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1COVID-19 Mortality in Kerbala-Iraq

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Abstract

Background: *COVID 19 pandemic hit the world in December 2019 and flourished to almost all countries in the following two years killing millions and billions were infected and impact on life and health. All people are affected, but augmented in those suffering chronic non-communicable diseases.*

Objective: *To describes the main epidemiological features of COVIUD-19 in Kerbala/Iraq during three years period.*

Methods: *All records of confirmed cases of COVID-19 over three-year period of time (2020-2022) were included. Data were compiled in an inventory containing numbers of cases confirmed by the Iraqi Ministry Of Health official outlets supported other available sources to affirm the consistency in numbers of daily cases. Epidemic curves, tables and figures were prepared using Excel sheets.*

Results: *A total of 97396 cases were reported. The annual distribution showed that most cases (59.7%) were in 2021 and August represented the month with greatest incidence where 26.8% of total cases happened. Males formed about 60% of the cases and the mean age of patients was 37.42±15.39 years. The case fatality of COVID 19 in Kerbala governorate was 0.99%. While 0.15 % of total patients were reported to have reinfection with COVID 19. While only 4756 patients (4.9%) had received at least one dose of the vaccine.*

Conclusion: *The behavior 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 behavior, population behavior and public health interventions.*

Keywords: COVID-19, Iraq, Kerbala, epidemiology, Corona

1. Introduction

COVID-19 pandemic has become the most critical global health emergency in this century and the greatest challenge for the human population. In December 2019, an outbreak of pneumonia of unknown origin was reported in Wuhan, Hubei Province, China. Pneumonia cases were epidemiologically linked to the Huanan Seafood Wholesale Market. The first wave of COVID-19 was so dangerous that almost no place on earth was saved from the impact of this epidemic, despite the differences in seasons; the southern hemisphere was affected later, but no less severely. In addition to being a global health emergency, COVID 19 pandemic have several critical effects in all fields of life, including; environmental, socio-economic, and cultural and even political aspects [1].

The virus genome analysis through inoculation of respiratory samples into human airway epithelial cells, Vero E6 and Huh7 cell lines showed it to be a novel coronavirus related to SARS-CoV, named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2].

The World Health Organization (WHO) to declare a pandemic on 11 March 2020, since the disease has a global impact, affecting more than 200 countries, and it has gotten out of control, with well over one million cases and causing over 60, 000 deaths worldwide by the beginning of April 2020. The toll had reached to over 605 million confirmed cases and 6 million deaths globally as of September 2022. In Iraq a total of 2,465,545 confirmed cases and 25,375 deaths were reported till 29th July 2023 [3].

The transmission of SARS-CoV-2 typically occurs by respiratory droplets with an average incubation period is 6.4 days. The late findings about the virus spreads through close contact and by small droplets produced during cough, sneeze or talk, urged most of countries to respond with preventive measures through health advocacy campaigns, lockdowns and restricting public

gatherings [4]. The presenting symptoms include fever, cough, dyspnea, myalgia and fatigue. The majority of patients tend to have a mild illness; however minorities of patients develop severe hypoxia requiring hospitalization and may need mechanical ventilation. Management of patients is mostly supportive, but several direct anti-viral agents, and immunomodulatory therapy with steroids and various cytokine blockers were tried in early phase of the pandemic [5]. As a result the WHO was leading some form of lockdown across almost all countries of the world. The extent of the global pandemic due to COVID-19 had a significant impact on humanity. The COVID-19 global lockdown was initiated to stem the spread of the virus and 'flatten the curve' of the pandemic. However, the COVID-19 pandemic lockdown on crucial aspects of daily life globally, including; Food security, Global economy, Education, Tourism, hospitality, sports and leisure, Gender Relation, Domestic Violence/Abuse, Mental Health and Environmental air pollution [6].

The world has paid a high toll in this pandemic in terms of human lives lost, economic repercussions and increased poverty. With millions of confirmed cases worldwide, a comprehensive understanding of the risk and protective factors for COVID-19 will be helpful for the prevention of disease infection, progression, and adverse outcomes in infected patients [7].

In addition to unprecedented mortality and infection rates, COVID 19 pandemic has also caused major anxieties and social problems all over the world. The major factors that can contribute to urban social resilience during the COVID-19 pandemic include: social cohesion, resource accessibility, and, people participation and lawfulness, social resilience frameworks control, social capital [8].

The social media may play strong negative or positive role in this respect through supportive activities which can play an important role in promoting social resilience and its dimensions, such as the robust formation of social networks, social capital and trust and the recognition of social values and norms. All these improve social cohesion and might create high levels of resilience in the communities [9, 10].

The mutations of the virus were one of the challenges. However, the higher the infections rates, the higher chances of mutations. The mutation process will support the virus to survive and proliferate and virus evolutions will not be controlled even if the herd immunity being approached and do not keep restrictions. It is worth mentioning that the rate of cases and death in Africa, except in South Africa, was lower. This may be due to the low average age and Ebola disease some years ago, which helped to experience and decrease the problem [11].

Risk factors for developing COVID-19 in adults range from demographic factors, such as older age, male sex, and ethnicity, to the presence of underlying diseases such as cardiovascular diseases, hypertension, and chronic obstructive pulmonary disease (COPD).

Elderly individuals often have more comorbidity. In addition, weaker immune defense against infectious diseases and aging-related chronic pro-inflammatory status of the immune system with persistent low-grade innate immune activation may increase tissue damage caused by infections in the elderly [12]. A meta-analysis of 59 studies comprising 36,470 patients showed that men had a higher risk of infection, disease severity, intensive care unit (ICU) admission, and death than women. Overall, men had a statistically significant 8% higher risk of being diagnosed with COVID-19 than women [13].

In this long-lasting pandemic, efficacious COVID-19 vaccination was the most critical strategy to induce a protective immune response and may thus be the only way to prevent the spread of infection and the progression to severe disease and death from this disease [14].

A comparative study had suggested that countries with a low intensity of strictness have lower average confirmed cases and fatality rates related to COVID-19 than countries with high strictness in containment policies (confirmed cases are 24.69% vs. 26.06% and fatality rates are 74.33% vs. 76.38%, respectively, in countries with low and high strictness of COVID-19 public policies of containment) [15]. However, the researcher did not take the possibility that a low intensity of strictness might be a result and not a potential cause of lower COVID 19 impact.

In Iraq surrounding countries, for example in Iran more aggressive waves of outbreaks hit the country with higher incidence and mortality rates, with the majority of cases were in the age group of 50–60 years of old, male-to-female ratio was 1.93:1, and with a significant association with age, gender and the impact comorbidities on the mortality. The Case Fatality Rate among understudy cases was 8.06 % was reported in February 2020 [16]. The total officially reported deaths directly related to COVID-19 in Iran between December 2019 and March 2022 was 139,610 deaths; while a study used statistical models and estimated deaths as being double this figure at 308,486 [17]. While a study in April 2020 used multivariable regression models and demonstrated rising odds of in-hospital death related with age (odds ratio (OR) = 1.055, $p = 0.002$), levels of C-reactive protein (CRP) (OR = 2.915, $p < 0.001$), creatinine (OR = 1.740, $p = 0.023$), lymphocyte count (OR = 0.999, $p = 0.008$), and magnesium level (OR = 0.032, $p < 0.001$) on admission [18].

In Iraq, the epidemic started in on 24th of February 2020 when a case was reported in Najaf governorate. Then, the number of daily reported cases has continued to gradually increase over time, till 7thJune, the total number of COVID-19 cases reached 12,366,2 but the number has soared to almost four folds (47,151) on the 29th of June 2020.3?? The pandemic affected all the Iraqi provinces with variable incidence and deaths. Quite early on, the National Task Force Committee and the health authorities took variety of measures to contain the epidemic, such as halting air travel to and from affected countries, restricting population movement, promoting social distancing, closing all schools and universities and advising the public to practice personal protection by using face masks and maintaining personal hygiene [19].

A case series study was conducted in hospital in Baghdad, from October 2020 to December 2021 among 150 cases of confirmed COVID 19 infection by polymerase chain reaction of throat or nose swab. There were 86 (57.3%) patients who developed coag-

ulopathy during the follow up period and 46.7% of total patients died. There was a significant association between developing coagulopathy with higher risk group and death in COVID 19 patients ($P < 0.05$), while age and gender did not demonstrate a significant association [20]. A study in Basrah (southern border) in April 2020 among 152 cases reported a mean age of 45 year with no gender difference. The researchers compared different Iraqi governorates incidence and indicated that the highest number of cases were reported in Baghdad, Najaf, Erbil, Basrah and Sulaymaniyah. The lowest incidence rate was in Salah Al-Din (0.61 per million) and the highest was in Najaf (170.16 per million). The study reported the incidence rate in Kerbala at intermediate level of 63.2 per million [21]. Almost similar rates for cases and deaths in Iraqi governorates were also reported in a similar study 28th April 2023 where the number of cases and deaths in Kerbala governorate was reported at 79, 6; respectively. But the number of cases jumped to 54 000, and deaths to 22000 at the beginning of July 2020 [22]. Next; an epidemiological study analyzed COVID 19 cases in Iraq during one year and concluded that the results at national and governorate levels showed an early low scale incidence rate with wavy pattern, with two major waves. The first started by the end of May 2020, while the second by the end of January 2021. The incidence across different governorates was fluctuating with no uniform feature. The national cause specific mortality rate was estimated to be 347.29, while the rate for Kerbala governorate at 450.91 [23].

Two case series studies were published in Iraq, the first during three months period (March till May 2023) in a hospital in Baghdad among 797 admissions with confirmed positive cases of 393, and 30 deaths. The study reported a rising trend as the hospital reported 49 positive cases in March, 92 positive cases in April, and 238 positive cases in May 2023 [24]. While a case series study of 49 cases in the early three months phase of the epidemic in a southern study (Thi-Qar) indicated that majority (79.6%) of cases were mild and (18.4%) moderate while only (4%). The median age of the patients was 37 year and most affected age group was 14-26 year. The study followed transmission and reported that familial transmission formed 80.4% of cases [25].

This study aims to provide an extensive epidemiological picture of COVID 19 epidemic in Kerbala/ Iraq which is expected to reflect the national characteristics of the pandemic impact in Iraq.

2. Materials and Methods

This descriptive study used data and records of confirmed cases of COVID-19 over three-year period of time (2020-2022). Double checked data were compiled in combination with the inventory containing numbers of cases confirmed by the Iraqi Ministry of Health official outlets and was supported other available sources to affirm the consistency in numbers of daily cases of COVID 19.

The collected data included age, gender, occupation, address, year, month, date, re-infection, and vaccination status. Analysis was through plotting epidemic curves, tables and figures were using Excel sheets and SPSS-23 software at a significance level of < 0.05. Prior to conduct the study, ethical approved was obtained from the Ethical Committee of Kerbala Health Directorate.

Descriptive epidemiology used frequency and percentage distribution tables and figures to describe the main demographic characteristics of the patients. In addition, statistical test such as t-test was used to detect significant mean differences and Chi-squared test to compare the association of different proportions.

3. Results

A total of cases 97934 cases of COVID 19 patients were reported in Kerbala governorate since the beginning of the pandemic in Karbala in March 2020 till 31st December 2022. The majority (99.1%) of patients were from Kerbala governorate, while small minority was from other governorates in addition to 30 foreigners.

The annual distribution showed that most cases (59.7%) were in 2021 where the pandemic flourished the globe (figure 1).

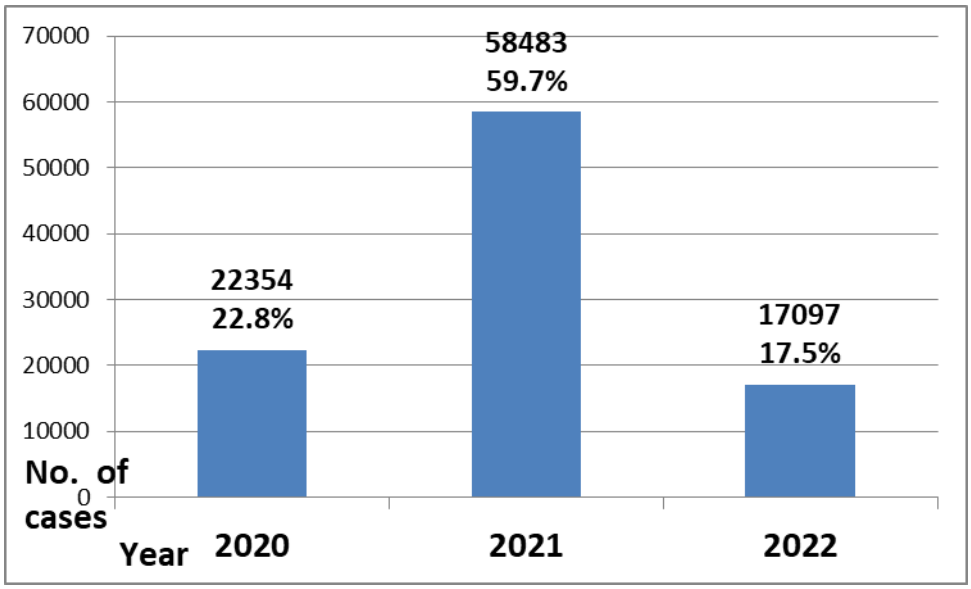


Figure 1: The annual distribution of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934)

The gender distribution of COVID 19 patients showed that males formed about 60% of the cases (figure 2). Male to female ratio was 1.42: 1.

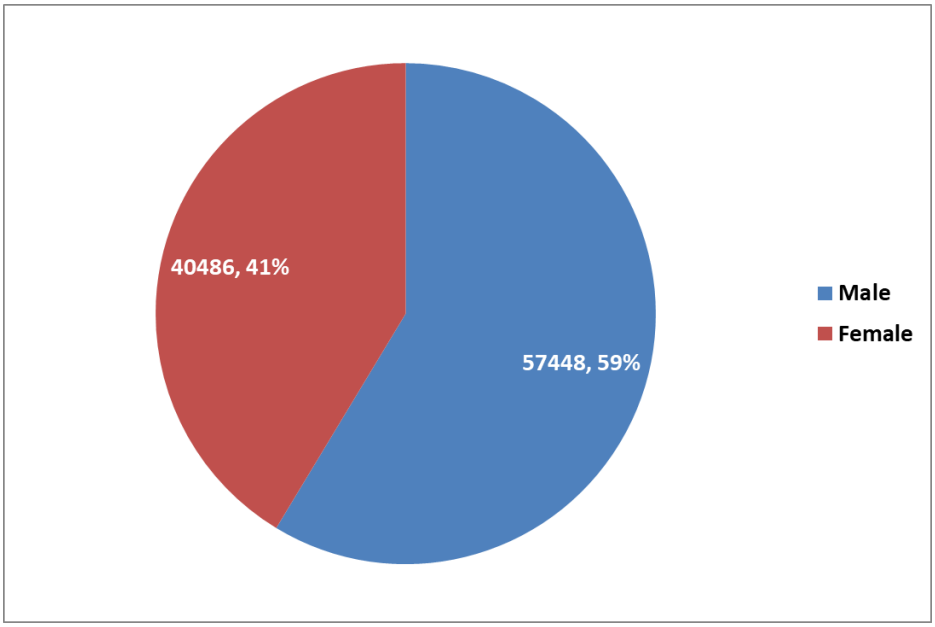


Figure 2: The gender distribution of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934)

The age distribution of COVID 19 patients showed that the mean age of patients was 37.42±15.39 years with highly significant gender difference 38.02±14.94 years for males 36.59±15.94 years for females, p<0.001). For age group distribution; more than two fifths (42.6%) of cases were 40 years old or more while a small minority (10.4%) were below 20 years of age (figure 3).

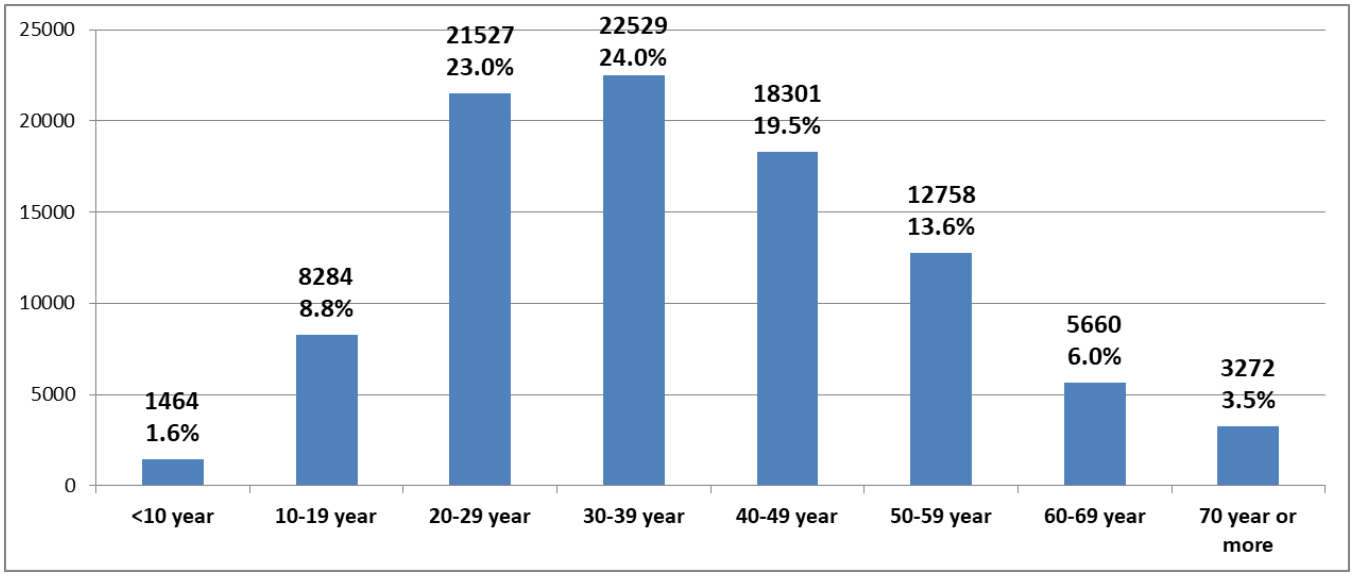
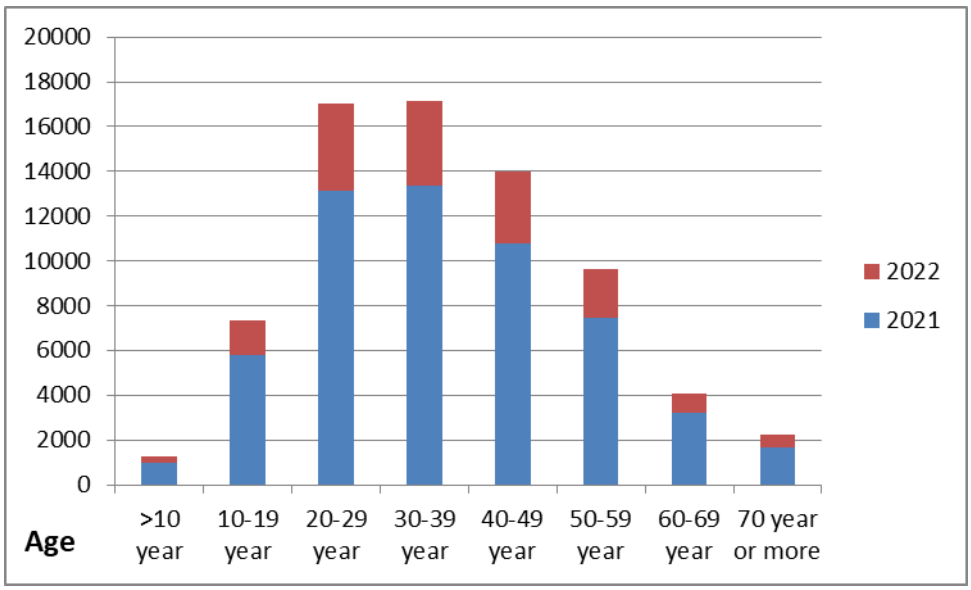


Figure 3: The age group distribution of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934).

Comparison of age distribution of COVID 19 cases between 2021 and 2022 showed highly significant differences where age was shifted to more young aged patients (figure 4).



p< 0.001

Figure 4: The age group distribution of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934)

The gender distribution by age group showed highly significant differences p < 0.001, (figure 5).
For occupation, 22203 were housewives, 18551 were farmers, 15497 were in military service, 14954 were health care workers (including 27of them were ambulance drivers), 924 were children and 80 were retired patients.

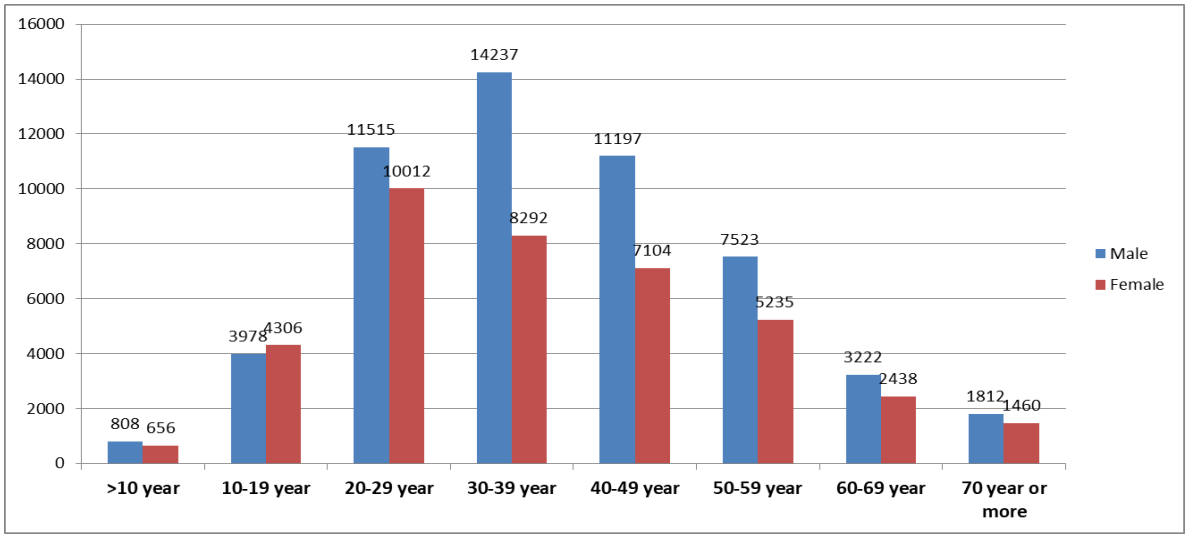


Figure 5: The gender distribution by age group of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934).

The gender distribution by deaths showed higher mortality rate among males (1.03%) in comparison to females (0.94%), however the difference was not statistically significant (p=.165). When this difference was compared for each year reported COVID 19 cases, the highly significant gender difference in case fatality was confined only to COVID 19 mortality in 2020, while no significant difference was detected in 2021 and 2022.

The monthly distribution of COVID 19 cases by month showed that August represented the month with greatest incidence where 26.8% of total cases happened (Figure 6).

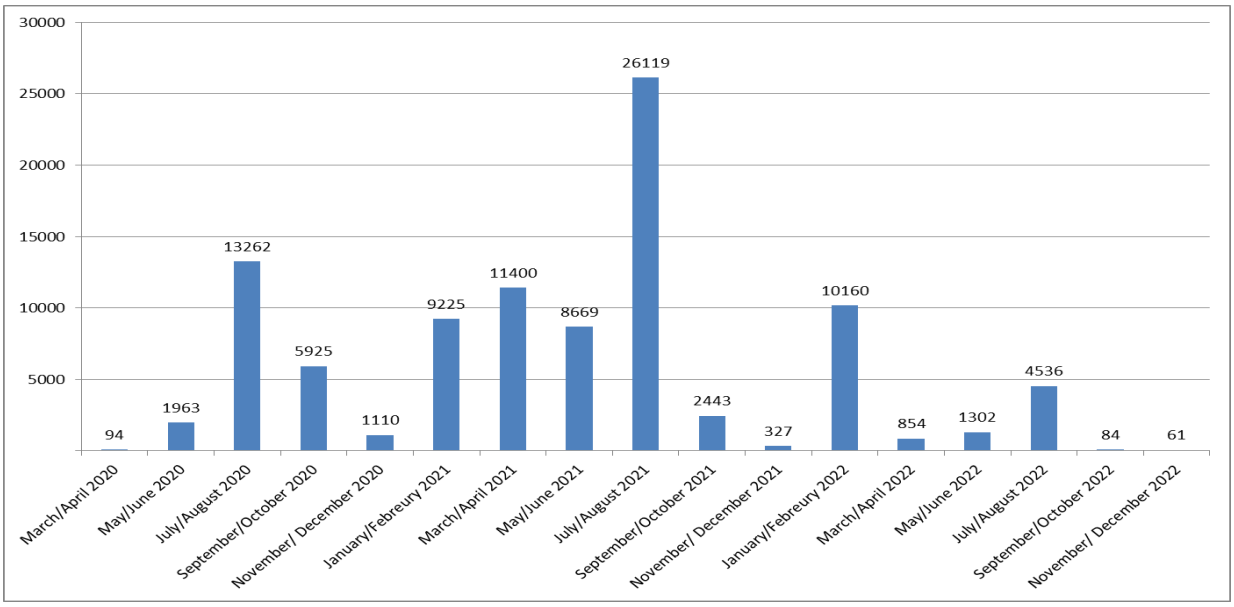


Figure 6: The monthly distribution of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934).

The Epidemic curve of incidence showed three main outbreaks and the highest was the last in midyear of 2022 was associated with religious festival in July 2022 (figure 3). The religious occasions and festivals in Iraq with wide spread mass gathering and social visits (Eid Al Fiter 3rd May 2022, Eid Al Adha 10th July 2022, Ashoraa 9th August 2022 and Arbaeen Day 20th September 2022) seemed to be greatly associated with raised incidence curves (figure 7).

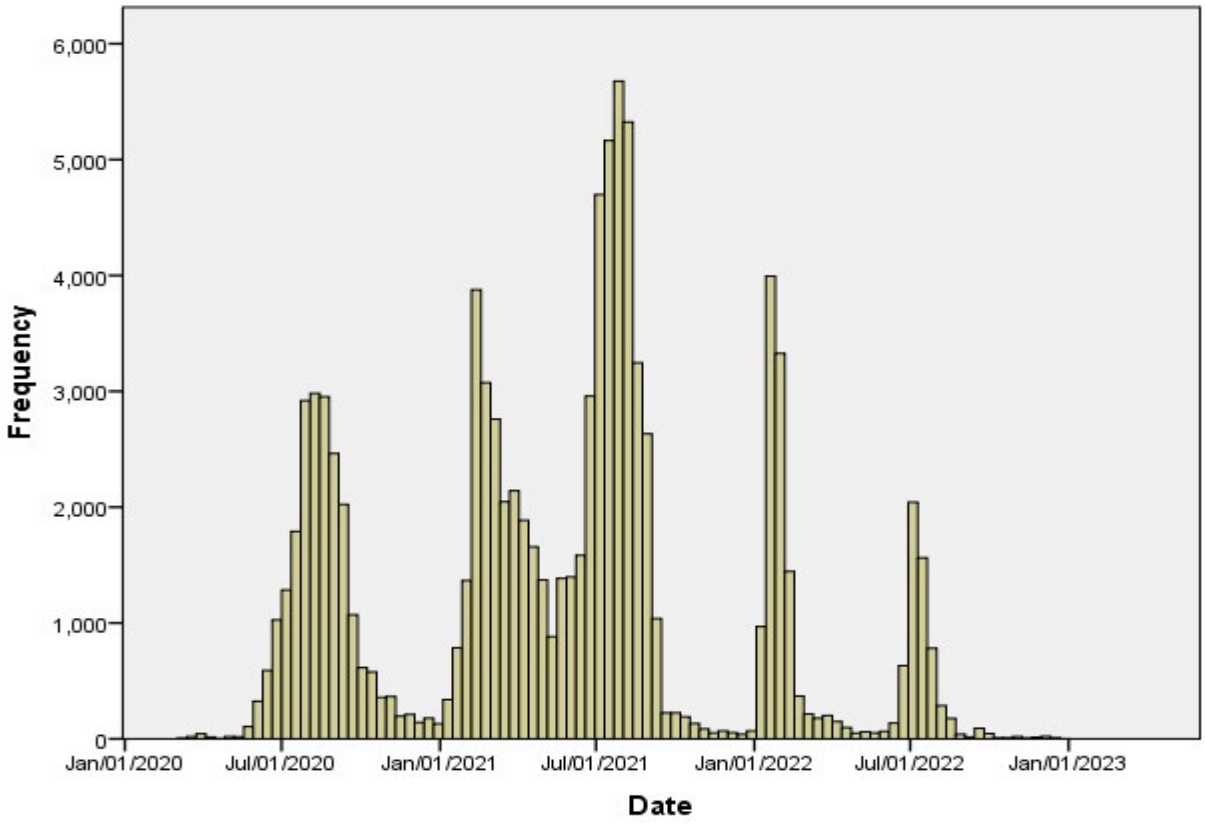
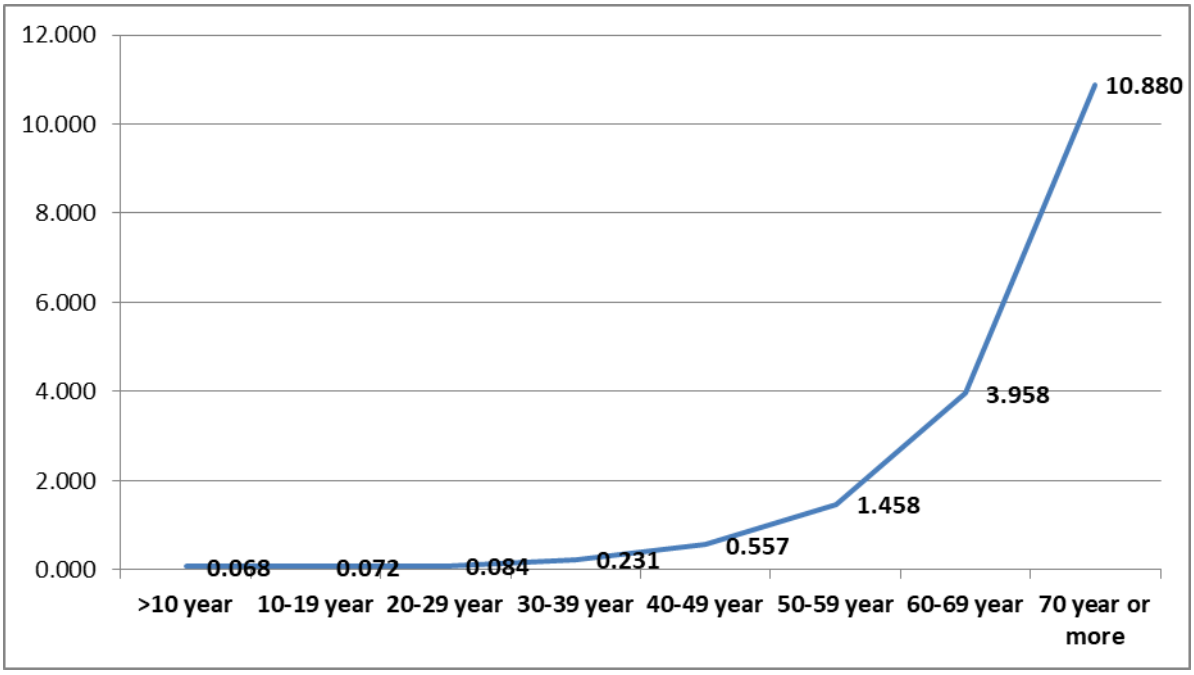


Figure 7: The epidemic curve of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934).

The case fatality of COVID 19 in Kerbala governorate was 0.99% of total cases or at a rate of 985.4 per 100 000 case. Total deaths were 968 deaths, with 87.0% happening in the hospital (842 deaths). The annual distribution showed that the highest case fatality (2.4%) was in 2020, while it showed a decreasing trend to (0.7%) in 2021 and (0.3%) in 2022.

A highly significant positive association of case fatality with age was found (figure 8), while no significant gender difference was observed (p=0.165).



p<.001

Figure 8: The association of case fatality with of COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934).

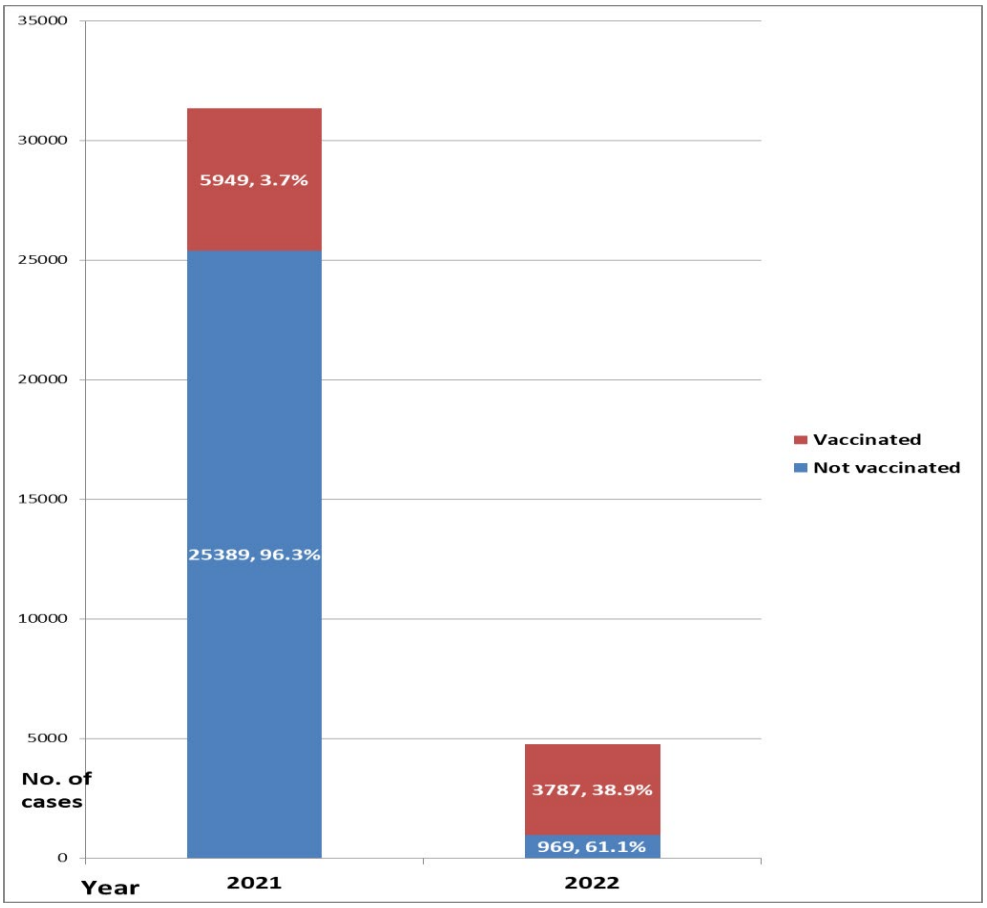
Similarly, highly significant differences were found in the case fatality rates between the years and a reduced trend case fatality rate was clear (table 1).

Year	Recovery	Death	Total
2020	21828 (97.6%)	526 (2.4%)	22354 (100.0%)
2021	58086 (99.3%)	397 (0.7%)	58483 (100.0%)
2022	17052 (99.7%)	45 (0.3%)	17097 (100.0%)
Total	96966 (99.0%)	968 (1.0%)	97934 (100.0%)

p < 0.001

Table 1: Annual distribution of case fatality among COVID 19 patients in Kerbala governorate from the start of the epidemic till the end of 2022 (n=97934).

The vaccination against COVID 19 in Iraq started in April 2021. The vaccination status of the patients showed that only 4756 patients (4.9% of total patients or 13.2% of patients with known vaccination status) were vaccinated with two doses of vaccine and 143 patient were vaccinated with one dose of vaccine of different types, while the remaining were rather not vaccinated or their vaccination status was unknown. About two fifths of patients had reported being vaccinated in 2022 compared to only 3.7% in 2021 (figure 9). Most vaccinated patients were vaccinated with Pfizer vaccine which is the most widely used vaccine in the country, while a very small minority (<20 patients) received other types of vaccines (Astra-Zeneca or Sino pharm vaccine).



p < 0.001

Figure 9: The distribution of vaccination status of COVID 19 patients in Kerbala governorate from April 2021 till the end of 2022 (n=36094).

The vaccination status was highly significantly associated with gender and age. Gender difference was towards males (13.8 vs. 12.4, table 2).

Gender	Vaccination status		Total
	Not vaccinated	Vaccinated	
Male	17334 (86.2%)	2766 (13.8%)	20100 (100.0%)
Female	14004 (87.6%)	1990 (12.4%)	15994 (100.0%)
Total	31338 (86.8%)	4756 (13.2%)	36094 (100.0%)

p< 0.001

Table 2: Vaccination status association with gender among COVID 19 patients in Kerbala governorate from April 2021 till the end of 2022 (n=36094)

A small minority (149 patients, 0.15 % of total patients) were reported to have reinfection with COVID 19. Females formed 45.6% of the reinfection cases, while males formed the remaining 54.4% of cases. Reinfection was highly significantly associated with age group (p<.001).

Among female patients; the reinfection cases formed 0.141%, while among males; the reinfection male cases formed 0.168% of cases, however the distribution showed no significant gender difference (p=0.286).

4. Discussion

The global pandemic of COVID-19 is the biggest health threatens faced by the world and health authorities in almost all countries and its effect will continue for years. However, its possibly the biggest lesson and experiment to learn from and being prepared for similar pandemics which may occur in future as some expect [4, 5]. The spread and infection rate amongst countries and regions of the world has continually been on the rise. A weekly report of the European Centre for Disease Prevention and Control (ECDC) as of the 18th of February 2021 accounts for 109,206,497 reported cases and a total of 2,407,469

deaths recorded in 219 countries, territories, and International conveyance [6]. Till the end of July 2021, almost 197 million COVID-19 cases have been registered, resulting in around 4.2 million deaths. Recent indices (till March 2023) indicated more than 650 million cases and over 6 million deaths, globally [26].

The trend of an increasing incidence largely followed exponential growth, and the mean basic reproduction number (R0) was estimated to range from 2.24 [95% confidence interval (CI) 1.96–2.55] to 3.58 (95% CI 2.89–4.39), associated with two- to eight-fold increases in the reporting rate [27]. The effect of rumors and false news; especially on social media was marked at early stage of the pandemic [9, 10].

The world has largely now adopted a 'living with COVID 19 policy. The virus remains and so does advice on vaccines and isolating when ill, but we've otherwise said goodbye to travel restrictions, lockdowns, and most mask mandates. The poorer clinical outcome in COVID-19 infected patients may have related to the presence and number of co morbidities especially hypertension, diabetes and cardiovascular diseases. The case fatality rate of 0.99% is consistent with global index, however it is much lower than (1.91) a nearby country (Iran) [26].

In the present study male formed 58.66% of cases total COVID 19 patients, which agrees with many studies that reported higher rate of infections among males. A meta-analysis of 59 studies comprising 36,470 patients showed that men had a higher risk of infection, disease severity, intensive care unit (ICU) admission, and death than women. Overall, men had a statistically significant 8% higher risk of being diagnosed with COVID-19 than women [13]. However, no significant gender difference was observed in case fatality rate in the present study.

The annual distribution of cases showed that the peak incidence of cases was in 2021, while deaths were more in 2020. However, the increase in cases could be explained by the limited number of PCR tests done at the beginning of the pandemic which was just few tests daily that sent to the capital (Baghdad) while after one year most logistic problems were solver and more than 2000 tests were done daily in Karbala.

The higher deaths in 2020 could be related to more severe strains of the virus at 2020 and possibly to lack of treatment, shortage in oxygen, ventilators and many instruments in the beginning of the pandemic in 2020 and also could be a result of the vaccination initiated in March 2021 in Iraq.

The results of the present descriptive study had indicated that aged people were more vulnerable to severe pattern of COVID-19 disease, and fatality than people younger than 50 year; probably because of health issues and comorbidities in this population group. On the other hand, children might be less probable to infected or might show mild symptoms if infected. In addition, male were affected more than female by COVID-19.

The late findings about the virus spreads through close contact and by small droplets produced during cough, sneeze or talk [4], urged most of countries to respond with preventive measures through health advocacy campaigns, lockdowns and restricting public gatherings. An estimated total of 542,387,620 confirmed cases and 4,637,274 in the world, while in Iraq a total of 2,465,545 confirmed cases and 25,375 deaths were reported till 29th July 2023 [3].

A comparative study had suggested that countries with a low intensity of strictness have lower average confirmed cases and fatality rates related to COVID-19 than countries with high strictness in containment policies (confirmed cases are 24.69% vs. 26.06% and fatality rates are 74.33% vs. 76.38%, respectively, in countries with low and high strictness of COVID-19 public policies of containment) [15]. However, the researcher did not take the possibility that a low intensity of strictness might be a result and not a potential cause of lower COVID 19 impact.

The disease pandemic in Iran showed serious severe impact. The outbreak began in Iran after the detection of the first death associated with COVID-19, on Feb 19, 2020 in Qom, a holy city in central Iran. After a short period, COVID-19 has widely spread in all other provinces in Iran. As of April 21, 2020, of 330 137 tested patients, 80 868 people have been infected with COVID-19. Of them, 55 987 people have recovered, 3513 people are critically ill and 5031 people have died [28]. A review study suggested the probable causes of successive waves to the significant delay in vaccine administration, the collective overwhelming fallacy toward immunization, the poly-pharmacy controversy, noticeable decrease in the public's resilience and inadequate community-based participation in risk reduction [29]. A model estimate reported that an increase in the percentage of population using masks to 95% might prevent 26,790 additional deaths by the end of year 2020 [30].

In this long-lasting pandemic, efficacious COVID-19 vaccination was the most critical strategy to induce a protective immune response and may thus be the only way to prevent the spread of infection and the progression to severe disease and death from this disease [14]. However, some patients (4.9%) were vaccinated. But case fatality was significantly higher among non-vaccinated patients (0.7 vs. 0.1, $p<.001$).

In Karbala and Iraq the vaccination coverage was low and far below target (around 20% need to look for reference), though availability of the vaccine in mid of 2021. As many people were reluctant to take the vaccine due to the wide scale advertised rumors and misinformation [9].

5. Conclusions and Recommendation

This descriptive large study had indicated the main epidemiological characteristics of COVID 19 epidemic in Kerbala/Iraq which might be inferred to the national disease epidemic. The gender and age distribution findings are consistent with global pandemic indices. However, the obvious lower impact of the pandemic in Iraq still needs further investigations. Mortality rate of <1% is also lower than the rate reported in an adjacent country (Iran), and this also had remained as unresolved puzzle.

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