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Mortality rates among vaccinated and unvaccinated covid19 patients in Duhok hospitals, Kurdistan Region, Iraq

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Abstract

Background and objectives: The corona virusvaccines are important in controlling the pandemic. In Kurdistan Region of Iraq three types of vaccines are available; Pfizer, AstraZeneca and SinoPharm. The objectiveof the study was to determine the effect of vaccine on severity and mortality rate among Covid-19 cases in Duhok, Iraq.

Methods: In this Prospective study, 470 of hospitalized covid19 cases in Duhok, Iraqi Kurdistan between 1st june 2021 to 1st june 2022 were enrolled. Demographic parameters including age, sex, and past medical history of chronic diseases were taken. The severity of cases was assessed based on respiratory rate, oxygen saturation, and percentage of chest involvement by CT scan. The types and doses of vaccines received by patients were recorded. The patients were followed-up by the outcome (recovered and discharged from the hospital or dead).

Results: The mean age of the patients was 64.98 years. The males were (51.49%, n=242) and females (48.51%, n=228). The majority of them did not receive any type of vaccines (81.49%, n=383). Most of the vaccinated patients received Pfizer vaccine. In term of Covid-19 severity, the study showed (65.75%, n=309) had mild-moderate disease and (34.26, n= 161) had severe disease. Moreover, the mortality rate was lower among vaccinated patients compared with unvaccinated patients 24.14% to 40.73% respectively. The study revealed that having the severe cases and being old were considered the main independent predictor of mortality among the patients (p value <0.0001).

Conclusions: Vaccinated patients had lower chance of severe chest involvement, oxygen requirement and death rate compared to unvaccinated patients in our study.

Keywords: Coronavirus, Covid-19 vaccine, Covid severity, Mortality rate

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Introduction

The coronavirus is a cause of pandemic infection worldwide.[1]Covid-19 emerged in December 2019 in Wuhan city,China and it was declared as pandemic infection by WHO in the beginning of 2020.[2] Coronavirus commonly presented clinically as fever 83%, cough 82% and shortness of breath 31% and pneumonia.[3-5] Covid-19 patients might have lymphopenia, high white blood cell, elevated C-Reactive proteinand high lactate dehydrogenate.[6] Initial high C-reactive protein used as independent marker for a severe infection.[7]The predictors of mortality were based on interleukin 6 and serum ferritin levels; which reflect severe inflammation due to infection.[8]

As the disease progressed to pandemic new treatments became available such as antiviral, monoclonal antibodies and vaccines.[9]For controlling the rapid spread of corona virus, countries took many precaution measures like social distancing, self-quarantine of suspected and positive cases, limitation of travelling, using mask and strict lock down, and at the end vaccines were emerged as effective solution for reducing coronavirus spread[10,11]. Many types of vaccine have been developed and most of them are valuable in decreasing severity and hospitalization. The two mRNA vaccines, Pfizer and Moderna, authorized by the U.S. Food and Drug Administrationand recommended by the Centers for Disease Control and Prevention, are generally safe and very good at preventing serious or fatal cases of Covid-19.[12,13] The risk of serious side effects associated with these vaccines small.Within 12 months of data, including data from tens of thousands of participants in clinical trials, show that the vaccines are safe and effective at preventing serious disease or death due to COVID-19 and the Chinese SinoPharm vaccine according to available data is effective and safe at the same.[14]In Iraq since thebeginning of the Covid-19 pandemic on 3 January 2020 till 11 November 2021, the number of coronavirus positive cases and mortality were 2,066,042 and 23,415, respectively. By 2nd of November 2021, (9,632,835)Iraqi people have being vaccinated.[15]In Kurdistan region of Iraq three types of effective Covid-19 vaccines are available; Pfizer, AstraZeneca and SinoPharm.[16] The aim of the study was to estimate impact of Covid-19 vaccines on severity and mortality rates ofhospitalized Covid-19 cases in Duhok, Iraq.

Patients and methods

In this Prospective study, 470 Covid-19 patients who were admitted to two main Covid19 hospitals in Duhok province, Iraqi-Kurdistan between 1st of June 2021 to 1st of June 2022 were included.

The required parameters were taken from the patients/ their families included age, sex, past medical histories of chronic diseases. In addition, we assessed the patient severity based on respiratory rate, oxygen saturation, percentage of chest involvement, and oxygen supplies used by patients. All related information to vaccines received by the patients including types of vaccines and doses had been taken.

The formal permission was obtained from the hospital's administrations and verbal consent of patients or their facilities. The hospitals administrations were given a guarantee to protect the confidentiality of the patients' information of the patients according to the modified Declaration of Helsinki.

The diagnosis of the patients who were admitted to the mentioned two hospitals was confirmed by real time PCR test. The demographic and clinical parameters including age, sex, oxygen supplement need and history of chronic diseases (hypertension,

diabetes mellitus, ischemic heart disease, stroke, chronic obstructive pulmonary disease, bronchial asthma and malignancies) were recorded.

The severity of the disease was determined based on clinical features and radiological chest findings. The mild-moderate cases had a fever and respiratory symptoms with radiological findings of pneumonia and majority of them requiring nasal, simple mask or reservoir mask oxygen, and the lung involvement was (<50%). The moderate-severe cases have the following criteria; (1) respiratory distress (≧30 breaths/min); (2) oxygen saturation≤93% at rest; (3) respiratory failure and requiring mechanical ventilation, and the lung involvement was (>50%). The patients were followed-up by the outcome (recovered and discharged from the hospital or dead).

The rate of vaccination and mortality rate among unvaccinated and vaccinated patients were determined in number and percentage. The rate of severity and mortality among patients with different characteristics in both vaccinated and unvaccinated was assessed by Pearson Chi-squared test. The predictors of mortality were examined in a nominal logistic regression. The uncertainty was determined in a 95% confidence interval (CI). The level of difference in a p-value <0.05 was considered a statistically significant difference. The statistical calculations were performed using JMP Pro 14.3.0 and Microsoft Excel 2013. The protocol of the study was approved by the ethical committee of the Kurdistan board of Higher Council of Medical Specialties. (The number of orders was 66 in 11th of Jan. 2022).

Results

The mean age of the patients was 64.98 years. The males were (51.49%, n=242) and females (48.51%, n=228). The ages of majority of patients were between 60- 69 (27%, n= 127). Most of the cases did not receive Covid vaccines (81.49%, n=383). The vaccinated cases commonly received Pfizer vaccine 10.85% as shown in Table (1).

Table (1): General characteristics of patients

General characteristics (n=470)		
	No.	%
Age (17-98 years)	64.98	15.76
Age groups		
17-29	10	2.13
30-39	27	5.75
40-49	34	7.23
50-59	67	14.26
60-69	127	27.02
70-79	105	22.34

80-89	74	15.75
90-99	26	5.53
Gender		
Male	242	51.49
Female	228	48.51
Medical history		
Asthma	5	1.06
Chronic obstructive pulmonary disease (COPD)	1	0.21
Stroke	9	1.92
Diabetes mellitus	25	5.32
Hypertension	59	12.55
Ischemic heart disease	29	6.17
Malignancy	10	2.13
Multi-chronic disease	189	40.21
No chronic disease	143	30.43
Severity		
<50%	309	65.75
>50%	161	34.26
Oxygen supply		
Mechanical ventilation	88	18.72
	24	5.11
Nasal cannula	195	41.49
Reservoir mask	163	34.68
Simple mask		
Mortality		
Recovered	293	62.34
Dead	177	37.66
Types of vaccine		

AstraZeneca	22	4.68
Pfizer	51	10.85
SinoPharm	14	2.98
Unvaccinated	383	81.49

Comparing between vaccinated and unvaccinated patients, the study found that the ages of most of the unvaccinated group were more than 70 years old. They were having more co-morbidities, more severe chest involvement and requiring more oxygen supplement compared with vaccinated group, it showed significant comparison (p value < 0.05) between two groups as shown in Table (2),

Table (2): characteristics of unvaccinated and vaccinated patients.

Characteristics (n=470)	Vaccination		p value (two-sided)
	Unvaccinated (383, 81.49%)	Vaccinated (87, 18.51%)	
Age groups			
17-29	8 (2.09)	2 (2.30)	
30-39	20 (5.22)	7 (8.05)	
40-49	25 (6.53)	9 (10.34)	
50-59	53 (13.84)	14 (16.09)	0.010
60-69	98 (25.59)	29 (33.33)	
70-79	90 (23.50)	15 (17.24)	
80-89	66 (17.23)	8 (9.20)	
90-99	23 (6.01)	3 (3.45)	
Gender			
Male	189 (49.35)	53 (60.92)	0.051
Female	194 (50.65)	34 (39.08)	
Medical history			0.033
No chronic disease	105 (27.42)	38 (43.68)	

Asthma	5 (1.31)	0 (0.00)	
COPD	1 (0.26)	0 (0.00)	
Stroke	9 (2.35)	0 (0.00)	
Diabetes mellitus	24 (6.27)	1 (1.15)	
Hypertension	45 (11.75)	14 (16.09)	
Ischemic heart disease	26 (6.79)	3 (3.45)	
Malignancy	8 (2.09)	2 (2.30)	
Multi-chronic disease	160 (41.78)	29 (33.33)	
Severity			
<50%	243 (63.45)	66 (75.86)	0.027
>50%	140 (36.55)	21 (24.14)	
Oxygen supply			
Mechanical ventilation	75 (19.58)	13 (14.94)	
Nasal cannula	9 (2.35)	15 (17.24)	<0.0001
Reservoir mask	171 (44.65)	24 (27.59)	
Simple mask	128 (33.42)	35 (40.23)	

Pearson chi-squared tests were performed for statistical analyses.

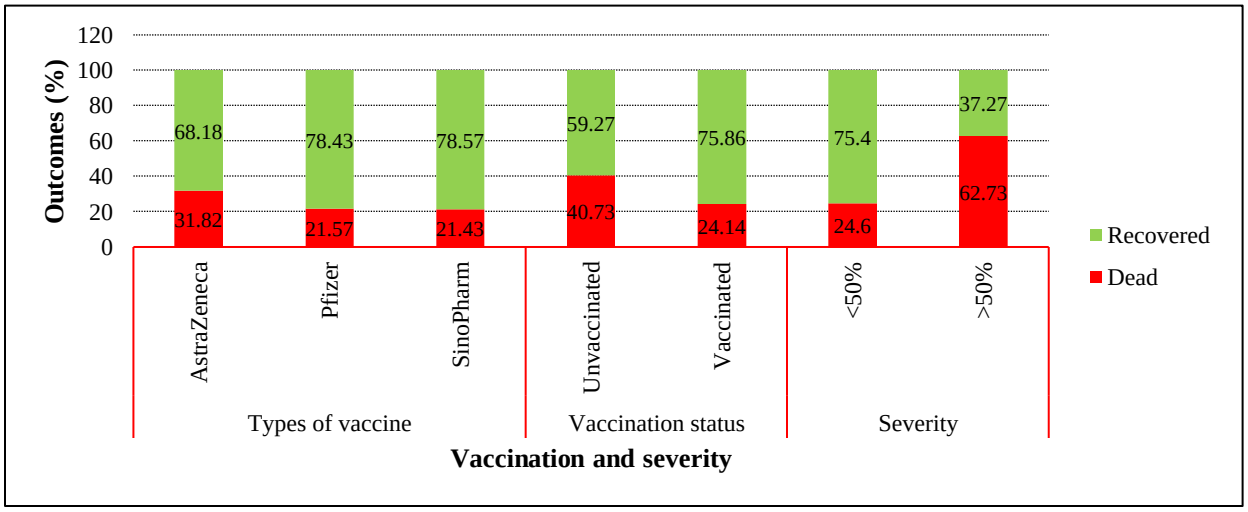

Figure (1): Mortality rate among patients with vaccinated and unvaccinated and different severity

The mortality rate was 31.82% among those who received AstraZeneca, and it was almost the same between two other vaccines as shown in figure (1) The study indicated that having the severe cases and being old were considered the main independent predictor of mortality among the patients. Vaccination status, medical history and genders were not found to be the predictors for the mortality among the patients as shown in Table (3).

Table (3): Predictors of mortality among patients

Controlling factors (n=470)	Outcome: Mortality	Presentation	p value
	OR (95% CI)		
Severity			<0.0001
>50%/<50%	7.71 (4.67-12.71)		<0.0001
Age groups			<0.0001
60-69/30-39	19.75 (2.35-165.89)		0.0060
60-69/40-49	6.08 (1.81-20.44)		0.0035
60-69/50-59	4.53 (1.99-10.32)		0.0003
70-79/30-39	40.94 (4.83-347.09)		0.0007
70-79/40-49	12.61 (3.65-43.55)		<0.0001
70-79/50-59	9.39 (3.93-22.42)		<0.0001
70-79/60-69	2.07 (1.13-3.80)		0.0184
80-89/30-39	26.55 (3.08-228.60)		0.0028
80-89/40-49	8.18 (2.32-28.86)		0.0011
80-89/50-59	6.09 (2.47-15.04)		<0.0001
90-99/30-39	58.34 (6.07-560.45)		0.0004
90-99/40-49	17.96 (4.30-75.04)		<0.0001
90-99/50-59	13.38 (4.34-41.20)		<0.0001
90-99/60-69	2.954 (1.17-7.48)		0.0223
20-29/30-39	16.27 (1.18-224.26)		0.0371
Vaccination status			0.15593
Unvaccinated/ Vaccinated	1.56 (0.84-2.91)		0.1618

Medical history			0.72338
Asthma/ None	0.68 (0.09-5.05)		0.7027
CVA/ None	4.46 (0.78-25.66)		0.0940
Diabetes mellitus/ None	0.75 (0.25-2.20)		0.5965
Hypertension/ None	1.12 (0.51-2.46)		0.7700
IHD/ None	0.76 (0.28-2.04)		0.5844
Malignancy/ None	0.90 (0.15-5.49)		0.9067
Multi-chronic disease/ None	1.09 (0.60-1.97)		0.7757
Gender			0.79559
Male/ Female	0.94 (0.58-1.51)		0.7956
Nominal logistic regression was performed for statistical analyses.			

Discussion

The study stated that most of the admitted patients did not receive vaccines and death rate was significant among them. Furthermore, most of them had past medical history of chronic conditions such as diabetes mellitus, atherosclerotic diseases and others. The patients having different severity of lung involvements and 40.73% of the patients died inside the hospitals. The patients, who didn't receive vaccine and had chronic diseases, had more morbidity and mortality rates compared to patients with negative past medical diseases.[18]

In this study, a conclusive decision can't be provided about the role of the covid-19 vaccines on patients in hospital and mortality rate because of insufficient data. However, this study could prove that most of the patients who were hospitalized in Duhok province were unvaccinated up to the enrollment time. This is comparable toMuthukrishnan`s[19] study who showed that the death rate was higher in unvaccinated confirmed cases ofcovid-19 compared to those who were vaccinated. It reported that 332 (28.4%) patients died of its study sample. Among fully vaccinated, 12.5% (23/184) died, while it was 31.4% (309/984) among unvaccinated. Those who received full doses of vaccine was associated with lower death than either unvaccinated ($p < 0.0001$) or partially vaccinated ($p< 0.0001$) status. There was no significant difference between unvaccinated vs. partially vaccinated in India study ($P = 0.3$).[19]

Another study done by Demir[20]in a neighbor country reported that unvaccinated patients account for 78.1% of Covid-19 hospitalizations. When death rate was considered between vaccinated and unvaccinated, the mortality rate in those who did not receive vaccine was seen to be significantly higher than vaccinated group ($p < 0.05$). The death rate in the vaccinated group was 12.5% whereas it was 61.4% in the unvaccinated group. They stated that most of the hospitalized patients did not receive vaccine. Moreover, they were more likely to have severe illness, hospitalization, death and requiring mechanical ventilation.[20]

A study had been published by UzunO[21]whichsupport the using of 3 doses of different vaccines, double doses from Sinovac with booster from BioNTech vaccine, in their study the admission to hospital and intensive care unit were lower in those who received two different doses of vaccine compared with those who received three doses of Sinovac.[21]

Alarge study had been done by Mohammed[22]on the beneficial effect of different vaccines and their role for preventing infection, hospitalization, severity and death rate. Among them Pfizer/BioNTech vaccine was the broadly studied and showed effectiveness more than 90% especially after second dose, while efficacy of AstraZeneca vaccine was 80.7% after second dose and 74% after first dose in reducing rate of hospitalization, morbidity and mortality.[22]

In our study we found higher mortality rates among cases with co-morbidities and chronic non communicable disease. Geng[23] studied the impact of chronic medical conditions on the severity and mortality rate among hospitalized Covid-19patientswho were admitted to intensive care unit. They found that the high blood pressure was associated with higher death rate, admission to intensive care unit, severe lung involvement and prolonged period of staying inside hospital. The bronchial asthma was associated in their study with less severe covid-19 disease compared to chronic obstructive pulmonary disease. Meanwhile the cases with cerebrovascular disease, renal disease, and malignancy were more prone to die inside hospital.[23]

The findings in the study from our area are nearly compatible with those highlighted in the literature. Since the literature stated the association of mortality, severity and hospitalization were lower among vaccinated people and the vaccine had a role in decreasing the clinical features of severity of covid19 with minimizing hospital admission. Also, the findings reported that the patients with chronic medical diseases and those who were older than 60 years were susceptible to severe disease and death. Furthermore, it was found that the male and young patients were predominantly receiving the vaccines compared to the female and elderly patients, possibly they have misconceptions about the vaccines generally and the Covid-19 vaccines practically, or they are not employee since government mandate to receive vaccines for its employees.[24]

Limitations of the study

The outcomes discussed in this study should be analyzed carefully since the sample size of this study was not sufficient to make the conclusive determination on the role of covid19 vaccine on the disease severity and death rate. Besides, we do not have any information about the virus serotypes and mutations in this region owing to technical and laboratory challenges.

Conclusions

Vaccinated patients had lower chance of severe chest involvement, oxygen requirement, hospitalization and death rate compared to unvaccinated patients. It is essential for the health authorities in Kurdistan Region of Iraq to promotes campaigns for receiving the Covid-19 vaccines to overcome the public hesitancy and fear from the receiving the vaccines.

Conflict of interest

The authors recorded no conflict of interest.

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