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Adverse Effects of Covid-19 Vaccines Among Iraqi People

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Abstract

Background: Coronaviruses are noteworthy disease-causing agents in humans and animals. A new strain of this virus was detected in 2019 as the source of a pneumonia outbreak in Wuhan, a city in China. The virus, originally named 2019-nCoV, quickly escalated from an epidemic within China to a global pandemic. The World Health Organization labeled the disease as COVID-19 in February 2020, which was caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Coronaviruses are a large family of viruses that also include pathogens like Middle East respiratory syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV). Early data suggests that roughly 99% of COVID-19 cases present with mild symptoms, while the remaining cases are severe or critical. As of January 31, 2021, there have been a total of 103,286,991 reported cases worldwide, with 2,232,776 deaths. Vaccines have appeared as a crucial tool in preventing SARS-CoV-2 infection and are considered the most promising approach to curbing the pandemic. The first human clinical trials for COVID-19 vaccines began in March 2020, and several phase III trials have been completed or are nearing completion.

Study design and sample collection: This is a cross-sectional study that was collected from different Iraqi province, the study was involved 125 persons. Data collection during September 2021. A web-based self-report survey was administered to vaccinated persons. The electronic survey was administered through Google Form software. The survey link was distributed electronically via different social media groups (Facebook, WhatsApp, and Telegram).

Result: The median age of persons who was taken the vaccine is 32 years old. The females were higher than males in getting the vaccine with (56%) women and (44%) for men. A 59.2% of people were administer Pfizer vaccine, 24% were administer AstraZeneca and only 16.8% of people were administer Sino pharm. About half of persons (67) had fever, headache and arthralgia were occur in (51) and (43) persons respectively and then followed by pain at the site of injection about (14) persons. more than half people (70) had been shown adverse effects within first 12 hours and about (39) people had been shown adverse effects after 12 hours, these adverse effect durations were from 24 hours to more than 3 days. most people about (84) had been administered acetaminophen while (24) people were taken non-steroidal anti-inflammatory drugs to relief these symptoms.

Keywords: *Adverse Effects, COVID-19, Vaccines, and Iraqi People.*

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1. Introduction

Coronaviruses are a group of viruses that can cause illnesses in both humans and animals. In late 2019, a new coronavirus was discovered as the cause of a series of pneumonia cases in Wuhan, China. This virus, known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), quickly spread and led to a global pandemic. The illness caused by SARS-CoV-2 is called COVID-19, which stands for coronavirus disease 2019. It is important to note that coronaviruses also include other pathogens like Middle East respiratory syndrome coronavirus (MERS-CoV) and severe acute respiratory syndrome coronavirus (SARS-CoV). Initial data suggests that most COVID-19 cases present with milder symptoms, while a smaller percentage are classified as severe or critical [1,2]. As of January 31, 2021, there were over 103 million confirmed coronavirus cases globally, resulting in over 2.2 million deaths. of these cases, about 26 million were active infections. In the early stages in Wuhan, there appeared to be a link to a seafood market selling live animals, where many infected individuals either worked or visited before it was closed and disinfected. However, as the outbreak progressed, person-to-person spread emerged as the primary transmission mode. The main route is through direct respiratory transmission when an infected person coughs, sneezes or talks. This occurs via respiratory droplets over short distances of approximately six feet. The virus can infect another person if they inhale these droplets or if they make direct contact with mucous membranes. Infection can also occur by touching contaminated surfaces and then touching the eyes, nose or mouth, but this is not considered a major transmission route [3,4,5]. There is ongoing debate about the extent to which SARS-CoV-2, the virus responsible for COVID-19, can be transmitted over longer distances through the airborne route. While close-range respiratory transmission is considered the primary mode of transmission, there have been scattered reports of outbreaks in enclosed and poorly ventilated spaces, such as restaurants or buses, suggesting the potential for longer distance airborne transmission. Experimental studies have also supported the feasibility of airborne transmission. Specialized imaging techniques have shown that respiratory droplets, produced through activities like speaking, coughing, or sneezing, can become aerosolized or carried in a gas cloud. These studies have shown that these respiratory droplets may have horizontal trajectories beyond the typical recommendation of six feet or two meters [6]. The transmission risk of SARS-CoV-2 generally drops after one is sick for about 7 to 10 days, particularly for those who have a competent immune system and mild infections. The disease COVID-19 can elicit a broad spectrum of symptoms that range from mild to severe. These symptoms usually arise 2 to 14 days post exposure to the virus. Frequent symptoms of COVID-19 encompass the following: fever or chills, cough, difficulty in breathing or shortness of breath, fatigue, aches in muscles or body, headache, recent loss of taste or smell, sore throat, congestion or a runny nose, nausea or vomiting, and diarrhea. It's critical to highlight that elderly individuals and those with pre-existing medical conditions like heart or lung diseases or diabetes are at a heightened risk for meeting serious complications from COVID-19 [7,8].

2. Preventions

2.1. Infection control in the health care setting

In areas with widespread community transmission of COVID-19, it is important to implement preventive strategies in healthcare settings to minimize the risk of exposure. These measures apply to all individuals in the healthcare setting. Added precautions should be taken for patients who are suspected or confirmed to have COVID-19. Specific guidelines and recommendations for infection control in healthcare settings are available and should be followed to ensure the safety of both patients and healthcare workers. For comprehensive information on infection control in the healthcare setting, please refer to detailed resources on this topic [9].

2.2. Personal preventive measures

During times of community transmission of SARS-CoV-2, it is recommended for residents to practice social distancing measures such as avoiding crowded places and keeping six feet (two meters) from others in public settings. It is also important to avoid close contact with individuals who are ill. Wearing masks while in public is also recommended. Apart from these general measures, there are other recommended strategies to help reduce the transmission of the infection. Please refer to detailed resources for comprehensive information on these added measures [9].

It is very important to regularly wash your hands, especially after touching surfaces in public places. Washing with soap and water is highly recommended, but if that's not possible, use a hand sanitizer having at least 60% alcohol if your hands don't look dirty. A study showed the importance of hand hygiene by applying mucus that has cultured SARS-CoV-2 virus to human skin samples from autopsies. The virus remained practical on the skin for about nine hours. However, it was completely deactivated within just 15 seconds of exposure to 80% alcohol. This highlights how effective alcohol-based sanitizers are at cutting the virus from skin surfaces [9].

To reduce the transmission of SARS-CoV-2, it is important to practice respiratory hygiene by covering your cough or sneeze. It is also recommended to avoid touching your face, specifically the eyes, nose, and mouth. The American Academy of Ophthalmology recommends individuals to refrain from wearing contact lenses, as they may lead to more frequent eye touching. Additionally, cleaning, and disinfecting objects and surfaces that are often touched is recommended to minimize the risk of transmission [10].

To create a safer indoor environment and lower the risk of transmitting SARS-CoV-2, it is crucial to prioritize ventilation in indoor spaces. This can be done by opening windows and doors to allow fresh air to circulate. Putting fans in front of windows helps exhaust indoor air to the outside. Running heating/air conditioning fans continuously also improves air circulation. Using portable high-efficiency particulate air (HEPA) filters can further enhance air quality. These ventilation strategies are recommended for everyone when SARS-CoV-2 is spreading in the community. However, highlighting these measures is especially important for older adults and those with chronic medical conditions, who may be at higher risk [11].

2.3. Vaccines: Vaccines have appeared as the most promising strategy for preventing SARS-CoV-2 infection and controlling the COVID-19 pandemic. The first human clinical trials for COVID-19 vaccines began in March 2020, and since then, several phase III trials have been completed or are close to completion. These significant advancements in vaccine development supply hope for effectively managing the spread of the virus [12].

2.3.1. Vaccine platforms

A variety of platforms are being used to develop COVID-19 vaccines, including both traditional and newer approaches. Traditional methods use inactivated or weakened live viruses, which have been successful for vaccines against influenza and measles. Newer platforms use technologies like recombinant proteins (used in human papillomavirus vaccines) and viral vectors (used in Ebola vaccines). RNA and DNA vaccines are also being explored, even though they have not yet been used in licensed vaccines. This range of strategies highlights the diverse approaches under investigation to create effective COVID-19 vaccines [12,13].

Inactivated vaccines: Inactivated vaccines for SARS-CoV-2 are produced by cultivating the virus in cell culture, then using a chemical process to deactivate it. These vaccines often mix the inactivated virus with "adjuvants" like alum to boost the immune response. Generally, these vaccines are delivered via intramuscular injections. The manufacture of inactivated vaccines necessitates a biosafety level 3 facility due to the risk level of the

virus. The immune responses triggered by inactivated COVID-19 vaccines react to not only the spike protein but other parts of the virus as well. Currently, various prototype inactivated COVID-19 vaccines are under development in locations such as China, India, and Kazakhstan, with several in the late stages of clinical trials [14].

Live attenuated vaccines: Live attenuated vaccines work by introducing a less powerful form of the actual virus. This weaker version can replicate within the recipient's body but does not cause the disease. The virus is weakened or attenuated through either genetic modification or growth in adverse conditions, which reduces its disease-causing ability while keeping its ability to provoke an immune response. The purpose of a live attenuated COVID-19 vaccine is to promote both the antibody (humoral) and cellular immune responses against different parts of this weakened virus. Live attenuated vaccines have a further advantage as they can be given via nasal administration, like the methods used for live attenuated influenza vaccines. This may trigger specific immune responses in the mucous membrane at the virus' point of entry - the upper respiratory tract. Safety concerns, however, exist in relation to live attenuated vaccines. There is a potential risk of the weakened virus reverting to or mixing with the original wild-type virus. Therefore, these safety aspects require careful assessment in the development of live attenuated COVID-19 vaccines. Currently, several live attenuated COVID-19 vaccines are at the pre-clinical stage of development, but none have yet reached the stage of human trials [13,15].

Recombinant protein vaccines: Recombinant protein vaccines have viral proteins produced through various systems including mammalian and insect cells, yeast cells, and plants. These types of vaccines are typically delivered via an intramuscular injection. A significant distinction between recombinant protein vaccines and live attenuated vaccines is that the former do not need the replication of live viruses, leading to a simpler production process. However, the yield of these vaccines relies on the successful expression of the spike protein, which may vary. In the context of COVID-19, a variety of recombinant vaccines are under development, such as those based on recombinant spike proteins, recombinant receptor-binding domains, and virus-like particles (VLPs). An example at the forefront is a recombinant spike protein vaccine that is currently undergoing advanced clinical trials [12,13].

2.3.2. Vector vaccines

Replication-incompetent vector vaccines: Replication-incompetent vector vaccines refer to a type of vaccine that uses a modified virus as a vector. These vaccines are engineered in a way that they cannot replicate or reproduce in the body. The modified virus serves as a delivery system to express a specific viral protein, which is the target of the immune response. A commonly used vector for replication-incompetent vector vaccines is adenovirus. However, other vectors such as modified vaccinia Ankara (MVA) and influenza virus can also be used. In the case of SARS-CoV-2, most replication-incompetent vector vaccines being developed are designed to be administered intramuscularly and express the spike protein of the virus. By expressing the spike protein, these vaccines stimulate an immune response in the host against the spike protein itself. This immune response is important in supplying protection against SARS-CoV-2 infection. Several replication-incompetent vector vaccines for SARS-CoV-2 are currently in late-phase clinical trials [16].

DNA vaccines: DNA vaccines use plasmid DNA that has mammalian expression promotors and the desired target gene. When administered, the DNA is taken up by cells in the recipient's body and triggers the production of the target protein using the recipient's own cells. Escherichia coli is commonly used to produce large quantities of stable plasmid DNA, giving DNA vaccines a production advantage. However, DNA vaccines often show low immunogenicity, meaning they may not generate a strong immune response, and they require special delivery devices like electroporators to

enhance their efficacy. This can limit the practical usage of DNA vaccines. Moreover, for DNA vaccines to be effective, they must reach the nucleus of recipient cells where they undergo transcription, resulting in the production of messenger RNA (mRNA) and ultimately leading to the synthesis of the desired protein. This protein then stimulates an immune response. In the context of SARS-CoV-2, DNA vaccines being developed typically have the spike protein gene as the target for generating an immune response against the virus [17].

RNA vaccines: RNA vaccines are an innovative approach to vaccine development and were the first type of vaccines developed for SARS-CoV-2. These vaccines work by introducing RNA molecules into the recipient's body, which are then translated by the recipient's cells to produce the target protein and elicit an immune response [18]. It is important to note that mRNA vaccines do not interact with or integrate into the recipient's DNA, as they still are in the cytoplasm of the cell. One advantage of RNA vaccines is that they can be entirely produced in vitro, simplifying the manufacturing process. However, the scalability of large-scale RNA vaccine production has not been extensively tested [19]. Additionally, some RNA vaccines require ultra-low temperature storage, which poses challenges in terms of distribution and storage logistics. Ensuring the cold chain and keeping the required storage conditions are significant considerations for the deployment of RNA vaccines.

3. Methodology

3.1. Study design

This cross-sectional study was conducted in various provinces in Iraq and involved a total of 125 individuals. The data collection took place in September 2021.

3.2. Sample Collection

A web-based self-report survey was used, where vaccinated individuals were asked to complete an electronic survey using Google Form software. The survey link was shared electronically through various social media platforms such as Facebook, WhatsApp, and Telegram.

4. Result

The median age of individuals who received the vaccine was 32 years old, with the minimum age being 20 and the maximum age being 60 (as shown in Table 1, which displays the demographic distribution of patients). Among those who received the vaccine, 56% were female and 44% were male. Additionally, a small percentage (2.4%) of individuals experienced hypersensitivity following vaccination.

Table 1: The demographic distribution of patients.

Variables	Categories	No.	%
Age	20-30	49	-
	30-40	30	-
	40-50	20	-
	50-60	26	-
Gender	Male	55	44%
	Female	70	56%
Persons with	Yes	3	2.4%

hypersensitivity	No	122	97.6%

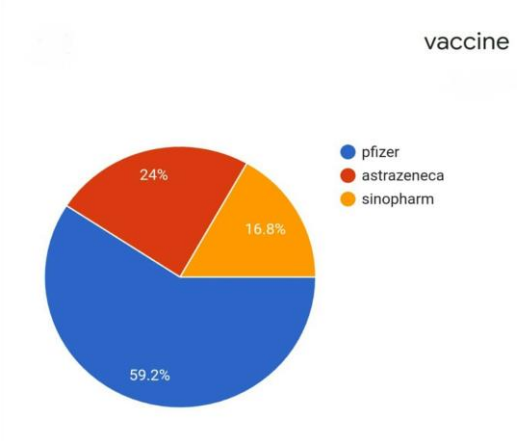

Figure 1: Show that 59.2% of people were administer Pfizer vaccine, 24% were administer AstraZeneca and only 16.8% of people were administer Sino pharm.

Approximately half of the individuals (67) experienced fever, while headache and arthralgia were reported by 51 and 43 individuals, respectively. Pain at the injection site was reported by approximately 14 people. Other side effects included back pain (30 individuals), nausea (4 individuals), shivering (1 individual), fatigue (3 individuals), diarrhea (1 individual), dizziness (1 individual), and lymph node tenderness (1 individual). Only 16 individuals did not report any side effects. Please refer to table 2 for a detailed overview of these findings.

Table 2: Adverse effects of the vaccines.

Adverse effects of vaccines	No. of patients	%
Fever	67	53%
Headache	51	40.8%
Arthralgia	43	34.4%
Pain at the site of injection	13	10.4%
Back pain	3	2.4%
Nausea	4	3.2%
Shivering	1	0.8%
Fatigue	3	2.4%
Diarrhea	1	0.8%
Dizziness	1	0.8%
Lymph node tenderness	1	0.8%
None	16	12.8%

Over half of the individuals (70) experienced adverse effects within the first 12 hours after vaccination, while approximately 39 individuals experienced adverse effects after 12 hours. Furthermore, the duration of these side effects varied among individuals, lasting anywhere from one day to more than three days. You can refer to table 3 and table 4 for a detailed breakdown of the timing and duration of the side effects, respectively.

Table 3: Onset of adverse effects.

Side effects appearance	No. of people	%
1-12 hours	70	56%
12-24 hours	39	31%
	16 people without any adverse effects	12.8%

Table 4: Duration of adverse effects.

Side effects duration	No. of people	%
Less than 24 hours	20	16%
24-48 hours	20	20%
Above 3 days	64	51.2%
	16 people have no adverse effects	12.8%

Table 5 presents the medication intake for reducing or relieving adverse effects. Most individuals (84) took acetaminophen, while 24 individuals took non-steroidal anti-inflammatory drugs (NSAIDs). Only 2 individuals took antihistamine medication.

Table 5: Medications used to reduce or relief side effects.

Medications	No. of people	%
Acetaminophen	84	67.2%
NSAIDs	24	19.2%
Antihistamine	2	1.6%
None	27	21.6%

5. Discussion

Like other vaccines, COVID-19 vaccines can result in mild, temporary side effects like low-grade fever, pain, or redness at the injection site. These reactions are typically mild and go away within a few days without needing treatment. Serious or long-lasting side effects from vaccines are extremely rare. A recent study found some of the most common vaccine side effects were fever, headache, joint pain, injection site pain, back pain, nausea, chills, diarrhea, dizziness, and fatigue. These align with known side effects of widely administered vaccines like AstraZeneca and Johnson & Johnson, which have protected millions. Data from clinical trials and surveillance programs prove the efficacy and safety of these vaccines. It's important to note that some individuals may experience mild to moderate side effects like fever, muscle aches, headaches, soreness at the injection site and fatigue, which are normal signs that the body is building protection against the virus [18,19].

This study shows that most side effects saw in individuals receiving the COVID-19 vaccine resolved within a time frame ranging from one day to one week. These findings align with the World Health Organization's reports on side effects of COVID-19 vaccines, which have predominantly been mild to moderate and short-lasting. In this study, most individuals who experienced side effects of the vaccine took acetaminophen to alleviate the severity of these adverse effects. This approach is in line with the WHO's recommendation that rest and consumption of plenty of non-alcoholic liquids can manage typical side effects in most cases (3).

6. Conclusion

Most COVID-19 vaccines have mild to moderate side effects, which may include fever, fatigue, headache, joint pain, injection site pain, back pain, nausea, shivering, diarrhea, dizziness, and lymph node tenderness. The occurrence and duration of these side effects can vary depending on the specific COVID-19 vaccine. However, they typically last for a short period of time. Most of these side effects can be managed with rest, staying hydrated with non-alcoholic liquids, and taking acetaminophen for the more common side effects.

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