in Iraq over a one-year period.

3.3. Time trend of the pandemic at governorate level

The pattern of COVID-19 time trend (epidemic curve) is variable both across the world countries and at the level of governorates within a given country. Figures 4-7 display the epidemic curves of
COVID-19 in various Iraqi governorates grouped according to arbitrary criteria.

Figure 4. presents data related to the governorates in the northern and western areas of the country (Dahuk, Erbil, Sulaimaniyah, Kirkuk, Ninava, Salaldeen and Al-Anbar). All showed a four phase epidemic curve. The start was a low scale daily cases followed by the first wave which lasted for relatively long time, and ended in slow down of cases at various stages of the epidemic in different governorates. The curve started to escalate again towards the end of February 2021. Somewhat later than the escalation in other Iraqi governorates. It is very clear that each governorate has its unique epidemic curve.

Figure 5 shows the epidemic curve of the weekly cases of COVID-19 in the governorates of Middle Euphrates Region (Karbala, Babil, Diwaniyah and Najaf). Completely identical epidemic curves are seen in these four governorates with two severe waves. The first wave extended from late May to late September 2020. The second followed a significant decline in cases and started early in February 2021. The two waves were more severe in Karbala and Najaf as compared to Diwaniyah and Babil.

The epidemic curves for the governorates of Diyala, Wasit, Al-Muthanna, Thi Qar, Missan and Basrah are shown in Figure 6. The pattern is similar to that of Middle Euphrates governorates in waves and weekly cases.

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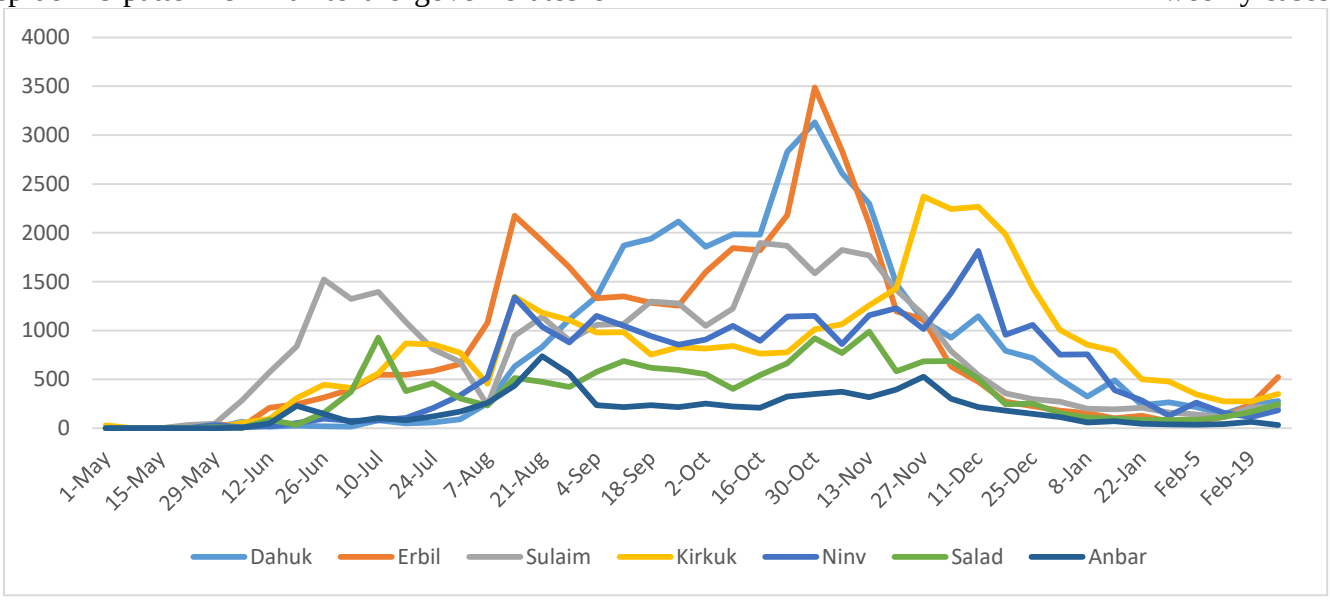
Bagdad governorate (Figure 7) experienced an epidemic pattern similar to the governorates of central and southern Iraq but at higher level of weekly cases.



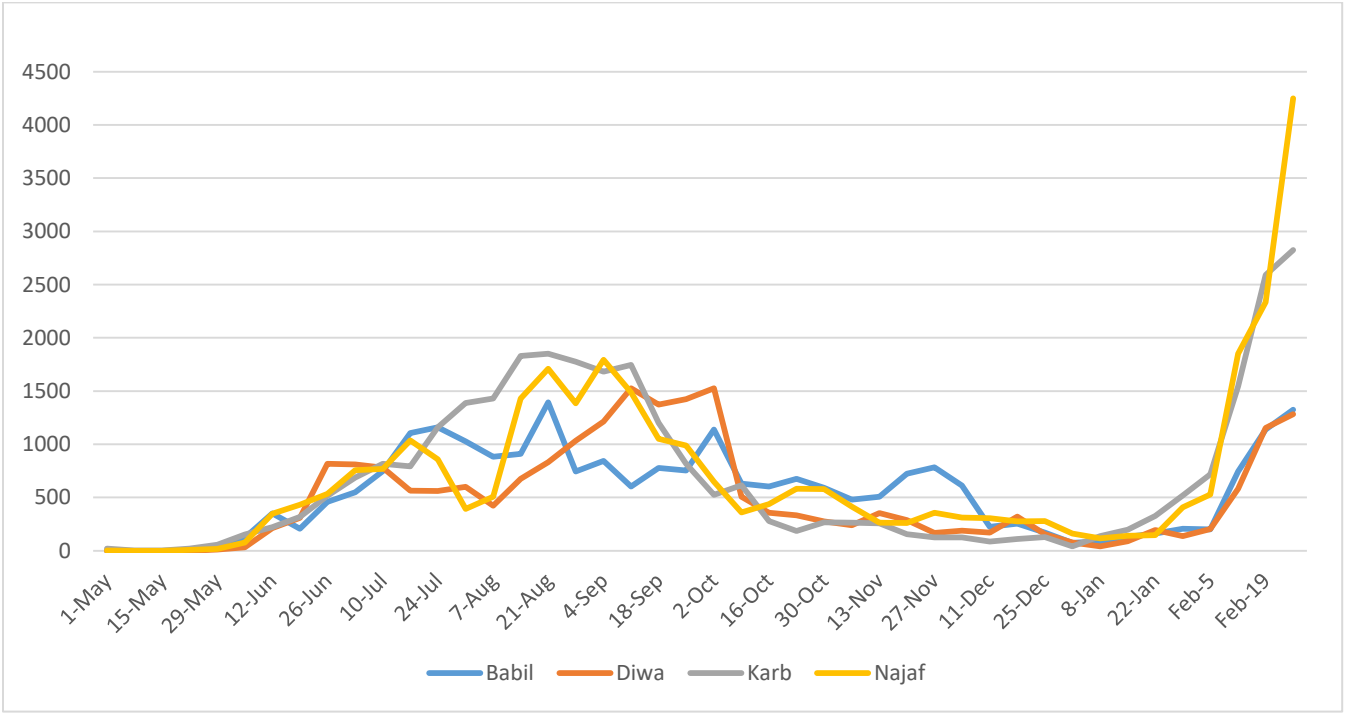


Figure 5: the epidemic curves of COVID-19 weekly cases over one year period (24 February 24, 2020-February 26 2021) for the governorates of Karbala, Babil, Diwaniyah and Najaf

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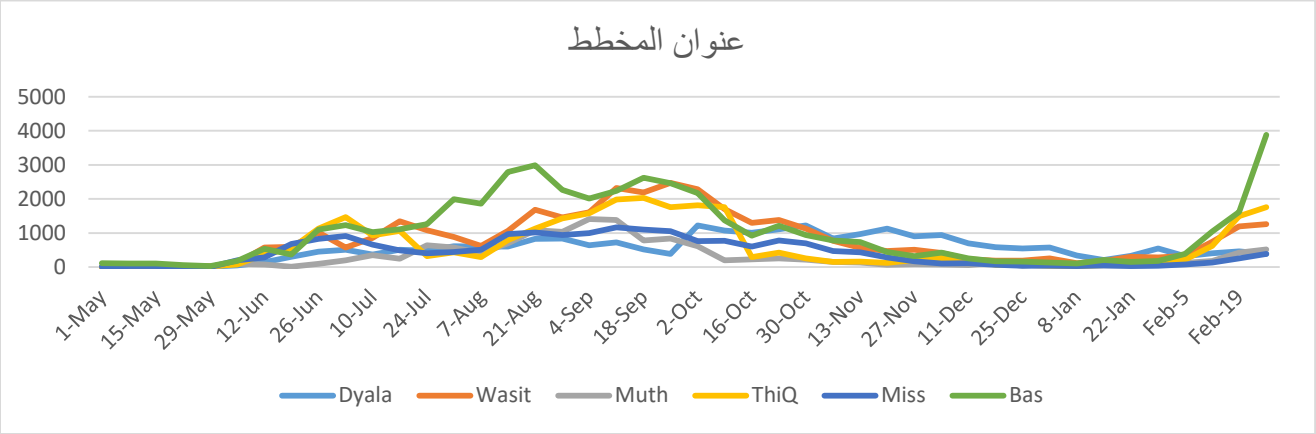

Figure 6: the epidemic curves of COVID-19 weekly cases over one year period (24 February 24, 2020-February 26 2021) for the governorates of Diyala, Wasit, Al-Muthanna, Thi Qar, Missan and Basrah

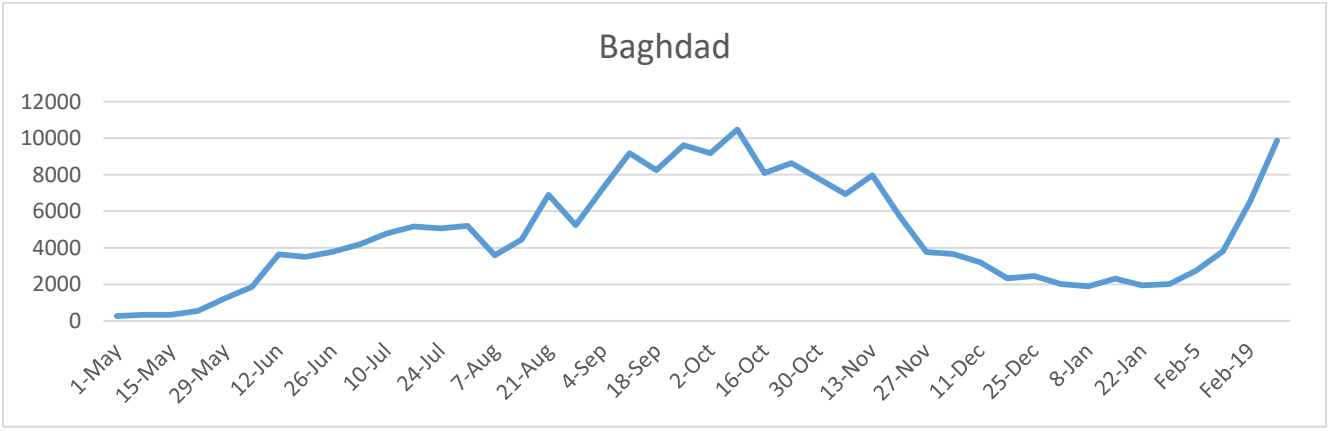

Figure 7: the epidemic curves of COVID-19 weekly cases over one year period (24 February 24, 2020-February 26 2021) for the governorate of Baghdad

Discussion

The COVIOD-19 pandemic was unique in the scale of cases and deaths all over the world, It is also unique in the rapidity of spread and the un-predictable pattern in various countries, regions or cities. The present paper presents time trend and governorate comparative patterns and outcomes of COVID -19 over a one-year period. The data published here are part of a more detailed study that can be found elsewhere. [11,12] The major outcome indicators (Incidence rate, case fatality ratio and cause specific mortality rate) in Iraq as a whole and for various governorates showed very variable values. To give some examples, the incidence rate in various governorates spanned a wide range from as low as 4,541.3 per Million in Al-Anbar governorate to as high as 27,305.9 in Dahuk governorate. The same was true for case-fatality ratio and cause-specific mortality rate as they both showed great variation across governorates (Figures 2 and 3). The variation in these indicators is likely to be a reflection of true difference in the magnitude of disease risk, severity of diseases, risk of death and effectiveness of the public health intervention at prevention and treatment levels. [13] In addition, testing intensity and accuracy of reporting are two other factors that affect the documented

cases. [14] The risk of infection and death is further affected by people behavior at preventive and curative levels.

These results are not unique to Iraq. Actually, the pattern tended to prevail in various countries. For example the United kingdom,[15] Europe,[16] China [17] and Brazil. [18] The explanation of the variation is complex and involve demographic characteristics, socioeconomic differentials, public health interventions and people response and adherence to recommended preventive measures and behaviours. [15-17] Effective policy making is another issue in explaining variability in epidemiological parameters of COVID-19. [18]

In conclusion, the COVID -19 is a devastating infectious disease at all levels. Its effects in terms of morbidity and mortality are enormous and very variable. The patterns at spatial and temporal levels are not easy to predict. The characteristic fluctuations are likely to reflect factors related to virus behaviour, population behaviour and public health interventions.

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جائحة كوفيد -19: مدى وتغاير المعايير الوبائية في المحافظات العراقية

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الملخص

خلفية: يعد كوفيد-19 حدثا مثيرا غطى جميع البلدان والمناطق والاقاليم تقريبا في جميع انحاء العالم وتميز بمعدلات عالية في الاصابة والوفيات والتأثير الهائل على الصحة والحياة.

الهدف: يصف هذا البحث السمات الوبائية الرئيسية لكوفيد-19 خلال مدة عام واحد في العراق على المستوى الوطني ومستوى الملا حافظات.

الطريقة: كانت البيانات المستخدمة في هذا البحث مستندة الى السجلات المتعلقة بالحالات المؤكدة لكوفيد-19 وعلى مدار سنة (24 شباط 2020-23 شباط 2021). تم تجميع البيانات حول الحالات التي أكدتها وزارة الصحة العراقية وتم دعم البيانات من مصدرين أخر لاين لتأكيد الاتساق في البيانات ولتحليل البيانات تم استخدام وظائف أكسل في توثيق البيانات وفي اعداد المنحنيات. تم استحصال موافقة مجلس كلية الطب (الأمر رقم 22656/37/7 في 10/5/ 2020 وكذلك لجنة البحوث المركزية بالمديرية العامة للخدمات الصحية في البصرة..

النتائج: أظهرت النتائج على المستوى الوطني والمحافظات معدل حدوث منخفض مبكر تلاه نمط متموج، مع موجتين رئيسيتين بدأت الأولى بنهاية مايس 2020 والثانية بنهاية كانون ثان 2021. لا يمكن تحديد سمة موحدة أخرى عبر المحافظات المختلفة. بشكل عام معدل الإصابة ومعدلات الوفيات الخاصة بالسبب كانت تتزايد باطراد مع مرور الوقت. كانت نسبة الوفيات بين الحالات تتراجع مع مرور الوقت. أظهرت المحافظات تباينًا كبيرًا في المعايير الوبائية الثلاثة (معدل الحدوث ، ونسبة الوفيات إلى الحالات ، ومعدل الوفيات حسب السبب).

الاستنتاج: من الصعب فهم سلوك كوفيد 19 في العراق وفي العالم ، ومن المرجح ان تعكس التقلبات العوامل المرتبطة بسلوك الفيروس وخصائصه البيولوجية وسلوك السكان وتدخلات سلطات الصحة العامة.

الكلمات المفتاحية: كوفيد -19 ، العراق ، علم الأوبئة ، كورونا