

The general situation of Covid-19 in Iraq

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Abstract: The Coronavirus has caused the death of nearly five million people, according to data provided by the World Health Organization. In Iraq, in February 2020, the first confirmed cases of infection were announced, and it raised great concern due to the primitive health infrastructure.

SARS-CoV-2 is a beta coronavirus belonging to the subgenus Sarbecovirus. The epidemic led to the loss of human lives that prompted the world to be cautious and fearful of the future, because due to the strength and ferocity of the virus, some factors that increased the severity of the disease, including weak immunity caused by some diseases like cancer.

The respiratory system is the main target of the virus, but due to the systemic nature of the disease, the inflammatory condition may generalize and affect the rest of the body's organs.

Some methods have emerged aimed at stopping the chain of this epidemic, including social distancing and the use of sterilizers, but these measures are considered primitive when compared to the ferocity of the virus. Many research centers and scientists cooperated to find a suitable vaccine for the virus. In the beginning, companies used old methods to produce the vaccine, such as using parts of viruses and injecting them into the host. From here, companies began racing in a scientific way to find the appropriate vaccine.

This review, discussed the health situation within Iraqi society regarding the Corona virus since the first infection was recorded. also discussed the targeted organs, the impact of diseases on the virus, and the vaccines used. We conclude that awareness is an important factor in avoiding global epidemics, which is represented by adhering to preventive measures and taking vaccines, as it has not become clear that the Corona virus is a seasonal virus, but rather what helps in its spread are the health conditions of the host, specifically the condition of the lungs.

Keywords: Coronavirus, pandemic, Vaccines.

الوضع العام لكوفيد-19 في العراق

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المستخلص: فيروس كورونا تسبب في وفاة ما يقرب من خمسة ملايين شخص، بحسب بيانات منظمة الصحة العالمية. وفي العراق، أُعلن في فبراير 2020 عن أول حالات إصابة مؤكدة، وأثار قلقًا كبيرًا بسبب البنية التحتية الصحية البدائية. فيروس كورونا سارس-كوف-2 هو فيروس كورونا بيتا ينتهي إلى جنس ساربيكوفيروس الفرعي. أدى الوباء إلى خسارة أرواح بشرية دفعت العالم إلى الحذر والخوف من المستقبل، لأنه بسبب قوة وشراسة الفيروس، كانت هناك بعض العوامل التي زادت من شدة المرض، بما في ذلك ضعف المناعة الناجم عن بعض الأمراض مثل السرطان.

الجهاز التنفسي هو الهدف الرئيسي للفيروس، ولكن بسبب الطبيعة الجهازية للمرض، قد تعمم الحالة الالتهابية وتؤثر على بقية أعضاء الجسم.

ظهرت بعض الطرق التي تهدف إلى وقف سلسلة هذا الوباء، بما في ذلك التباعد الاجتماعي واستخدام المعقمات، لكن هذه الإجراءات تعتبر بدائية إذا ما قورنت بشراسة الفيروس. تعاون العديد من مراكز الأبحاث والعلماء لإيجاد لقاح مناسب للفيروس. في البداية استخدمت الشركات طرق قديمة لإنتاج اللقاح، مثل استخدام أجزاء من الفيروسات وحققها في الجسم، ومن هنا بدأت الشركات بالتسابق بشكل علمي لإيجاد اللقاح المناسب.

تناولت هذه المراجعة الوضع الصحي داخل المجتمع العراقي فيما يتعلق بفيروس كورونا منذ تسجيل أول إصابة، كما ناقشت الأعضاء المستهدفة، وتأثير الأمراض على الفيروس، واللقاحات المستخدمة. الخلاصة، نخلص إلى أن الوعي عامل مهم في تجنب الأوبئة العالمية، يتمثل بالالتزام بالإجراءات الوقائية وأخذ اللقاحات، حيث لم يتبين بعد أن فيروس كورونا هو فيروس موسمي، بل ما يساعد على انتشاره هي الحالة الصحية للمصاب وتحديدًا حالة الرئتين.

الكلمات المفتاحية: فيروس كورونا، جائحة، لقاحات.

Introduction

Various infectious diseases have already arisen in lots of places in recent years, like viruses such as swine flu, chickenpox, Nipah virus, etc (Dhama et al., 2020). Since the outbreak and rapid spread of COVID-19 starting in late December 2019, it has been apparent that multiorgan involvement has largely influenced disease prognosis. Comorbidities such as cardiovascular diseases have been the most common risk factors for severity and mortality (Zaim et al., 2020).

Coronaviruses are enveloped positive-stranded RNA viruses that replicate in the cytoplasm. To deliver their nucleocapsid into the host cell, they rely on the fusion of their envelope with the host cell membrane. The spike glycoprotein (S) mediates virus entry and is a primary determinant of cell tropism and pathogenesis. It is classified as a class I fusion protein, and is responsible for binding to the receptor on the host cell as well as mediating the fusion of host and viral membranes—A process driven by major conformational changes of the S protein (Belouzard et al., 2012).

The first patient with COVID-19 was reported in Iraq on 24 February 2020 the Iranian student came from Iran. As of 24 May 2020, the confirmed cases of COVID-19 infections reached 4469, with 160 deaths and 2738 patients recovered from the infection. Most of the cases were recorded in Baghdad followed by Basra and Najaf. About 45% of the patients were female (with 31% deaths of the total cases) and 55% were male (with 68% deaths of the total cases). Most cases are between the ages of (20-59) years old, and (30-39) years are the most affected range (19%) Approximately (8%) of cases are children under 10 years old. Iraq has shown a cure rate lower than those reported by Iran, Turkey, and Jordan; and higher than Saudi Arabia and Kuwait. Healthcare workers represented about (5%) of the total confirmed cases (Sarhan et al.,2020).

Covid-19 disease in Iraq was associated with a significant mortality during the year 2020. It actually changed the previously reported national mortality pattern, as covid-19 has become the second most common cause of death in Iraq. Contradictory, to the general belief that mortality associated with covid-19 disease was generally restricted to the older age groups, 117 children under the age of ten years died because of covid-19 disease in 2020. This number of childhood deaths suggests the need to consider vaccination of the younger age groups and to perform the relevant research. Covid-19 disease has emerged as a new notifiable infectious disease in Iraq and throughout the world; therefore, it changed the pattern of notifiable infectious diseases in Iraq (Al-Mosawi, 2021).

Vaccines

To prevent infectious diseases, vaccines are the safest way to generate herd immunity, and this is through developing vaccines using either microorganisms, their proteins, or their toxins. To stimulate the infected person's immune system against any foreign body, these vaccines are introduced into the body in several ways (injection, mouth, or nose). Suppose the same person is infected with the same microorganisms. In that case, the person's antibodies prevent the disease and reduce the severity of the disease, and thus herd immunity is formed due to the development of vaccines (Manhas et al., 2022; Feather et al., 2020).

In Iraq, at the beginning of the use of the Corona vaccine, the fear of taking the vaccine posed a serious threat to community health, despite the efforts made (Shareef et al., 2022).

Vaccines Development: new generation vaccines

Manufacturing vaccines in a safe way involves encoding the antigen from the pathogen into a plasmid by inserting DNA. This method does not cause disease, but it can cause a negative effect when used alone because it generates large amounts of antibodies (Feather et al., 2020).

This type of vaccine was approved by Food and Drug Administration (FDA) such as manufactured by ModernaTX, Inc. or Pfizer, Inc, where it agreed that a person aged 12 years should receive one or more doses (Le et al., 2020). These vaccines are lipid-coated mRNA of the SARS-CoV-2 (Khuroo et al., 2020).

In previous years, the fastest mumps vaccine took four years, but thanks to the experience of previous years in discovering vaccines less than a year passed for the Moderna and Pfizer vaccines to be approved as vaccines for the Corona virus. Global cooperation and the dissemination of research and clinical trials also helped in it (Morris, 2022). The global cooperation was focused on determining the Ribonucleic acid (RNA) sequence of the virus. Living cells Messenger RNA is usually used as a template for building or synthesizing proteins, as scientists were studying vaccines based on viral proteins and genomes (da Gama and Petrides, 2021).

When the host is infected with the Corona virus, and because it's not trained and not prepared to produce antibodies, it will certainly face a great danger. Therefore, the vaccine works to train the host's immune system to produce antibodies to confront the

Corona virus. This is done by producing protein (S) which present in a piece of mRNA existing in the vaccine, as the (S) protein, after recognizing the host's immune system, produces antibodies. Thus, the immune system is trained, recognized and prepared for the Corona virus if the host becomes infected with the virus in the future, as the (S) protein is not Harmful (Morris, 2022).

COVID-19 and other disease

People who have weak immunity, especially those with cancer, are entitled to viral infections, even if they are simple (Kamboj and Sepkowitz, 2009). An early report revealed that cancer patients are more susceptible to infection with the Coronavirus (Yu et al., 2020).

A study comparing the rate of infection with the Corona virus between people with cancer and normal people revealed that the prevalence of the former was twice as high as that of normal people (Liang et al., 2020). This also applies to the death rate as well, and the infection rate certainly varies based on the stage of treatment or type of cancer, as those who suffer from breast or blood cancer are more susceptible to infection with the new Corona virus (Luo et al., 2020).

The lungs are the main target of the Corona virus, and children are less affected by the virus (Shen et al., 2020; Girona-Alarcon et al., 2021). However, children are infected with the virus either directly, with symptoms such as runny nose, low-grade fever, diarrhea, cough, and abdominal pain (Parri et al., 2020; Lu et al., 2020). or indirectly effect from the closure of recreational areas, quarantine policies, and distance education also caused negative effects on children's mental health (Spinelli et al., 2020).

As for the direct effects, children can suffer from systemic inflammation, which is in a dangerous stage and is called multisystem inflammatory syndrome in children (MISC), whose symptoms are functional dysfunction of multiple organs and fever (Panaro and Cattalini, 2021).

A study in Scotland showed that those who suffer from asthma (at a serious stage) in children have a risk of infection with the virus, while in North Carolina they did not find evidence of a relationship between asthma and Corona. However, the level of asthma control is a major factor in determining the risk of infection with the Corona virus (Shi et al., 2022).

Alcohol abuse, obesity and diabetes all increase liver failure, and although liver failure a common medical condition, it can lead to an increase in cases of Acute-on-chronic liver failure (ACLF) (Mochida et al., 2022; Arroyo et al., 2016). A study conducted in hospitals for those suffering from ACLF and at the same time infected with the Corona virus showed that deaths have increased (Satapathy et al., 2021).

For those suffering from primary and secondary liver injury, Corona infection may contribute to the exacerbation of liver disease and cirrhosis (Łykowska-Szuber et al., 2019).

Drug-induced liver injury (DILI) is often observed in patients with COVID-19, with 10.9% of COVID-19 patients found to have DILI (Mücke and Zeuzem, 2022). Meanwhile (Gurala et al., 2020) could not prove that coronavirus is the causative agent of liver failure.

Despite initial reports since the beginning of the epidemic that made it clear that there was no relationship between kidney disease and Covid-19 (Gansevoort and Hilbrands, 2020), and with the availability of data and evidence and the spread of the epidemic across countries and continents, the relationship between the two diseases had reached 50% (Cheng et al., 2020). Singh et al concluded that the severity of Covid-19 was closely linked to acute renal failure and chronic kidney disease (Singh et al., 2022).

The relationship includes that Covid-19 disease binds to a receptor on the surface of cells called angiotensin-converting enzyme 2 receptors (ACE2R), which is usually expressed in multiple organs, including the kidneys (Braun et al., 2020).

Nishiga et al also explained that Covid-19 disease results in cardiac dysfunction, and this also leads to kidney injury (Nishiga et al., 2020).

Coronavirus vaccine types

AstraZeneca

The vaccine developed by Oxford University and AstraZeneca showed defensive and immunological effectiveness (Van Doremalen et al., 2020). After the approvals of vaccine obtained, it was given to 543 people, in addition to an initial booster schedule and protocols, where immune responses were observed in the recipients after the initial vaccination dose (Folegatti et al., 2020).

The vaccine uses an adenovirus modified with chimpanzee DNA, where the chimpanzee DNA creates S-protein similar to the protein found in the Corona virus. After being injected into humans, this protein migrates to the cell nucleus to be converted into

mRNA. After the process of transcription and translation, these vaccines lead to the activation of Cells T-, B-, plasma and antibodies (Mascellino et al., 2021).

Moderna Company

It is a vaccine based on messenger RNA (mRNA) lipid particles coated with nucleosides and works on encoding the spike protein that is already present in SARS-CoV-2. The vaccine gives rise to a vigorous binding and neutralizing antibody response. This also includes CD4+ T-cell and CD8+ cytotoxic T-cell response to eliminate the virus (Francis et al., 2022).

After approval to administer the vaccine, it was given as an intramuscular injection in two doses of 100 grams during the 28th day. mRNA vaccines are free of preservatives or adjuvants and do not use cells or animal products (Zhu et al., 2020).

Pfizer and BioNtech

COVID-19 vaccines based on mRNA have also been produced by Pfizer and BioNtech. According to preliminary findings from phase 1/2 in (sixty-six trials) Pfizer is a lipid nanoparticle-formulated, nucleoside-modified mRNA vaccine, that induces RBD-binding IgG and neutralizing antibodies with mainly mild side effects in 45 volunteers in a study comparing two types of vaccines (BNT162b1 and BNT162b2), For example, tension at the injection site, nausea, headaches, Chills, body pain, and joint pain are all symptoms of this vaccine. The 18–55-year-old participants were given two intramuscular doses of 10 g, 30 g, or 100 g of BNT162b1 (given as 0.5 mL doses and held at –80°C) at random. Separated by 21 days due to enhanced reactogenicity, the vaccine was not given a second dose of 100 g. At day 21 after the first vaccine injection, geometric mean titers of RBD-specific IgG were measurable, ranging from 534 U/mL to 1778 U/mL, and were equal to, or higher than, those present in a human convalescent serum panel (Mulligan et al., 2020).

Johnson and Johnson vaccine

Johnson Pharmaceutical Companies have begun with the Ad26- SARS coronavirus vaccine, which expresses glycoprotein spikes form (replication-defective vaccine) and was tested in phase 3 randomized, double-blind, placebo-controlled trial with 60000 participants aged 18 and over. In rhesus macaques aged 6–12 years, a single immunization with serotypes adenovirus type 26- vectored vaccine (1.0 10¹¹ viral particles through the intramuscular route without adjuvant) produces strong neutralizing antibody responses and protects against SARS-Coronavirus 2 challenge (Mercado et al., 2020).

This candidate vaccine, which must be stored between 2 and 8 degrees Celsius, currently has about 1045 individuals (18–55 and 65 years old) who took part in this vaccine in 1/2 of the experiments in the United States and Belgium (Poland et al., 2020).

Biotech Sinovac

Biotech Sinovac is a vaccine for coronavirus and was chemically inactivated, entire virus administration is given in 2 doses ((0-28 days)) and received an essential use authorization In July 2020, and Chinese authorities will be in control, prior to the start of phase 3 studies. According to reports, almost 90% of company staff was immunized as a result of this authorization. Healthy Participants in the age stratum between 18–59 years old in clinical trials 1/2, which were completed (Deng, 2020).

A total of 143 people took part in the phase one experiment. On day 0 and day 14, or day 0 and day 28, 600 patients were randomly allocated to receive either 3 µg /0.5 mL or 6 µg /0.5 mL of the trial vaccine, or placebo, in two intramuscular injections (Zhang et al., 2019).

Sinopharm

Sinopharm has developed and evaluated two alum-adjuvanted inactivated whole-virus vaccines. Wuhan Institution of Biological Products is a Wuhan-based research institute, in China that created the candidate for the first vaccine (COVID-19- New Crown). The results of both the phase 1 and phase 2 experiments have been made available to the public. The stage 1 trial "A number of volunteer 96" focused on a three-dose chain, while the stage 2 trial "a number of volunteer 224" focused on a 5-µg dose of vaccination in 2 groups including days 0 and 14 with a number of volunteers (n=84) & (n=28) respectively, and second dose of vaccination included on days 0 and 21 within a number of volunteers (n=84) (n=28) respectively. Adults between the ages of 18 and 59 were enrolled in this trial experiment (Xia et al., 2020).

Methodology

The study included (35) months, distributed from the beginning of the entry of the Coronavirus into Iraq in February 2020, until the end of 2022.

Monthly rates of infections, recovery, deaths, and vaccinated were calculated to determine the extent of prevalence at the monthly level. An analysis was also made using the Chi-Square Independence test to determine the prevalence of the number of infected people for the four seasons during the study period Statistical Package for the Social Sciences (SPSS). The data used were from the Iraqi Ministry of Health (Public Health Laboratory) or through the website of the Iraqi Ministry of Health (http://phd.iq/CMS.php?CMS_P=293).

Result and discussion

This study used data available from the Iraqi Ministry of Health (Public Health Laboratory) or through the website of the Iraqi Ministry of Health

The monthly cumulative infection rate showed an increase in infection rates until they peaked in July 2021, reaching 280,695 confirmed infections (Figure 1). The figure shows that infections varied in their beginnings and began to gradually decline.

Al-Mousawi explained that there was a slight increase in the number of government hospitals in the first year of the Corona pandemic, so it varied at the beginning and began to gradually decrease (Al-Mosawi,2021).

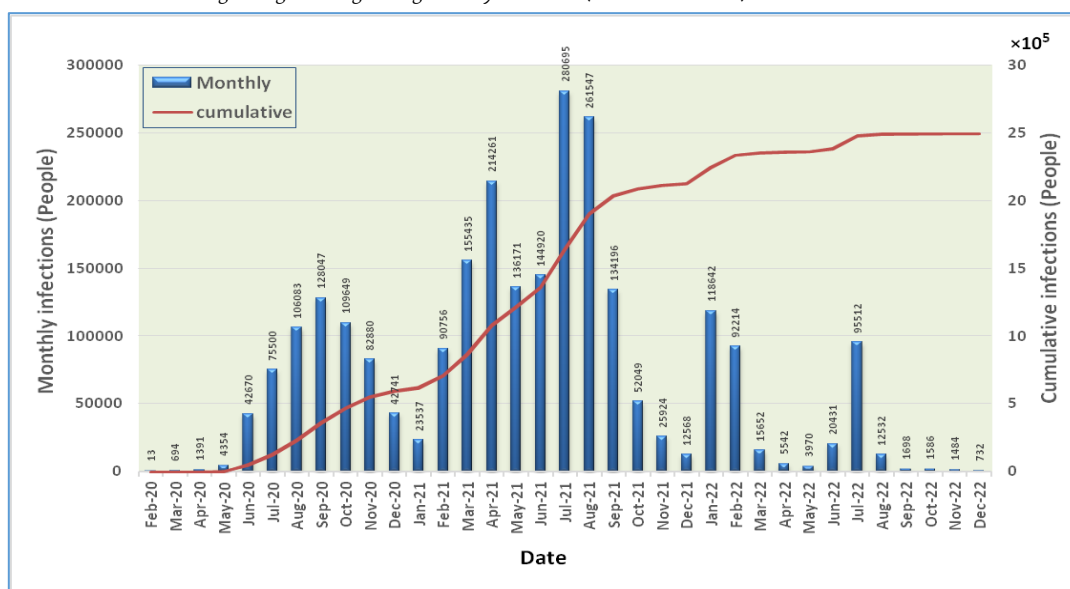


Figure 1: The monthly cumulative infection from February 2020 to December 2022 in Iraq.

At the same time, the recovery rate peaked in August 2021 (Figure 2). The rates were somewhat coordinated with the rates of infection rates, and this is due to the successful protocols used in treating infected people in Iraq. The protocols were used in cooperation with the World Health Organization.

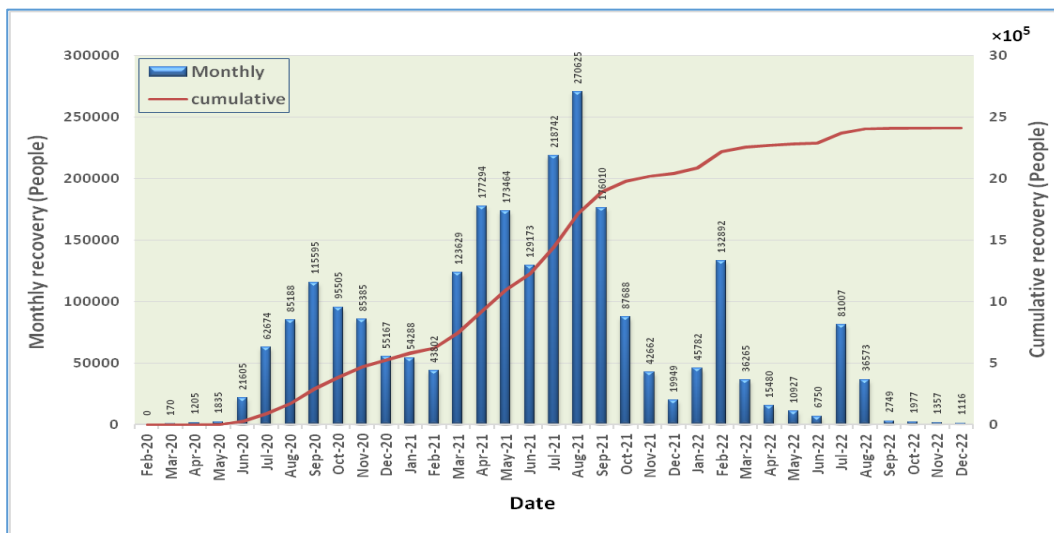


Figure 2: The monthly cumulative recovery from February 2020 to December 2022 in Iraq.

Using the protocols provided by the World Health Organization, which benefited the Iraqi community, did not prevent an increase in death rates during the study period, as the monthly cumulative death rate reached its peak in July 2020 (Figure 3). The societal awareness factor plays an important role in curbing the spread of the Corona virus, and awareness means adherence to the preventive measures explained by the Iraqi Ministry of Health and the World Health Organization, which are represented by wearing masks, using gloves, continuous sterilization, and adhering to social, all of these preventive measures, if not adhered to, will lead to an increase in deaths

Malaeb et al observed the high mortality rate throughout all waves, with 60% of deaths due to respiratory failure. Older age, male gender, pre-existing medical conditions (Malaeb et al., 2023).

demonstrated to the Results showed in China (Wuhan), where the pandemic started, 49% of all 2087 inpatients seriously affected by COVID-19 died, reaching a mortality rate around 62% (Phua et al. 2020).

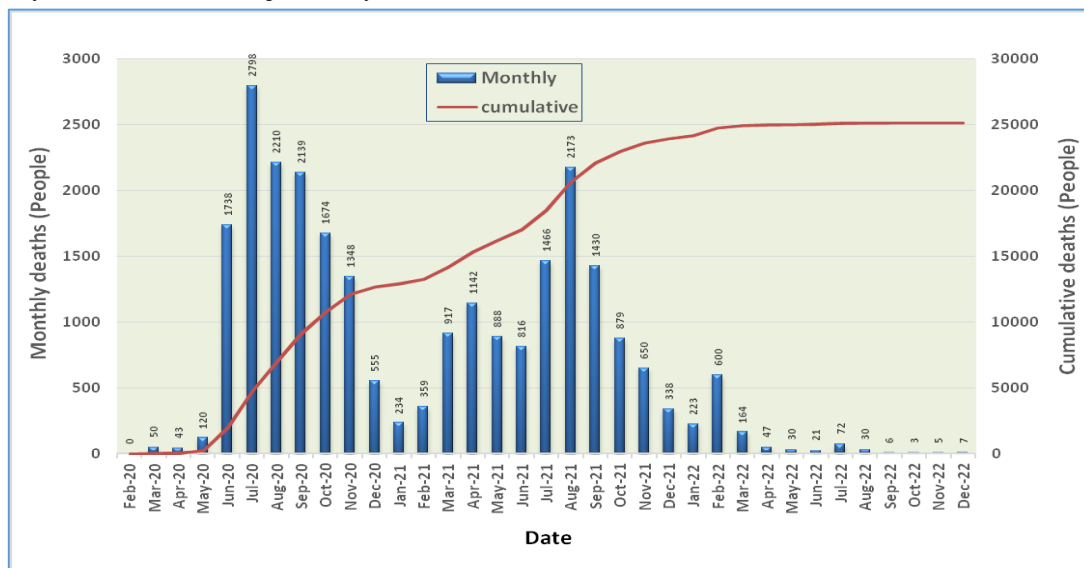


Figure 3: The monthly cumulative deaths from February 2020 to December 2022 in Iraq.

With the launch of various vaccines that aim to eliminate or reduce the infection rate, awareness has become not only about adhering to preventive measures, but the biggest role is taking doses of the vaccine. Vaccines entered Iraq approximately in the first quarter of 2021. Vaccine receipt rates were low until they reached their peak in November 2021 (Figure 4). We notice in the figure below an increase in the rates of receiving vaccines from August to November of the year 2021, and for the same period mentioned, the rate of infections decreased. While when the rate of receiving vaccines decreased in the first quarter of the year 2022, an increase in the rate of infections was observed.

The Ministry of Health's social media initiatives have significantly enhanced awareness and comprehension regarding COVID-19 in the UAE, amounting to 95% (Bhagavathula et al., 2020).

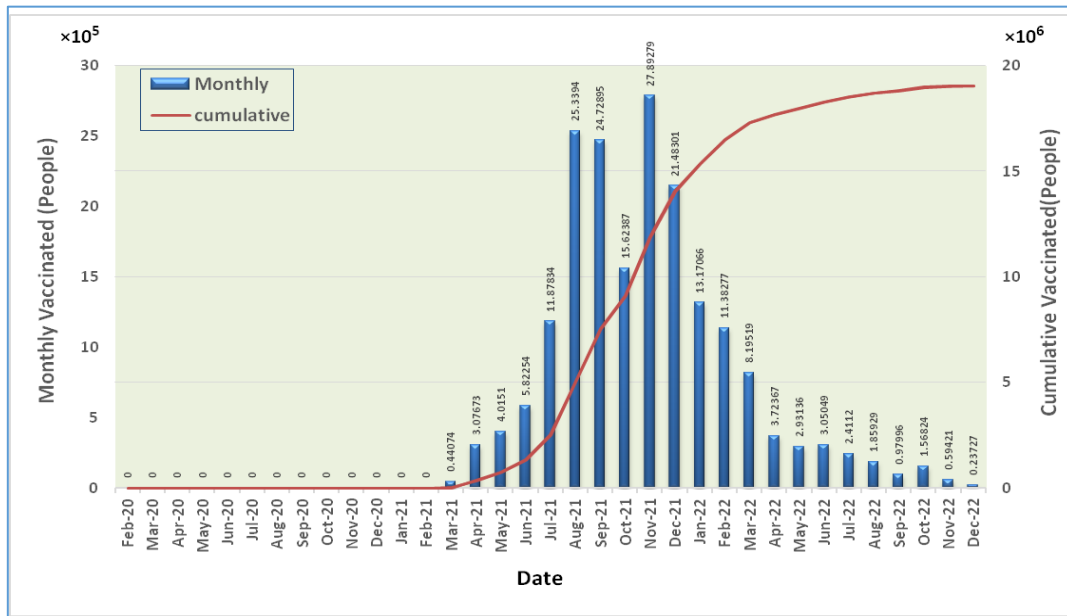


Figure 4: The monthly cumulative vaccinated from February 2020 to December 2022 in Iraq.

During the study period, data did not indicate that the Coronavirus is a chronic seasonal virus. The cumulative numbers of infected people varied during the study period. In 2020, the highest number of infections occurred in the fall season, in 2021, the highest number of infections occurred in the summer season, while in 2022 it was noted that the highest number of infections occurred in the winter season. This indicates that the Coronavirus in Iraq is non-seasonal, but what helps in its spread is its ability to mutate and not adhere to preventive measures. This is what we observed in the Table 1 and Figure 5.

Table 1: The cumulative number of infected people in four seasons in three years in Iraq

| Year \ Season | 2020 | 2021 | 2022 | Total | χ^2 -value | P-value |
|---------------|--------|---------|--------|---------|-----------------|---------|
| Winter | 42754 | 126861 | 211588 | 381203 | 1159349.66 | <0.001* |
| Spring | 6439 | 505867 | 25164 | 537470 | | |
| Summer | 224253 | 687162 | 128475 | 1039890 | | |
| Autumn | 320576 | 212169 | 4768 | 537513 | | |
| Total | 594022 | 1532059 | 369995 | 2496076 | | |

*Significant difference at P<0.01

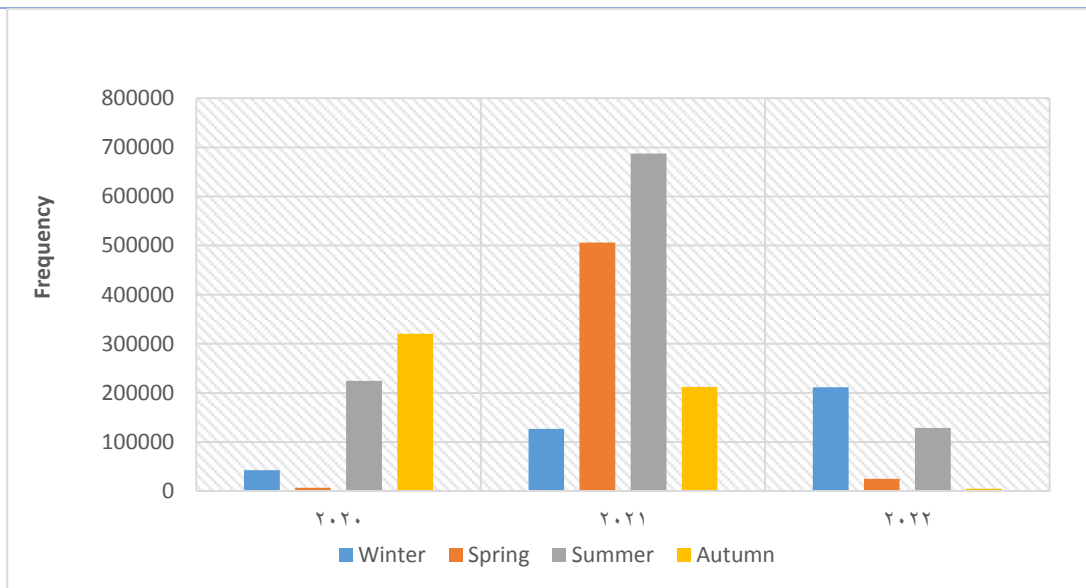


Figure 5: The cumulative number of infected people in four seasons in three years in Iraq.

As for the death rate, it was observed that the numbers increased significantly in the summer season, as the data showed that in the years 2020 and 2021, they were in the summer season, while the death rate in 2022 was variable and small in most seasons ((Table 2 and Figure 6).

Table 2: The cumulative number of death in four seasons in three years in Iraq.

| Year \ Season | 2020 | 2021 | 2022 | Total | X ² -value | P-value |
|---------------|--------------|--------------|-------------|--------------|-----------------------|---------|
| Winter | 555 | 931 | 830 | 2316 | 9019.82 | <0.001* |
| Spring | 213 | 2947 | 241 | 3401 | | |
| Summer | 6746 | 4455 | 123 | 11324 | | |
| Autumn | 5161 | 2959 | 14 | 8134 | | |
| Total | 12675 | 11292 | 1208 | 25175 | | |

*Significant difference at P<0.01

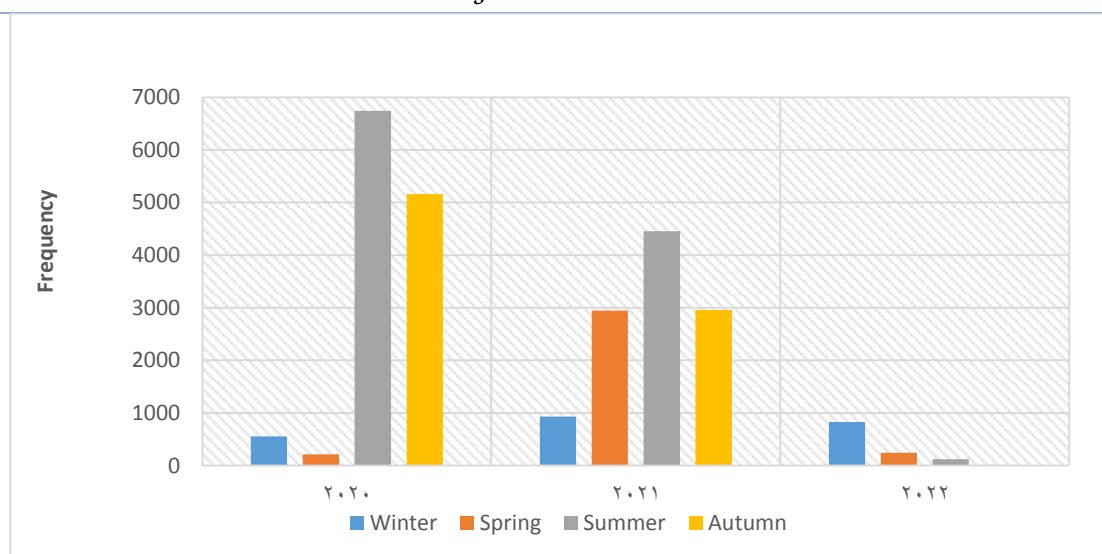


Figure 6: The cumulative number of death in four seasons in three years in Iraq.

conclusion

We conclude from this that the Corona virus is an advanced disease that appeared suddenly and as a result of the development of this strain, the number of deaths increased, which prompted the World Health Organization to declare it a global pandemic.

The increase in the number of infections and deaths is primarily due to the weak awareness among the general public, and this is what we noticed twice, once at the beginning of the epidemic, when people did not respond to the recommended preventive measures, and the other when the vaccines were announced, as many societies did not respond to taking the vaccines.

In Iraq, it was found that the Corona virus is a non-seasonal virus, meaning that its spread rate is not related to the change of seasons, but rather to several factors, including the health status and weak immunity of the host, in addition to the ability of the virus to mutate.

Recommendation

After conducting the research and reviewing its results, we recommend establishing long-term research centers and following up on all recommendations related to the spread of epidemics to avoid problems that occur when an epidemic occurs. At the same time, special hospitals should be established in at least every city that specialize in epidemic cases.

Support for the health sector by governmental and non-governmental agencies. We also recommend conducting many studies for each country on the Corona virus (number of infections, deaths, recovered and vaccinated) in order to know the status of each country before and after the epidemic in order to take the necessary measures to confront future epidemics if they occur.

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