ORIGINAL ARTICLE

# EVALUATION OF COVID-19 VACCINES EFFICACY IN IRAQI PEOPLES

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## ABSTRACT

**The aim**: The present study was carried out on patients recovered from COVID-19, including those patients who have taken vaccine and those who have not.
**Materials and methods:** The patients were recruited via an online panel and surveyed at different regions of Iraq from June 1, 2021, to August 30, 2021.
**Results**: Our results demonstrated that the highest percentage of people recommended Pfizer vaccine followed by Sinopharm, while AstraZeneca vaccine was least recommended.
**Conclusions**: The efficacy of different vaccines differed significantly; the highest effectiveness was observed with Pfizer vaccine followed by AstraZeneca and Sinopharm with effectiveness ranging from 94%, 89%, and 74%, respectively. Further, the highest percentage of re-infected patients was observed with Sinopharm vaccine followed by Astra Zeneca and Pfizer vaccine, respectively. Also, the highest percent of re-infection with masking used was seen in the case of Sinopharm vaccine followed by AstraZeneca and Pfizer vaccine. Although, we observed that post-vaccination symptoms were lowest than pre-vaccination symptoms, the percent of asymptomatic cases post-vaccination was highest than pre-vaccination cases for all vaccines.

**KEY WORDS:** COVID-19, Pfizer vaccine, Astra Zeneca vaccine, Sinopharm, post-vaccination symptoms

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## INTRODUCTION

The past two years have been the most difficult years of the modern era because of the ongoing COVID-19 pandemic. COVID-19 is caused by novel strain of coronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. SARS-CoV-2 was first detected in December 2019 in Wuhan, China [2]. Coronaviruses are enveloped, positive-sense single-stranded RNA viruses with a helical nucleocapsid. They belong to the *Coronaviridae* family in the order *Nidovirales*, subfamily *Orthocoronaviridae* and are divided into four genera namely alpha, beta, delta, and gamma coronavirus [3]. Several vaccines have been developed during the past one and half year. The mRNA-based vaccine has been developed by *BioNTech /Pfizer* company under the name BNT162 [4]. The efficacy of this vaccine was investigated in a total of 45 healthy volunteers, which were divided into 4 groups, the first two groups received two doses of 10 and 30 μg intramuscularly, 20 days apart, and the third group received 100 μg dosage but did not receive a second dose and a fourth group of 9 participants received a placebo [5]. Seven days after the second dose, the first two groups showed increased IgG levels and it remained elevated even after 14 days. While in the third group, the IgG levels peaked at 21 days after the first dose and did not increase thereafter [5]. Non-replicating Viral Vector Vaccines has been developed by Astra Zeneca in collaboration with the University of Oxford, under the name ChAdOx1 and now designated as AZD1222 [6]. The efficacy of AZD1222has been checked in 1077 healthy participants recruited in the UK. The participants who received vaccine were divided into two groups; the AZD1222 vaccine group received a dose of vaccine particles ($n$ = 543), 10 participants received a second booster dose of the vaccine after 28 days interval or a placebo group received meningococcal vaccine Men ACWY ($n$ = 534) [7]. The AZD1222 vaccine group showed elevated antibodies and these levels remained until day 56. Additionally, the 10 participants who received a booster dose, a much higher specific antibody response was noted after day 56 and also, T cell response observed in all participants, peaked at day 14 and remained elevated through day 56 for both single or two doses [7]. Sinopharm has developed inactivated vaccine in collaboration with Wuhan Institute of Biological Products and Beijing Institute of Biological Products [8]. The efficacy of this vaccine has been tested in 224 participants divided into one of two dual-dose programs - days 0 and 14 or days 0 and 21days interval, the both schedules showed high antibodies response, however, 97.6% (41 out of 42) seroconversion noted for both. Additionally, for the specific antibody response, a much higher response was shown with the 0- and 21-day schedule 100% than the 0- and 14-day schedule 85.7% [9].

**Table I.** Total number and percentage of people taken or not taken vaccines, also the number and percent of the two genders

| Vaccine type | N | % | Gender | | Gender % | |
|---|---|---|---|---|---|---|
| | | | Male | Female | Male | Female |
| Pfizer | 96 | 38.4 | 58 | 38 | 60 | 40 |
| AstraZeneca | 64 | 25.6 | 34 | 30 | 53 | 47 |
| Sinopharm | 68 | 27.2 | 43 | 25 | 63 | 37 |
| Not take vaccine | 22 | 8.8 | 8 | 14 | 36 | 64 |
| Total | 250 | 100.0 | 143 (57.2%) | 107 (42.8%) | | |

**Table II.** The Total and percent of different age that participate in this study

| Age | Frequency | Percent |
|---|---|---|
| 20-30 | 144 | 57.6 |
| 31-40 | 75 | 30.0 |
| 41-50 | 23 | 9.2 |
| 51-60 | 5 | 2.0 |
| >60 | 3 | 1.2 |
| Total | 250 | 100.0 |

**Table III.** The total and percent of participates in this study that previously infected or not, also the percent of people symptoms and need

| | N | Percent | Symptoms | Percent |
|---|---|---|---|---|
| Yes | 135 | 54 | Mild | 24.0 |
| | | | Moderate | 14.8 |
| | | | Sever | 1.6 |
| | | | Asymptomatic | 59.6 |
| | | | Need | Percent |
| | | | Hospital admission | 2.4 |
| | | | O2 | 2.4 |
| | | | NON | 95.2 |
| No | 115 | 46.0 | | |
| Total | 250 | 100.0 | | |

## THE AIM

The present study was carried out on patients recovered from COVID-19, including those patients who have taken vaccine and those who have not.

## MATERIALS AND METHODS

This was a prospective study of patients recovered from COVID-19 including those who took vaccines or those who did not take vaccine. The respondents were recruited via an online panel and surveyed at different regions of Iraq from June 1, 2021, to August 30; 2021. Verbal informed consents were obtained from patients or their surrogates for the urgent need to collect data. Data was collected by direct individual interview through questionnaire. Medical records, demographic and clinical data were obtained including age, gender, clinical symptoms, admission to hospital, taken the vaccine or not, type of vaccine, re-infected and symptoms after vaccination were collected from the patients' medical records. All cases withCOVID-19 enrolled in this study were diagnosed on the basis of World Health Organization by RT–PCR (Real Time Polymerase Chain Reaction) and the diagnostic and vaccinated guideline for COVID-19 issued by the Ministry of Health (MOH) and update protocol supported by World Health organization (WHO) [10].

### STATISTICAL ANALYSIS

The counts and percentage were used to calculate the descriptive and categorical variables. The association between gender groups, type of vaccines, clinical symptoms and severity of disease were analyzed by application of chi square ($x^2$) test, used as appropriate, at level of significance $\alpha = 0.05$. All statistical analyses were applied using SPSS 26.0 for Windows and graphs were draw by Graph Pad prism 8.02 v.

### VACCINE TYPES

The results of this study revealed that the percentage of people taking vaccines was more than those who were not taking vaccines. However, the highest percentage of people gave preference to the Pfizer vaccine followed by Sinopharm and the last one was AstraZeneca vaccine (38.4%, 27.2%, and 25.6%, respectively).

There is a difference between the total numbers of people taking the vaccine. Moreover, there is a significant difference ($p<0.05$) between the Pfizer and other vaccines, while there is an insignificant difference ($p>0.05$) between Sinopharm and AstraZeneca vaccines. There is a significant difference ($p<0.05$) between the gender to take the vaccine depend on the percentages; however, the male gender has highest percent as compared with female gender, see table I, and figure (1).

### AGE

According to age, we found that the total number and the percentage of people taking vaccines was highest for age 20-30 years, followed by 31-40 years, and the lowest percentage taking vaccine was for the age group 60 years and older (57.6%, 30.0%, and 1.2%, respectively), see table II and figure (2).

### PREVIOUSLY INFECTED WITH COVID-19

We found that the total no. and the percentage of people previously infected with COVID-19. The highest percentages of infected people were asymptomatic and the lowest percent had severe symptoms. However, about 95% of infected cases did not need hospital admission, see table III and figure (3).

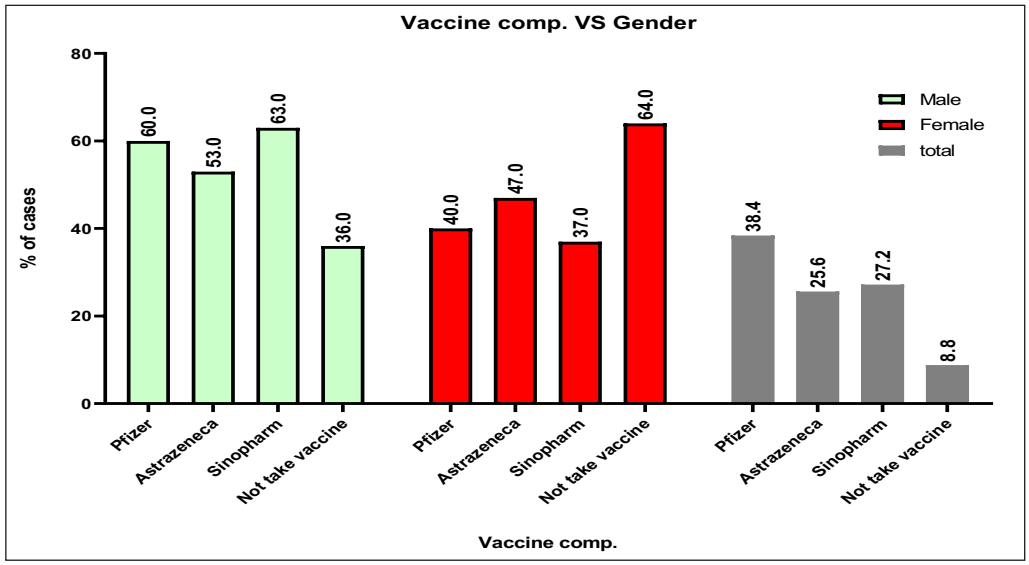


**Fig. 1.** Gender difference in terms of taking vaccines or not taking vaccine

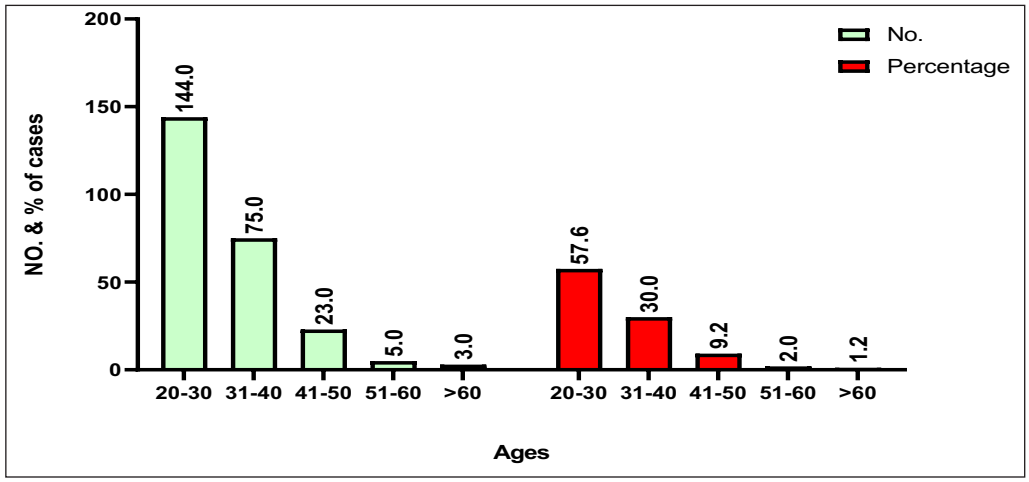


**Fig. 2.** The total and percent of different age that participate in this study according to age

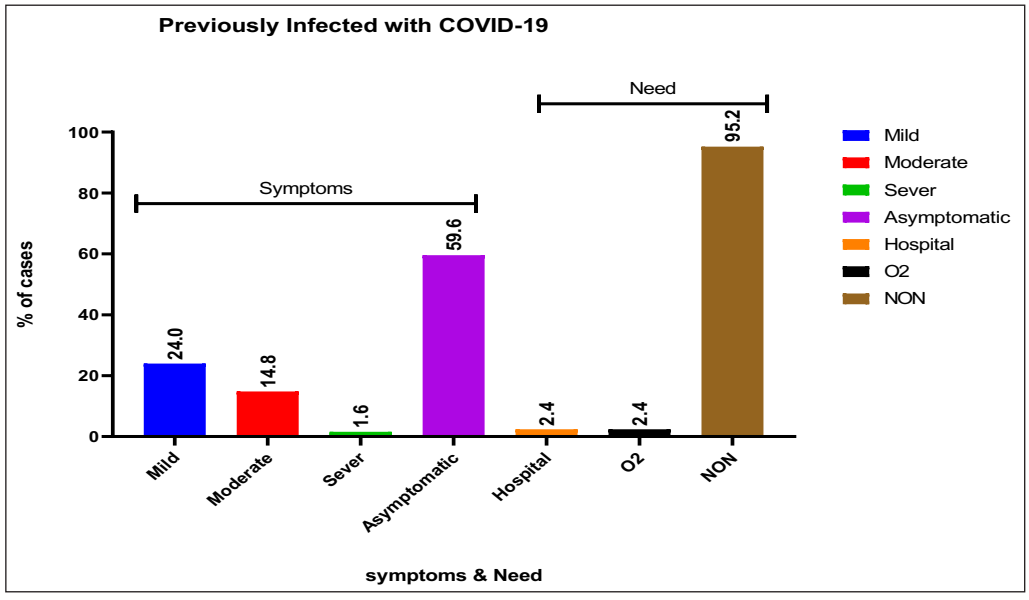


**Fig. 3.** The percent previously infected patients and the percent symptoms and need

## INFECTION AFTER VACCINATION

We found that the percentage of patients infected after vaccination was less than that not vaccinated. However, the highest percentage of re-infected patients was notified in Sinopharm followed by AstraZeneca and lastly the Pfizer vaccine. We noticed that most of patients were re-infected after two doses. There is a difference between the re-infected patients and not infected. Moreover,

**Table IV.** The percent of re-infection and protection efficacy after vaccination and after the doses, also show that the difference between vaccines

| Company | Re-infected % | | |
|---|---|---|---|
| | Infected % | After one dose | After Two doses |
| Pfizer | 6.25 | 16.6 | 83.4 |
| AstraZeneca | 11 | 43 | 57 |
| Sinopharm | 26.5 | 5.5 | 94.5 |
| | Not infected % | | |
| Pfizer | 93.75 | | |
| AstraZeneca | 89 | | |
| Sinopharm | 73.5 | | |

**Table V.** The percent of re-infection after vaccination at different duration for three companies $P < 0.05$

| Duration | 2-5 days | | 6-9 days | | 10-14 days | | > 14 | | |
|---|---|---|---|---|---|---|---|---|---|
| Company/doses | One dose | Two doses | One dose | Two doses | One dose | Two doses | One dose | Two doses | P value |
| Pfizer | 0 | 0 | 0 | 20 | 0 | 40 | 0 | 40 | * |
| AstraZeneca | 14 | 14 | 0 | 14 | 14 | 0 | 14 | 29 | * |
| Sinopharm | 0 | 33 | 0 | 6 | 0 | 0 | 6 | 56 | * |

**Table VI.** The relationship between masking used and re-infection for all companies

| | Masking used | No Masking used | Re-infection | P value |
|---|---|---|---|---|
| Company/percent | 61.6 | 29.6 | | |
| Pfizer | 67 | 33 | 6.25 | * |
| AstraZeneca | 57 | 43 | 11 | * |
| Sinopharm | 78 | 22 | 26.5 | * |

**Table VII.** The difference in percent between the pre- and post-vaccination of totally and three companies

| Comp./symptoms | Total % | | Pfizer | | AstraZeneca | | Sinopharm | |
|---|---|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Mild | 24 | 11.6 | 23 | 17 | 43 | 53 | 28 | 6 |
| Moderate | 14.8 | 5.2 | 50 | 17 | 29 | 0 | 28 | 88 |
| Sever | 1.6 | 0.8 | 17 | 17 | 0 | 0 | 6 | 6 |
| Asymptomatic | 59.6 | 82.4 | 10 | 49 | 28 | 47 | 38 | 0 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Fig VIII.** The difference in percent between the pre- and post-vaccination of totally and three companies

| | Percent | Pfizer | AstraZeneca | Sinopharm |
|---|---|---|---|---|
| Same | 4.4 | 17 | 53 | 0 |
| less | 8.4 | 50 | 0 | 28 |
| more sever | 2.4 | 17 | 0 | 11 |
| Asymptomatic | 76.0 | 17 | 47 | 61 |
| Not take vaccine | 8.8 | | | |
| Total | 100.0 | | | |

the re-infected data showed that there is a significant difference ($p< 0.05$) between the Pfizer and Sinopharm, while there is an insignificant difference ($p>0.05$) between Pfizer and AstraZeneca vaccines, and also between Sinopharm and AstraZeneca vaccines, see table IV, and figures 4 and 5.

## DURATION OF INFECTION TIME AFTER VACCINATION

When we compared the percent of the re-infection after one dose with those after two doses at different duration, we observed that the patients infected after two dose vaccination was highest than that after patients after one dose. However, the highest percentage of re-infected patients was notified

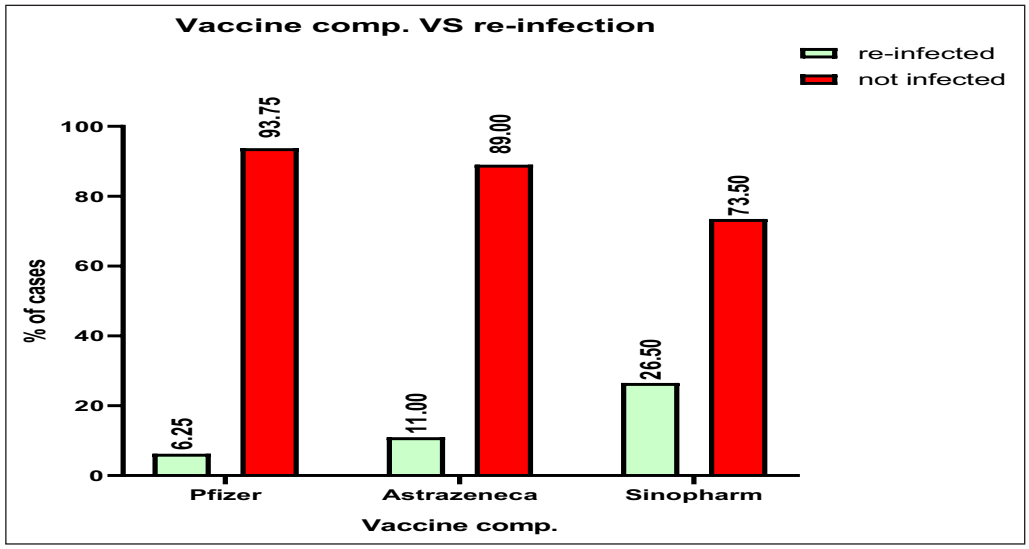


**Fig. 4.** The percent of re-infection and protection efficacy of different vaccines

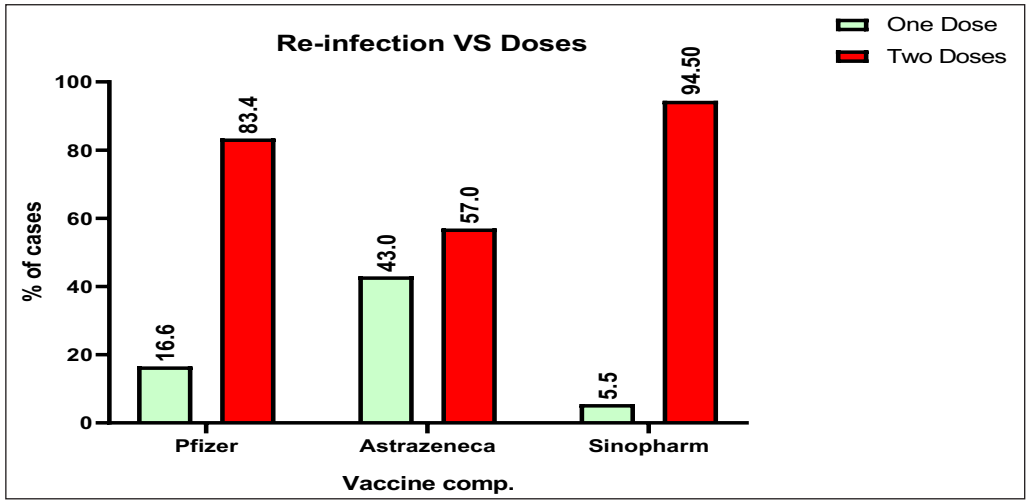


**Fig. 5.** The percent of re-infection after one and two doses of different vaccines

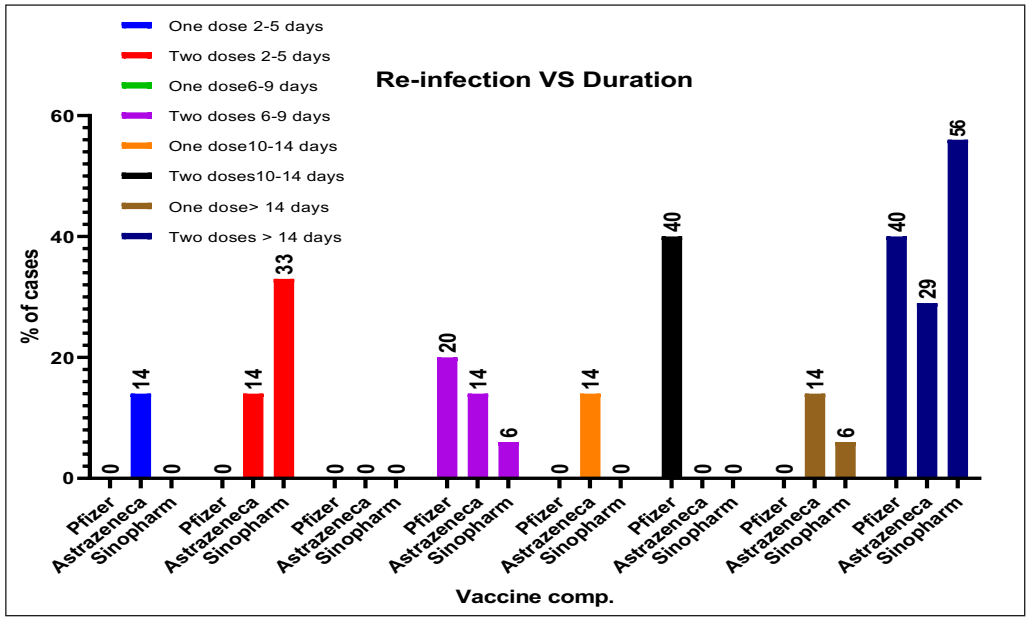


**Fig. 6.** The percent of re-infection after vaccination at different duration for three vaccines

at duration more than 14 days and after two doses for all vaccines. Our results showed that there is significant difference ($p>0.05$) among the companies; the highest percent of re-infection was seen in the Sinopharm followed by Pfizer and lastly AstraZeneca vaccine. Table 5 and figure 6

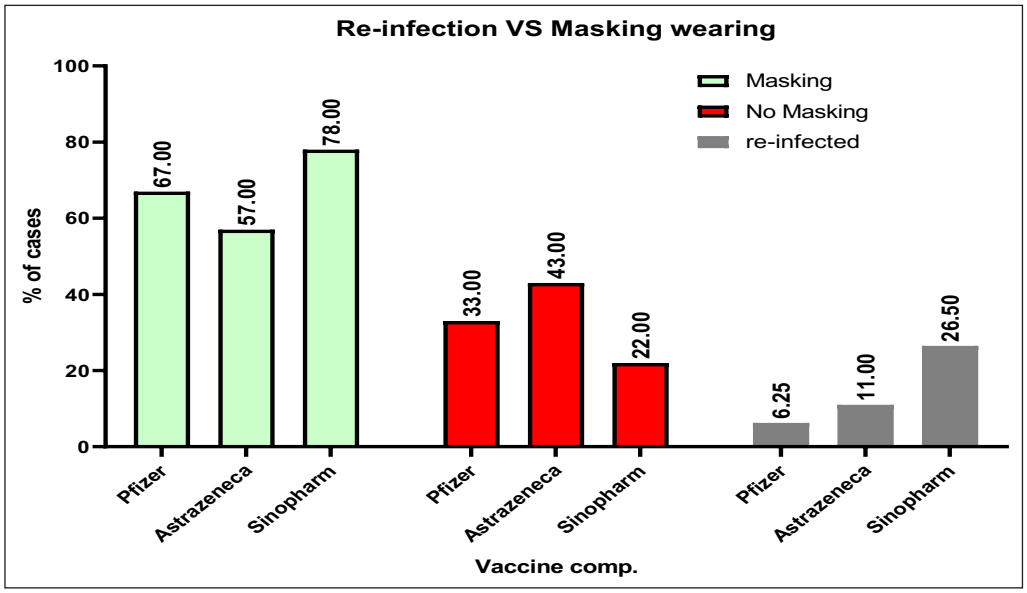


**Fig. 7.** The percentage of masking used and re-infection for all vaccines

**Table IX.** The difference in hospital admission of three vaccines as compared with pre-vaccination

| vaccine | Pfizer | | AstraZeneca | | Sinopharm | |
|---|---|---|---|---|---|---|
| | pre | post | pre | post | pre | post |
| % | 2 | 1 | 5 | 0 | 11 | 6 |

## USE OF MASKING WEARING AFTER VACCINATION

We found that the percent of the patients used mask after vaccination was highest than those not used mask. Our results showed that there was a significant difference ($p<0.05$) between vaccines; the highest percentage of re-infected people with mask used was seen in the Sinopharm followed by Pfizer and the least percentage seen with AstraZeneca vaccine. Table VI and figure 7

## SYMPTOMS OF INFECTION AFTER VACCINATION SYMPTOMS

The percent of the different symptoms pre- and post-vaccination are shown in table VII and figure 8. There was a significant difference ($p<0.05$) between total percent of mild, moderate, and sever symptoms. However, we noticed that these post-vaccination symptoms were lowest than pre-vaccination, while the percent of asymptomatic of post-vaccination was highest than pre-vaccination. Our results showed that there is significant difference ($p<0.05$) between pre- and post-vaccination of all companies, the Pfizer company reduced the post mild, moderate, and sever symptoms while the asymptomatic increased as compared with pre-vaccination. The AstraZeneca shows that there is insignificant difference ($P>0.05$) in mild symptom between pre- and post-vaccination, while there is significant difference ($P<0.05$) in moderate symptom and asymptomatic, moreover, the post mild and asymptomatic showed highest percent as compared with pre-vaccination as well as the moderate shows lowest than pre-vaccination. The Sinopharm shows lowest mild and asymptomatic pre-vaccination as compared with post-vaccination.

## DIFFERENCE BETWEEN SYMPTOMS AFTER AND BEFORE VACCINATION

We found significant differences ($p<0.05$) in symptoms between vaccines. However, we noticed that those patients who took Pfizer vaccine, have less symptoms as compared with pre-vaccination while AstraZeneca showed that about 50% of patients had both same symptoms and asymptomatic as compared with pre-vaccination. The patient taken Sinopharm vaccine, most of them had asymptomatic (61%) and about 28% had fewer symptoms as compared with pre-vaccination, table VIII and figure (9).

## ADMISSION TO HOSPITAL

According to our results, we found significant difference ($p<0.05$) between vaccines. However, we noticed that the patient taken the Pfizer and Sinopharm vaccines have had lower hospital admission to half percent as compared with pre-vaccination while AstraZeneca showed that about 100% of patients lowered as compared with pre-vaccination. Table IX and figure 10.

# DISCUSSION

There are many strategies that have been recommended to improve vaccine effectiveness depending on disease awareness, clinical symptoms, hospital admission and increase vaccine accessibility [11]. The introduction of corona virus vaccines in a clinical practice demonstrated as a factor that influence the pathological and the progression course of diseases and can contribute favorably

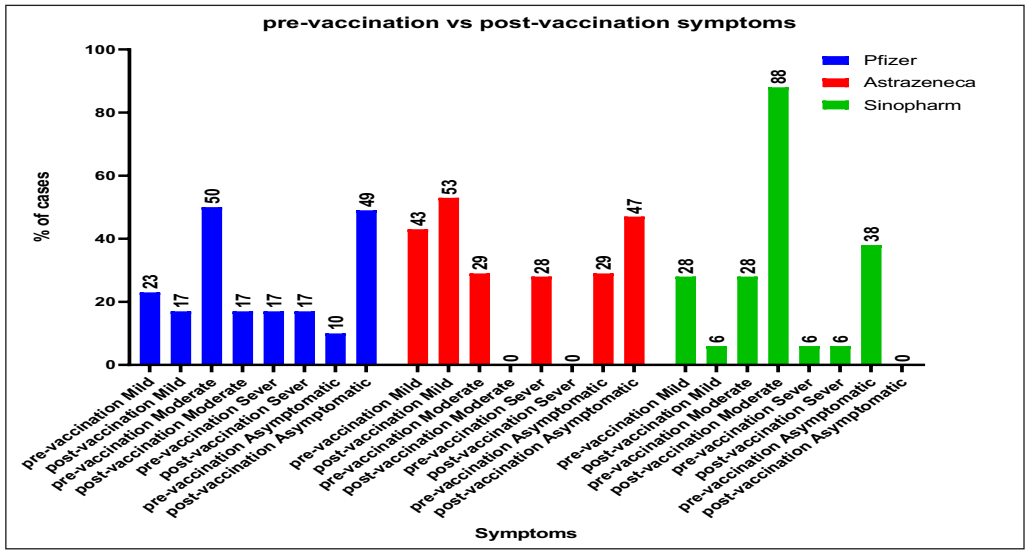


**Fig. 8.** The difference in percent between the pre- and post-vaccination of totally and three companies

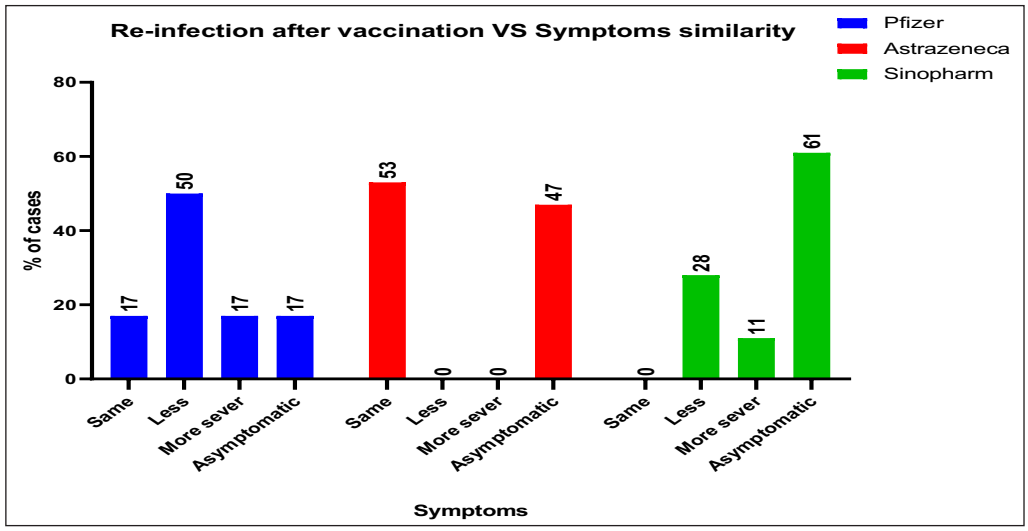


**Fig. 9.** The similarity in symptoms of three vaccines as compared with pre-vaccination

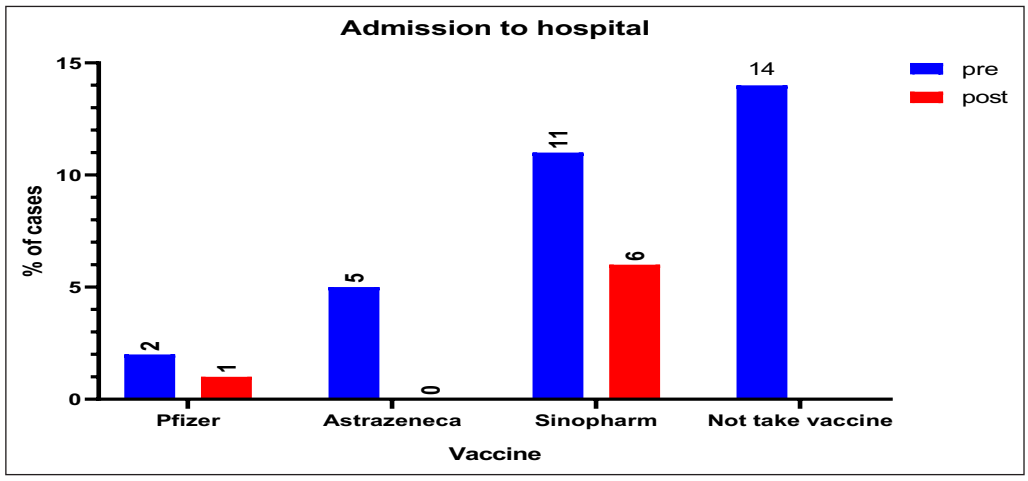


**Fig. 10.** The difference in hospital admission of three vaccines as compared with pre-vaccination

to the prevention, and treatment strategies, making health services more effective and efficient [12,13]. The present study demonstrated that vaccines evaluation is a crucial determinant in the management of COVID-19 to stratify the population and organize targeted approaches to monitoring vaccination compliance. Furthermore, the overall results of this study indicate that the type of vaccine, age and gender of recipients were potential modulators of the efficacy of COVID-19 vaccines. According to our results, the people taking vaccines had higher percent as compared with that not taken it which indicated that the effectiveness of vaccines or awareness from the complications of disease

itself. However, the Pfizer vaccine has more acceptance rates in Iraqi people followed by Sinopharm and the AstraZeneca vaccine. Also, as we note that the male gender had more acceptance than female one which may be due to the fear behaviors of the female. In addition to that the 20-30 years old has highest percent than other age groups and lower one was ages less than 60 years old, which may be due to Know agent of these groups than others groups. *N. Dagan* et al. were found that vaccine is effective for a wide range of Covid-19–related outcomes [14]. Shyh Poh Teo was observed that Pfizer-BioNTech and AstraZeneca demonstrated high efficacy and immunogenicity [15]. The percentage of patients that participates in our study and previously infected with COVID-19 was 54% that's indicated about half of participates suffer from the disease with different symptoms, however, about 60 % of them were asymptomatic, 24% mild, 15% moderate, and 1% sever symptoms while those who not need hospital admission and $O_2$ about 95%. We found that the percentage of patients infected after vaccination was less than that not vaccinated. However, the highest percentage of re-infected patients was notified in Sinopharm followed by AstraZeneca and lastly the Pfizer vaccine. We noticed that most of patients were re-infected after two doses after different duration; however, most re-infected time was after 14 days. The efficacy of vaccines was differed; the highest effectiveness was shown by Pfizer vaccine followed by AstraZeneca and the lowest one was Sinopharm vaccine (94%, 89%, and 74% respectively). Moreover, the percentage of patients who were vaccinated with Sinopharm vaccine and used mask higher than the patients vaccinated with other vaccines. We found that the symptoms after vaccination were low as compared with pre-vaccination in all vaccines. However, the Pfizer vaccine showed the mild and moderate symptoms, which were reduced after vaccination and also most patients become asymptomatic, moreover, 50% of cases showed less symptoms. Also, when we look to AstraZeneca vaccine data, it reduced moderate and sever symptoms and increased asymptomatic cases as compared with pre-vaccinated. Also about 50% of cases had either same symptoms or were asymptomatic that indicated the effectiveness of the vaccine.

## CONCLUSIONS

The efficacy of different vaccines differed significantly; the highest effectiveness was observed with Pfizer vaccine followed by AstraZeneca and Sinopharm with effectiveness ranging from 94%, 89%, and 74%, respectively. Further, the highest percentage of re-infected patients was observed with Sinopharm vaccine followed by Astra Zeneca and Pfizer vaccine, respectively. Also, the highest percent of re-infection with masking used was seen in the case of Sinopharm vaccine followed by AstraZeneca and Pfizer vaccine. Although, we observed that post-vaccination symptoms were lowest than pre-vaccination symptoms, the percent of asymptomatic cases post-vaccination was highest than pre-vaccination cases for all vaccines.

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