

Efficacy of Sars-Cov-2 Vaccines on Severity of Coronavirus Disease in Iraq

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ABSTRACT

Vaccination against novel Coronavirus (SARS-CoV-2) become highly recommended. In Iraq, three vaccines are available. They are Pfizer-Biontech, Oxford-AstraZenica, and Sino harm vaccines. A cross-sectional retrospective study was performed to a total of 2399 individual who are vaccinated with one of the available vaccines. People who are infected with Covid-19 before and/or after vaccination of either studied SARS-CoV-2 vaccines were also involved in this study (1175 case). Signs and symptoms have been reported for each of confirmed positive cases of Coronavirus disease. Statistical data analyses were applied to reveal the effect of different SARS-CoV-2 vaccines on the incidence of novel coronavirus disease among Iraqi population. Also, the virulence of novel SARS infection after vaccination was determined in response to sings and symptoms of the disease. Pfizer-BioNTech and Sino pharm vaccines show the least percentage (5.1%; 34 and 6.5%; 13) of disease incidence after first dose of vaccination respectively, while Oxford- AstraZenica show the highest percentage 11.5%; 39. In respect to SARSCoV-2 infection after second dose of vaccination, Pfizer-BioNTech percentage are the least (4.5%), Sinopharm (16.5%) and Oxford- AstraZenica (18.0%). The study concluded that incidence of Covid-19 was decreased after second dose vaccination of Pfizer, Sinopharm and AstraZenica vaccines respectively. Oxford-AstraZenica shows the least efficacy upon incidence of Covid-19 than Pfizer-Biontech and Sinopharm vaccines, after first and second dose vaccination, and severity of the symptoms after second dose vaccination.

Keywords: Coronavirus, Incidence, Vaccines, Impact.

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INTRODUCTION

The novel Coronavirus disease that appeared at the latest month of 2019, cause mild respiratory tract infection in human. In some cases, the disease may be developed to serious symptoms and leads to death¹. Globally, as of August 2021, the incidence of Covid-19 exceeds 204 million infected cases, accounting more than four million dead cases². In Iraq, an average of 10 thousand new cases and 65 deaths per day since June 2020³. Yet, there is no officially efficient antiviral treatment for the disease so that, the need for the vaccines increased to inhibit further transmission of SARS-CoV-2⁴. Vaccines start to appear at 2021 by some pharmaceutical companies and health authorities. They produced, for emergency, different vaccine candidates^{5,6}. Sino pharm (The inactivated SARSCoV-2 vaccine) is the first vaccine administered to Iraqi population with safety and immunogenic effectiveness exceeds 50%^{7,8}. Oxford University (ChAdOx1 nCoV-19) also introduced various studies demonstrated that the immunogenic impact of vaccination with AstraZeneca and Pfizer-Biontech is about 70% and 95% respectively^{9,10}. High-risk and vulnerable groups was initially given the authorization for vaccination for instance doctors, healthcare volunteers and individuals above 60 years old, then the vaccine promised to be available for general population, except infants. Women who are pregnant are authorized later¹¹. In spite of vaccines presence, people hesitate to accept it for administration. Non-accurate data of vaccines and rumors in respect of safety, efficacy and side effect leads a delay in immunization of the community^{12,13}. Only 2% of Iraqi population had been vaccinated by May 2021, but after the second prominent wave of transmission hit the country and the number of mortality increased, the uptake of the vaccines increased¹⁴. The Iraqi ministry of health and environment scored a total of 2.4 million vaccine dose with an average of 103 thousand doses a day³. Researchers reported that AstraZeneca and Pfizer vaccine showed a high percentage of efficacies. In spite of the high efficacy of the vaccines, SARS-CoV-2 have a great capacity to mutate producing a variant strains which have concerns that these new strains may influence the efficiency of the available vaccines¹⁵. Our study focused on evaluating the efficacy of three different types of SARS-CoV-2 vaccines whether people infect by Covid-19 after taking the second dose or not. Also, clearing the symptoms of covid-19 and their differences among people before and after vaccination. The present study also discusses the differences in side effects of the three new Coronavirus disease vaccines

PATIENTS & METHODS

Proposal design: This cross-sectional retrospective random analysis of data was performed from August 2021 to April 2022. A platform was used to gather responses data about the Iraqi individuals. Platform composed of two major parts: clinical profile (Gender, previous Covid-19 infection, symptoms and severity); and vaccine data (type of vaccine administered, signs and symptoms in respect of duration and whether the infection severe or not, infection after first dose, and infection after second dose). A total of 2399 individual were involved in this study. Individuals of the study were Iraqi citizens from the North, middle and south of Iraq. Individuals aged 18 years and above who received Pfizer-BioNTech vaccine, Oxford-AstraZeneca, and Sino pharm vaccines of SARS-CoV-2 before one week were involved. Also, individuals who are infected with Covid-19 before and / or after vaccination of either studied SARS-CoV-2 vaccines were involved. Signs and symptoms have been reported for each of confirmed positive cases of Covid-19.

Ethical approval: The study ethical considerations were taken from the Scientific and the Ethical Committee of Made Nat Alelem University College on July, 2021 after reviewing and approving. Individuals had submitted their information prior to involvement in the study.

Statistics: The Statistical Analysis System- SAS (2012) program was performed to demonstrate the effect of difference vaccines and symptoms in study parameters. Chi-square test was applied to significant compare between percentages (0.05 and 0.01 probability) in present study¹⁶.

RESULTS & DISCUSSION

A total of 2399 case were included in this study. All of the cases are vaccinated against one of the novel Coronavirus disease vaccines which are available in Iraq. The vaccines are Pfizer-BioNTech (55.2%) of the cases, Oxford- AstraZeneca (28.2%) and Sino pharm (16.5%). Data collected for the following parameters (gender, vaccine type, dose, side effects, infection after first dose, infection after second dose, and symptoms) and statistical analysis were applied. The efficacy and effectiveness of Covid vaccines are demonstrate by revealing novel coronavirus infection after both doses (first and /or second) of vaccination.

Gender Distribution: According to gender, males comprise 54.9% of total vaccinated cases while female representing 45.1%. Pfizer-BioNTech is prevalent choice among the other vaccines in males and females (29.7 % and 25.5%) respectively Table 1. The percentage of

Table 1. Total distribution of studied cases according to gender.

Type of Vaccine	All		Male		Female	
	No	%	No	%	No	%
Pfizer	1325	55.2	713	29.7	612	25.5
Sinopharm	397	16.5	223	9.3	174	7.3
Astrazeneca	677	28.2	382	15.9	295	12.3
Total	2399	100	1318	54.9	1081	45.1

males and females is a matter of chance and the choice of vaccination or not and the type of vaccine usually depend on mentality and circumstances of individuals.

Vaccination signs and symptoms: AstraZeneca and Pfizer-BioNTech appear to cause symptoms after vaccination more than Sino pharm. AstraZeneca show 81.2 % (550 out of 677 case), Pfizer-BioNTech show 73.6% (976 out of 1325 case), while Sino pharm show only 45% (179 / 397). The types of vaccination side effects also conducted in the present study. The five main types are: heat, hardness and pains at the site of injection, weakness, increase body temperature, cough, and shortness of breath. Our study demonstrated that pain injection is the most common side effect in Pfizer-BioNTech and Sino pharm vaccines while weakness is dominant side effect after AstraZeneca vaccine administration Table 2. Pain at the site of injection comprises about (90%) of the vaccinated cases, Weakness (67%), and fever (48%), were the most associated signs reported by a study performed during 2021¹⁷. Our results were not so far from those that were reported by clinical examination of vaccine. Information from clinical examination and recent researches support our findings¹⁸⁻²². As an example, in third phase of examination of the Pfizer-BioNTech vaccine, the most frequent signs and symptoms after first dose vaccination were pain at injection site (71–83%), deficiency (34–47%), and headaches (25–42%)¹⁸.

Incidence of disease: According to infection after first dose, statistical analysis shows that there is a highly significant difference ($P \leq 0.01$) between the different types of vaccines. Pfizer-BioNTech and Sino pharm vaccines show the least percentage (5.1% ; 34 and 6.5% ;13) respectively, while Oxford- AstraZeneca show the highest incidence of disease after first dose of vaccination 11.5% ; 39.

The infection after second dose of vaccination, Pfizer-BioNTech percentage are the least (4.5%), Sino pharm (16.5%) and Oxford- AstraZeneca (18.0%). Statistical analyses reveal non-significant differences between the studied vaccines in the first, second and third week of infection incidence after vaccination, while Infection after fourth week of vaccination reveals highly significant differences ($P \leq 0.01$) Table 3. In general, we observed that first and second dose vaccination reduces the number of Covid positive cases. Before Vaccination by Pfizer-BioNTech, the number of infected cases was (624 cases). After getting the first dose, the number of infected cases drops to 10 cases after two weeks and only one case after fourth week. After second dose of vaccination, the incidence of disease reduced in all types of vaccines. Pfizer-BioNTech and Sinopharm vaccines show the least percentage of infection by covid-19 after vaccination after first and/or second dose. This result agreed with Liu Q. *et al.* 2021. They concluded that vaccination reduces Covid-19 positive cases of different variants²³. Although most vaccines recommend two-dose vaccines, A study found that one dose of novel Coronavirus vaccines could reduce the infection up to half of the percentage, a recent research revealed that the T-cell and levels of antibodies triggered by one dose of BNT162b2 vaccine (Pfizer-BioNTech) were significantly different from that infected with SARS infection naturally^{24,25}. In fact, we found increase in infection after four weeks of second dose vaccination of all vaccines. This may be due to decrease in IgG antibodies levels that produced upon vaccination after one month of vaccination²⁶.

Association between vaccination and severity of infection symptoms: The present study includes the common symptoms that usually appeared with the

Table 2. Types of Side effects as a result of vaccination with different types of vaccines.

Type of Vaccine	Percentage %	Types of vaccination side effects					Chi- Square (χ^2)	
		Pain injection	Weakness	Fever	Coughs	O ₂ decrease		
Pfizer	73.4	929	798	550	63	21	22.81 **	22.81 **
Sinopharm	45	133	128	43	6	2	13.47 **	13.47 **
AstraZeneca	81.2	479	504	380	36	12	18.45 **	18.45 **
Total	---	1541	1430	973	105	35	27.94 **	27.94 **
Chi-Square (χ^2)	---	16.53 **	14.05 **	14.37 **	8.73 **	8.22 **	---	---

** ($P \leq 0.01$)

Table 3. Infection period of vaccinated people with different types of vaccine

Type of Vaccine	Infection by Covid-19										
	Before Vaccination	After 1st dose	One week	Two weeks	Three weeks	Four weeks	After 2nd dose	One week	Two weeks	Three weeks	Four weeks
Pfizer	624	34	20	10	3	1	30	4	7	3	16
Sinopharm	152	13	2	6	5	0	33	7	1	2	23
AstraZeneca	190	39	14	3	4	18	61	8	6	4	43
Total	966	86	36	19	12	19	124	19	14	9	82
Chi-Square (χ^2)	28.57 **	9.52 **	8.26 **	3.09 NS	0.773 NS	7.93 **	9.02 **	1.78 NS	2.61 NS	0.973 NS	9.04 **

** ($P \leq 0.01$), NS: Non-Significant

Table 4. Symptoms and Severity of infection after first dose of vaccination of different types of vaccines.

Type of Vaccine	Infection symptoms after vaccination (1 st dose)							Severity infection	
	sore throat	weakness	fever	Dry cough	O2 decrease	diarrhea	Shortness of breath	>3	≤3
Pfizer	19	22	7	17	0	2	0	15	14
Sinopharm	8	12	5	7	0	0	0	6	7
AstraZeneca	16	18	8	15	0	0	0	13	12
Total	43	52	20	39	0	2	0	34	33
Chi-Square (χ^2)	8.35 **	7.94 **	3.01 NS	7.69 **	0.00 NS	1.89 NS	0.00 NS	5.03 *	7.25 **

Table 5. Symptoms and Severity of infection after second dose of vaccination of different types of vaccines.

Type of Vaccine	infection symptoms after vaccination (2 nd dose)							Severity infection	
	sore throat	weakness	fever	Dry cough	SPO2 decrease	diarrhea	Shortness of breath	>3	≤3
Pfizer	12	17	11	16	1	0	1	12	13
Sinopharm	21	21	8	17	0	0	0	15	14
Astrazeneca	29	38	20	34	0	1	0	31	23
Total	62	76	39	67	1	1	1	58	50
Chi-Square (χ^2)	8.46 **	8.77 **	7.69 **	8.07 **	0.74NS	0.74 NS	0.74 NS	9.32 **	9.81 **

** ($P \leq 0.01$), NS: Non-Significant

Covid-19 infection before and after get vaccinated. The number of individuals infected with coronavirus disease in the present study is 1175 case. Sore throat appeared in 416 cases, weakness in 648 case, fever in 437 case, Dry coughing in 437, SPO₂ decrease in 2 cases, diarrhea in 4 cases and shortness of breath in one case only. The severity of the symptoms are divided into two groups (≥ 3 and ≤ 3) meaning more than three symptoms (40.7%) or less than or equal three symptoms (30.3%) appeared in each case. The symptomless Covid positive cases are 20% of the infected people. According to CDC, increase body temperature, cough, difficulty breathing, body deficiency, headache, sore inflammation and diarrhea are the most frequent symptoms of Coronavirus disease which is commonly appeared in our study²⁷. After first dose of vaccination, Covid-19 signs and symptoms appear to be Fever, SPO₂ decrease and diarrhea (non-significant differences among different types of vaccines) while, sore throat, weakness and dry cough show a highly significant differences among different types of studied vaccines ($P \leq 0.01$). AstraZeneca show the highest number of cases in fevered-symptom of infection while sore throat, weakness and dry cough are dominant in covid-19 after vaccination with Pfizer-BioNTech vaccine Table 4.

After Second dose of vaccination, sore throat, weakness, fever and dry cough demonstrate a highly significant differences ($P \leq 0.01$) among the studied vaccines while SPO₂ decrease, diarrhea and shortness of breath show non-significant differences. Oxford- AstraZenica post-vaccination show the highest number of all types of symptoms of covid-19 infection Table 5. According to WHO, AstraZeneca vaccine impact against SARS coronavirus-2 infection was less than 76%. This is specific from two weeks past second dose, with an interval of one month.

A study conducted with correlation of vaccination with an mRNA vaccine against Coronavirus and severity

and hospitalization of Covid infection. They found that administration with an mRNA coronavirus disease-19 vaccine was significantly less among patients with disease that require hospital entry and disease complications to death²⁸. Another study conducted among patients who are suffering from coronavirus disease, severe symptoms was correlated with a lower vaccination levels. The study revealed that Pfizer Biontech have a role in attenuation of disease hardness in response to patients who are infected with the novel coronavirus disease despite vaccination, and the total advantages of vaccination exceed those determined from the prevention of severe hospitalized alone²⁹. Research published recently revealed that complete vaccine examinations and following post marketing information concluded that administration of mRNA vaccine correlated with risk reduction of severe cases of novel coronavirus disease³⁰.

CONCLUSION

Present study concluded that incidence of Covid-19 was decreased after 2nd Dose vaccination of Pfizer-Biontech, Sinopharm and Oxford-AstraZenica vaccines respectively. Pfizer-BioNTech and Sinopharm vaccines show the least percentage of disease incidences after first dose of vaccination respectively. The severity of symptoms also reduced due to vaccination. Oxford-AstraZenica shows the least efficacy upon incidence of Covid-19, after first and second dose vaccination, and severity of the symptoms after second dose vaccination. Further investigations should be performed dealing with the association of the results with SARS-Cov-2 variants.

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