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COVID-19 Vaccines: Types, Definition, Side Effects and Myths

A Graduation Project Submitted by

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1. Introduction

In December 2019, several cases of pneumonia due to some unknown pathogen were on the rise in Wuhan city, Hubei province of China. It was not till 31st of December 2019 that health authorities in China reported these cases to be investigated further. By this time a number of patients had become victim of severe illness. Soon a viral RNA was detected from bronchoalveolar lavage samples of some of the patients. The genome was sequenced and it was found to be closely related to SARS corona virus. The disease was named by WHO as COVID-19 caused by SARS-CoV-2. It had started as a single patient on December 1, 2019, then increased rapidly, initially in China, thereafter affecting other countries particularly Iran, Italy, Spain and USA. WHO declared it as a worldwide pandemic on March 11, 2020. Iraq was not exempted from this pandemic. Till date this potentially deadly virus has infected more than 595,000 people worldwide, and 1400 plus cases are already been reported from Iraq.

The disease has variable clinical presentation., Initial presentation — Among patients with symptomatic COVID-19, cough, myalgias, and headache and flu like symptoms are the most commonly reported symptoms. Other features, including diarrhea, sore throat, and smell or taste abnormalities, are also well described more severe complications are ARDS and sepsis. Mortality is more often reported in elderly population and those with comorbidities(1,2) .

In this situation Who and others health organizations focus on treating cases with symptoms relief drugs and critical cases was treated in intensive care unit since There was no drug or vaccine initially discovered against covid-19. Coronavirus disease 2019 (COVID-19), is an infectious disease that threatens the lives of millions worldwide. COVID-19 emerged in China in 2019 and rapidly spread across the globe. According to the WHO, COVID-19 has caused nearly five million deaths and over 251 million confirmed positive cases. In Iraq there have been about 23 thousand deaths and 2 million confirmed positive cases. The COVID-19 outbreak in Iraq has caused major alarm to the country's fragile health infrastructure. Iraq reported its first case of COVID-19 on 21 February 2020.6 To try to control the rapid spread of the pandemic, Iraqi health authorities implemented a lockdown involving some public sectors. Yet, failure to control the situation had led to a total lockdown as well as enforcing strict preventative measures including social distancing, face masks, and banning social gatherings. Infection and mortality rates hit their peaks in July and August, peaking to 12185 reported cases on 27 July 2021(3,4).

At that time many of companies was started to develop vaccines against virus Three COVID-19 vaccines are authorized or approved for use initially around the world Pfizer-BioNTech, Sinopharm COVID-19 vaccine And The Oxford/AstraZeneca (ChAdOx1-S [recombinant] vaccine) COVID-19 vaccine.

Vaccine hesitancy is a long-standing problem that poses a severe threat to global health, as seen by the return of infectious diseases such as measles and pertussis.14 The rapid development of effective and safe COVID-19 vaccines was remarkable. Nonetheless, vaccination reluctance for COVID-19 could be a significant barrier to global efforts to contain the pandemic and limit its health and socioeconomic consequences. Previous work has indicated that the Middle East has one of the lowest COVID-19 vaccine acceptance rates14 Low vaccination rangetes have been attributed to conspiracy views, which has resulted in a negative attitude toward immunization.15 No information about the COVID-19 acceptance rate or the association factors for vaccination acceptance have yet been reported for Iraq. This study will be the first to quantify the vaccine acceptance among medical students(5,6).

2. Literature Review

2-1. What is COVID-19 ?

Coronavirus, is a virus that can cause mild to severe respiratory illness, including death. The best preventive measures include getting vaccinated, wearing a mask, staying 6 feet apart, washing hands often and avoiding sick people.

What are the symptoms of the novel coronavirus (COVID-1 9) infection?

The CDC says you may have coronavirus if you have these symptoms or a combination of symptoms:

*Fever or chills
*Cough.
*Shortness of breath or difficulty breathing.
*Tiredness.
*Muscle or body aches.
*Headaches.
*New loss of taste or smell.
*Sore throat.
*Congestion or runny nose.
*Nausea or vomiting.
*Diarrhea.
*Additional symptoms are possible.

Symptoms may appear between two and 1 4 days after exposure to the virus. Children have similar, but usually milder, symptoms than adults. Older adults and people who have severe underlying medical conditions like heart or lung disease or diabetes are at higher risk of more serious complication from COVID-1 9(2,7)

How is coronavirus diagnosed?

COVID-1 9 is diagnosed with a laboratory test. Your healthcare provider may collect a sample of your saliva or swab your nose or throat to send for testing.

When should I be tested for the coronavirus (COVID-1 9?(

Call your healthcare provider if you: Feel sick with fever, cough or have difficulty breathing. Have been in close contact with a person known or suspected to have COVID-19

Your healthcare provider will ask you questions about your symptoms. Your healthcare provider will tell you if you need to be tested for COVID-1 9(1,7,8).

How many people are infected with COVID-1 9?

The number of people infected changes daily. As of this writing (1 0/1 1 /2021). more than 1 96,91 0,000 people in the world have been infected. Over 4,850,000people have died. Some 1 92 countries and territories on all continents have now reported cases of COVID-1 9(1,7,8).

How do you get infected with COVID-1 9?

COVID-1 9 enters your body through your mouth, nose or eyes (directly from the airborne droplets or from transfer of the virus from your hands to your face). The virus travels to the back of your nasal passages and mucous membrane in the back of your throat. It attaches to cells there, begins to multiply and moves into lung tissue. From there, the virus can spread to other body tissues(1,7,8).

How does COVID-1 9 spread from person to person?

The virus travels in respiratory droplets released into the air when an infected person coughs, sneezes, talks, sings or breathes near you (within 6 feet). You may be infected if you inhale these droplets.

You can also get COVID-1 9 from close contact (touching, shaking hands) with an infected person and then touching your face.

It's considered possible to get COVID-1 9 after touching a contaminated surface and then touching your eyes, mouth, or nose before washing your hands. But it's thought to be unlikely (1,7,8).

Where do coronaviruses come from?

Coronaviruses are often found in bats, cats and camels. The viruses live in but do not infect the animals. Sometimes these viruses then spread to different animal species. The viruses may change (mutate) as they transfer to other species. Eventually, the virus can jump from animal species and begins to infect humans. In the case of COVID-1 9, the first people infected in Wuhan, China are thought to have contracted the virus at a food market that soldmeat, fish and live animals. Although researchers don't know exactly how people were infected, they already have evidence that the virus can be spread directly from person to person through close contact.

How long is a person infected with COVID-1 9 considered contagious?

If you're infected with COVID-1 9 it can take several days to develop symptoms,but you are contagious during this time. You are no longer contagious ten days after your symptoms began.you are concerned you may have coronavirus or have any severe symptoms(8,9).

2-2. Diagnosis and Tests

How is coronavirus diagnosed?

COVID-1 9 is diagnosed with a laboratory test. Your healthcare provider may collect a sample of your saliva or swab your nose or throat to send for testing.

What treatments do people receive if they have COVID-1 9?

Treatments for COVID-1 9 vary depending on the severity of your symptoms. Depending on the severity of your COVID infection, you may need:

Supplemental oxygen (given through tubing inserted into your nostrils.(

Mechanical ventilation (receive oxygen through a tube inserted down your trachea). You are given medications to keep you comfortable and sleepy as long as you're receiving oxygen through a ventilator.

Extracorporeal membrane oxygenation (ECMO). You continue to receive treatment while a machine pumps your blood outside your body. It takes over the function of your body's lungs and heart(9,10).

2-3. COVID-19 Vaccines

Generally, Vaccines work with your body's natural defenses so your body will be ready to fight the virus if you are exposed. This is also called immunity. COVID-19 vaccination works by teaching your immune system how to recognize and ght the virus that causes COVID-19, and this protects you from getting sick with the virus

Many pharmaceutical companies invested signs can't resources into quickly developing a vaccine for COVID-19 because of the world-wide impact of the pandemic. Both Pfizer and Moderna used similar processes when developing their vaccine. Even though COVID-19 is new, these types of viruses (called coronaviruses) have been studied since the 1960s. This knowledge helped scientists understand the virus to make a vaccine(11,12).

Several vaccines have been developed against SARS-CoV-2 and have shown promising results in clinical trials. One of the leading examples is the mRNA-based vaccine (known as BNT162b2) developed by Pfizer-BioNTech pharmaceutical companies, which demonstrated to be safe and offer protection in subjects after receiving the second dose . Additionally, mRNA-based vaccine (known as mRNA-1273) developed by Moderna showed favourable results in clinical trials published in the New England Journal of Medicine. Both vaccines were granted emergency use authorization by the Food and Drug Administration (FDA) and European Medicines Agency (EMA), respectively .

Another promising vaccine is the DNA-based vaccine (known as Vaxzevria) developed by Oxford-AstraZeneca which was authorized for use by the U.K Medicines and Healthcare products Regulatory Agency (MHRA). The World Health Organization (WHO) granted emergency validation to the Pfizer/BioNTech and AstraZeneca COVID-19 vaccine. A heterologous recombinant adenovirus (rAd)-based vaccine, Gam-COVID-Vac (Sputnik V) was developed by the Gamaleya Center, Russia. Lastly, two inactivated virus vaccines were developed by Sinovac and Sinopharm in China. As of January 20, the National Committee for Drug Selection at Iraqi Ministry of Health (MOH) approved three vaccines for emergency use: Pfizer/BioNTech, AstraZeneca and Sinopharm. Thereafter, the MOH ordered millions of doses from the Pfizer/BionTech, AstraZeneca and Sinopharm vaccines(11,12,13) .

2-4. Covid-19 vaccines development:

as the majority of the population are still susceptible (non-immune) to the SARSCOV-2 virus and the virus spreads easily, it is clear that a safe and effective vaccine is needed to prevent further cases

a COVID-19 vaccine prepares the immune system so that in the event of an exposure to the virus, it is able to respond and prevent or reduce the severity of infection during April 2020, a UK vaccine taskforce was set up to support the development of a SARS-CoV-2 vaccine(24,25).

the taskforce supported research and industry to rapidly develop and scale up the manufacture of a vaccine to protect the population

scientists, industry and other organisations have worked collaboratively across the globe to complete the different phases of vaccine development in parallel, rather than sequentially to make a safe and effective vaccine available as soon

as possible by knowing the genetic code for the SARS-CoV-2 virus, various methods to create vaccines can be used such as using the code itself (mRNA vaccines) or inserting part of this code into existing viruses (viral vector vaccines(by December 2020, over 270 different COVID-19 vaccines were in early development, over 50 of these were being given to people in clinical trials and 11 were being trialled in large phase 3 trials(26,27)
some vaccines have been made using currently used vaccine technology, others have been made using new approaches or methods used during previous emergencies such as the SARS pandemic and west African Ebola

2-5. Side Effects of COVID-19 vaccins

Most people will have no side effects but the vaccine may cause side effects in some people. For most, side effects will last no longer than a day or two.
Possible side effects include:
On the arm where you got the shot: Pain, redness, and swelling
Throughout the rest of your body:
Fever, chills, headache, tiredness, joint and body aches
To reduce pain and discomfort where you got the shot: Apply a clean, cool, wet washcloth over the area
Use or exercise your arm
To reduce other symptoms, talk to your doctor about taking an over-the- counter medication such as Tylenol or Ibuprofen. Side effects are a sign that the vaccine is working to help teach your body how to ght COVID-19 if you are exposed. They do NOT mean you have COVID-19. You can't get COVID-19 from the vaccine(30,31).

2-6. Reasons for COVID-19 Vaccine Hesitancy among People

The World Health Organization (WHO) has identified vaccine hesitancy as a leading global health threat.
Rejection of the COVID-19 vaccine lessens the probability of herd immunity and could extend the pandemic. Especially concerning is vaccine hesitancy among health care workers (HCWs), including doctors and nurses as well as those who deliver indirect care and services (aides, helpers, laboratory technicians, and even medical waste handlers.(
Not only are HCWs at increased risk of contracting and transmitting disease, but they also have a potentially powerful influence on patient vaccination decisions. Vaccinated HCWs are more likely to recommend vaccination to others.
Understanding and addressing HCWs vaccination attitudes is crucial to promoting COVID-19 vaccine acceptance and can provide important lessons for

other infectious disease crises. The following are four reasons for vaccine hesitancy(35,36)

1- Safety and efficacy concerns

While the COVID-19 vaccines are not yet fully approved for commercial use by the Food and Drug Administration (FDA), the FDA has issued Emergency Use Authorization (EUA) of several vaccines due to the public health emergency, based on data from clinical trials that included tens of thousands of participants.Still, the condensed timeline in which the vaccines were developed and received EUA has raised safety and efficacy concerns for some HCWs. However, there is evidence that vaccine data can help assuage these concerns. Among HCWs, knowledge of a specific vaccine increased their willingness to recommend that vaccine. For instance, concerns about the speed of COVID-19 vaccine development are often based on the mistaken belief that mRNA technology — used for the first two COVID-19 vaccines authorized in the U.S. — is entirely new. But the first successful use of mRNA technology in animals was reported more than 30 years ago, and tremendous mRNA advances have been made over the past decade.

Government, public health agencies, and private health care systems can work together to provide accurate information about the vaccines to HCWs. The increased availability of vaccine safety and efficacy data may be a factor in the increased acceptance of the vaccine in recent months(35,36) .

2-Preference for physiological immunity

Herd immunity can be achieved through vaccination or via previous infections, which eventually lead to natural or physiological immunity., Some HCWs, as well as some Americans and Canadians in the general population, have expressed a preference for physiologic immunity, rather than obtaining immunity via vaccination.Individuals who believe the seriousness of COVID-19 has been exaggerated perceive the risk of vaccination to be greater than the risk of infection.

The difference in consequences between these two approaches to reaching herd immunity must be clearly communicated to HCWs who currently prefer physiologic immunity over vaccination. Achieving herd immunity through previous infection would take significantly longer, incurring an immense cost in health care resources, as well as lives. There is evidence of greater vaccine acceptance among HCWs who have cared for hospitalized COVID-19 patients, presumably because of an accurate perception of the severity of the disease.

Discussions with clinicians who have had these experiences may convince vaccine-hesitant HCWs to get the shot(35,36) .

3-Distrust in government and health organizations

A key factor in gaining acceptance of a new vaccine is trust. Media misinformation can cause public doubts about disease spread, prevention, lethality, and vaccine safety, and can promote mistrust of the government, policymakers, health authorities, and pharmaceutical companies. Many members of the public, including HCWs, have been exposed to conspiracy theories (especially on social media) such as the claims that novel coronavirus was intentionally created by the government or that health organizations have exaggerated COVID-19's lethality for pharmaceutical and political gain. Such misinformation calls into question authorities' integrity and undermines efforts to increase COVID-19 vaccine uptake. Early on in the pandemic, social media exposure and conservative media exposure were both correlated with higher levels of misinformation about the SARS-CoV-2 virus. Placing accurate information on social media with credible sources will help to counter this misinformation(37,38)

Direct messaging from other HCWs, whether in the capacity of personal physician or co-worker, may be especially effective in decreasing vaccine hesitancy. Americans generally have a high level of trust in their physician, and there is evidence that HCWs have greater trust in medical professionals prescribing the vaccine than in public authorities and government. Simply delivering factual information, however, is inadequate. Confidence among HCWs can be heightened through discussion, eliciting their concerns, and involving them in vaccine recommendations. It is crucial to remember that language matters. Based on a nationwide poll from December 2020, the de Beaumont Foundation created a "cheat sheet" for language to improve COVID-19 vaccine confidence. Although it's too late now, government officials might have engendered greater trust in the vaccine development and dissemination process by labeling it "Operation Due Diligence," instead of "Operation Warp Speed(39,40)

4-Autonomy and personal freedom

HCWs and rural Americans report that a sense of personal freedom informs their attitudes toward the COVID-19 vaccines.7,20 Clinicians are held to the standard of informed consent when recommending treatments to their patients, and while COVID-19 vaccination remains elective, it is understandable that

HCWs prefer to make their own choices about it. Motivational interviewing may increase the effectiveness of pro-vaccine messages in these instances. In a post-partum intervention to promote vaccination, the use of motivational interviewing increased infant vaccination rates by 9%. While research in motivational interviewing has focused on patients rather than on HCWs, there is little reason to believe that HCWs would respond differently than the general population. When HCWs feel their opinion is heard and valued, perhaps they will be more inclined to consider vaccine acceptance a personal choice rather than coercion(39,40).

Although not typically used in medical communication, emotional appeal may be a valid tool to complement other facets of vaccine education in both public health education campaigns and personal interactions among HCWs. Emotion can be leveraged in vaccination messaging by acknowledging negative emotions such as fear and anxiety, taking care to not heighten such emotions, and activating positive emotions such as hope and altruism (e.g., protecting one's community from COVID-19). The emotional allure of anti-vaccine disinformation campaigns should also be examined so they can be countered with effective pro-vaccine messages. Self-identity has been associated with beliefs regarding COVID-19 vaccination. Exploring and understanding identity barriers is key to avoiding the reinforcement of vaccine-averse identities. Narrative (versus logical-scientific) forms of communicating are intrinsically persuasive and offer options for countering vaccine hesitancy. Equally important is creating narratives that allow changed opinion without losing face(39,40,41).

How long do I need to wait after getting a flu vaccine or another vaccine before getting a covid -19 vaccine?

You can get a COVID-19 vaccine and other vaccines, including a flu vaccine, at the same visit. Experience with other vaccines has shown that the way our bodies develop protection, known as an immune response, and possible side effects after getting vaccinated are generally the same when given alone or with other vaccines(39,40).

Do I need to wear a mask and avoid close contact with others if I am vaccinated?

Generally, if you are up to date on your COVID-19 vaccinations, you do not need to wear a mask in outdoor settings. Check your local COVID-19 Community Level for recommendations on when to wear a mask indoors and additional precautions you can take to protect yourself from COVID-19. If you are immunocompromised or more likely to get very sick from COVID-19(40,41)

Allergic Reaction to COVID-19 Vaccine Product

If you had a severe allergic reaction after a previous dose of a COVID-19 vaccine or if you have a known (diagnosed) allergy to a COVID-19 vaccine ingredient, you should not get that vaccine. If you have been instructed not to get one type of COVID-19 vaccine, you may still be able to get another type(40,41).

Could getting vaccinated against COVID-19 disrupt my menstrual cycle?

There have been some reports of people experiencing disruption to their menstrual cycle after being vaccinated against COVID-19. There is not yet enough data available to know whether there is a connection between the vaccines and this disruption. Several large studies researching the impact of vaccines on menstrual cycles are ongoing. WHO will continue to monitor any new evidence regarding menstrual cycles. Information regarding these studies can be found here and here. If you have concerns or questions about your periods, do not hesitate to speak with a health care provide(42,43)

Can COVID vaccines alter my DNA?

No. Vaccines cannot alter DNA. This is a great example of misinformation designed to scare people away from lifesaving vaccines and downplay the very real risks of vaccine-preventable diseases. At a glance, it sounds possible, but the science doesn't support it. (42,43)

Do COVID 19 vaccines causes infertility ?

No. There is currently no evidence that any vaccines, including COVID-19 vaccines, cause fertility problems in females or males.

While this misinformation is about the COVID-19 vaccine, it's not new. It's a pretty common tactic already used by people who want to scare people away from getting vaccinated against other diseases, such as hepatitis B, polio, and cancer-causing HPV. Just like with COVID-19 vaccines, these claims about fertility just aren't based on science(41,43).

COVID-19 and Female Fertility

According to CDC and the pregnancy experts at the American College of Obstetricians and Gynecologists (ACOG):

If you are planning or trying to get pregnant, you should get a COVID-19 vaccine.

There is no evidence suggesting that fertility problems are a side effect – in the short or long term – of any of the COVID-19 vaccines available for use in the U.S. The way that vaccines are made makes experts confident that the vaccines are not a cause of infertility and a recent study has confirmed this.

The study results show that women who had the COVID-19 vaccines were able to get pregnant at the same rates as women who did not get the vaccines.

Like all vaccines approved/authorized for use in the U.S., the COVID-19 vaccines are being studied carefully now and will continue to be monitored for safety for many years. Read more. (43,44)

You do not need to delay getting pregnant after you get a COVID vaccine.

Some COVID-19 vaccines, such as the mRNA COVID-19 vaccines from Pfizer and Moderna, require two doses for the best protection. If you find out you are pregnant after you have the first dose of COVID vaccine, you should still get the second dose.

In addition, according to the American Academy of Pediatricians (AAP), COVID vaccines don't affect puberty or a child's reproductive development in any way. (45,46)

COVID-19 and Male Fertility

There is NO EVIDENCE that any vaccines, including COVID-19 vaccines, cause male fertility problems. According to CDC, there was a recent study of 45 healthy men who got an mRNA COVID-19 vaccine (i.e., Pfizer or Moderna), which looked at their sperm characteristics (like quantity and movement) before and after vaccination. The study researchers found no significant changes in these sperm characteristics after vaccination.

In addition, while fever from illness, like COVID, has been associated with short-term decreases in sperm production in healthy men, there is no evidence that fever after COVID vaccination affects sperm production. (47,487)

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