

COVID-19 VACCINES: MYTHS AND RUMORS VS FACTS

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ABSTRACT

The pandemic of COVID-19 had caused millions of deaths and left hundred millions of patients. Actually the disease will be controlled only through vaccination. With the prevalence of wrong information, convincing people to get vaccinated is very difficult. So, accurate vaccine information is critical and essential. The most common myths and rumors were related to COVID-19 vaccine safety and utilization. They include: The vaccines were developed rapidly without research, It is not safe and not necessary for children, They cause many variants of the virus, many side effects, complications and deaths, The mRNA vaccine is not considered a vaccine, They contain microchips, fetal cells and around 99% graphene oxide, They cause the body to be magnetic, They shed or release their components, They will alter DNA, It is unsafe for women planning to have a baby one day, They cause COVID-19 infection, abortion and miscarriage, They cause test positive for COVID-19 on a viral test, They should be postponed for certain period of time after getting a flu vaccine or another vaccine, Vaccines not needed for patients recovered from COVID-19, Pfizer-BioNTech vaccine is the best one, Fully vaccinated do not need to avoid close contact with others or wear a mask, The second dose of vaccine is not necessarily the same as first dose and medical conditions are contraindication for vaccination. While social media posts and some news outlets may make it harder to know what is fact or fiction, the science is clear, approved COVID-19 vaccines safe and effective.

KEYWORDS: COVID-19, Vaccine, Safety, Myths, Rumors, misinformation.**BACKGROUND**

Vaccines are essential for ending the COVID-19 pandemic. In the U.S., one COVID-19 vaccine had full approval from Food and Drug Administration (FDA), and another two vaccines were authorized as emergency use. Health care facilities and pharmacies have plenty of COVID-19 vaccine supply for everyone.^[1] A lot of misinformation, rumors and conspiracy theories created resistance to vaccinations. Misinformation spreads so easily and quickly through social media networks that it has become a major barrier against vaccination that is essential for herd immunity. Accurate vaccine information is critical. It can help stop common myths and rumors. It is difficult to know the best sources of information you can trust. We have to check the information to ensure that it comes from a credible source, free of myths and rumors and is updated on a regular basis before considering vaccine information on the Internet.^[2] Now that the distribution of vaccines for COVID-19 covered most countries all over the world we have to review common myths and rumors circulating about the vaccine and try to clear up confusion with

reliable facts. A host of myths have left some people hesitant to receive the vaccine. While social media posts and some news outlets may make it harder to keep up with what is fact or fiction, the science is clear, approved COVID-19 vaccines safe and effective.^[3]

Objectives of the study

The main objective is to study misinformation, false claims, myths and rumors about COVID-19 vaccines on social media, news outlets or from the people in our life with the aim of clearing up confusion with reliable facts.

MATERIAL AND METHODS**Definitions**

Myth: pronounced mith; noun; definition: "a widely held but false belief or idea"; synonyms: misconception, fallacy, fantasy, fiction.^[4]

Rumor: "an interesting story or piece of news that may or may not be true, that spreads quickly from person to person".^[4]

It's likely we've heard misinformation, false claims, myths and rumors about COVID-19 vaccines on social media, news outlets or from the people in our life. So we review messages and videos on social media such as Facebook, Twitter, WhatsApp, Instagram, Snapchat and YouTube and some news outlets since the authorization of the vaccines till now. There is so much misinformation on social media and Facebook videos even people pretending to be doctors and they're saying that the vaccines are bad. We also searched for reliable facts behind these false claims, myths and rumors in the current literature to clear up confusion.

Human rights

The researchers did not mention the rumor mongers name, qualifications, specializations, or work in order to preserve their privacy and not to defame them. The greatest interest was in correcting concepts and showing the correct scientific facts.

RESULTS

Among the many reasons COVID-19 vaccination rates low in both developing and developed countries are false claims, myths and rumors that took hold among the unvaccinated and solidified as their reasons not to get the shots. *The vaccines are too new; the vaccines will make women sterile; the shots have a microchip in them; the vaccine itself will give me COVID; I'm immune because I had COVID; breakthrough cases prove vaccines are useless.* There are more. And none of them are true. The most common false claims, myths and rumors about COVID-19 vaccines on social media or from the people in our life were recorded and the reliable facts behind them were explained to clear up confusion.

1. "COVID-19 vaccines were developed rapidly without adequate research for safety and efficacy".

In spite of vaccines for COVID-19 were developed rapidly, they passed with all phases of research to make sure they are safe and effective. All vaccines must go through three phases of clinical trials to make sure they are safe and effective.^[5] Researchers and scientists have been working for many years to develop vaccines against viruses like the one that causes COVID-19.^[6] This basic knowledge speeded up the development of the current COVID-19 vaccines. During the development of these vaccines, the three phases were completed but overlapped to speed up the process. Before vaccines are available to the public, the U.S. Food and Drug Administration (FDA) assesses the results of the clinical trials.^[5,7] FDA approved three COVID-19 vaccines met FDA's safety and effectiveness standards and granted those vaccines Emergency Use Authorizations (EUAs) external icon. This approval allowed quick distribution of the vaccines to control the pandemic.^[8] For people ages 16 years and older, Pfizer-BioNTech (COMIRNATY) COVID-19 vaccine has now been FDA approved external icon. At the same time, safety monitoring of COVID-19 vaccine has been intense and comprehensive.^[9] Through several monitoring systems,

CDC and FDA continue to provide updated information on the safety of these vaccines.^[10] Hundreds of millions of people all over the world have received COVID-19 vaccines.^[11]

2. "COVID-19 vaccines is not safe and not necessary for children".

Vaccination against COVID-19 can protect children from getting infected. Although the incidence of COVID-19 infection among children is low compared to adults, they still have the opportunity to get infected and can spread the virus that causes COVID-19 to others. Vaccination of children helps to protect both the child and his/her family. It is now recommended for all children 12 years and older.^[12] Currently, the Pfizer-BioNTech COVID-19 Vaccine is the only vaccine approved to children 12 years and older. Studies done on COVID-19 vaccines under the most intensive safety monitoring in U.S. history, included children 12 years and older. Like adults, children may have some minor side effects after COVID-19 vaccination. These mild side effects such as fever may affect their ability to do daily activities, but they go away in few days.^[13]

3. "Appearance of many variants of the virus is the result of COVID-19 vaccines".

Vaccines approved for COVID-19 cannot create or cause variants of the virus that causes COVID-19. Virus that causes COVID-19 constantly changes through a natural ongoing process of mutation causing appearance of new variants of the virus. There were several variants of the virus even before the appearance of COVID-19 vaccines. Variants are also expected to continue to emerge as the virus continues to grow and change.^[14] While, COVID-19 vaccines can prevent new variants from emerging. As the virus spreads, it has more opportunities to mutate and change. So, control of spread of the virus through high vaccination coverage helps prevent new variants to emerge. CDC recommends that everyone 5 years of age and older have to get vaccinated as soon as possible to enhance vaccination coverage among different populations.^[12]

4. "COVID-19 vaccination causes too many side effects, complications and deaths".

The Vaccine Adverse Event Reporting System (VAERS) reports may contain information that is inaccurate, incomplete, coincidental, or unverifiable. Anyone can report adverse events to VAERS, even if it is not clear whether a vaccine caused the problem. Hence, VAERS data alone cannot determine if the reported adverse event was caused by a COVID-19 vaccination. These reported adverse events are studied by vaccine safety experts who look for unusually high numbers of health problems, or a pattern of problems, after people receive a particular vaccine. The number of deaths reported to VAERS following COVID-19 vaccination has been misinterpreted and misreported as if this number means deaths that were proven to be caused by vaccination. Conclusively, Reports of adverse events to VAERS

following vaccination, including deaths, do not necessarily mean that they caused by the vaccine.^[15,16]

5. "Some of COVID-19 vaccines are not considered vaccine".

The mRNA vaccines are new, but research and development of this type has been under way for decades.^[6] The mRNA vaccine, such as Pfizer-BioNTech, works differently than other types of vaccines, but it still triggers an immune response inside the body. The mRNA vaccines do not contain any live virus. Instead, they teach cells to make a harmless piece of a "spike protein," which is found on the surface of COVID-19 virus. After making the protein piece, cells display it on their surface. The immune system then recognizes that it is foreign and responds to get rid of it. Antibodies are then produced, creating the same response that happens in a natural infection.^[17]

6. "COVID-19 vaccines contain microchips".

COVID-19 vaccines are developed to fight against COVID-19 infection and are not administered to track movement or something else. Hence, they do not contain microchips. These vaccines work by stimulating the immune system to produce antibodies, exactly like exposure to the disease.^[17,18]

7. "COVID-19 vaccines contain fetal cells".

None of the COVID-19 vaccines contain fetal cells. COVID-19 vaccines manufacturer did not use a fetal cell line to manufacture the vaccine. However, a fetal cell line was used in early research efficacy of these vaccines. The use of these fetal cell lines in research and/or production of vaccines and medication is not new.^[6] Some over-the-counter medications for which a historic fetal cell line was utilized in research and/or production and manufacturing include: Aspirin, Tylenol, Maalox and others.^[17]

8. "COVID-19 vaccine cause the body to be magnetic".

All COVID-19 vaccines do not contain any ingredients that can produce an electromagnetic field at the site of injection. They are free from metals such as iron, cobalt, nickel, lithium, and rare earth alloys. They are also free from manufactured products such as microelectronics, electrodes, carbon nanotubes, or nanowire semiconductors. None of the vaccines contain eggs, gelatin, latex, or preservatives. So, receiving a COVID-19 vaccine will not make the body magnetic, including the site of injection which is usually the arm.^[3,4]

9. "COVID-19 vaccines contain 99% graphene oxide".

Covid-19 vaccines should not have unexpected ingredients. On the ingredient list posted on the U.S. FDA and the CDC for the Pfizer/BioNTech Covid-19 vaccine on their website, graphene oxide does not reported. The ingredients of the Pfizer vaccine on a factsheet on the U.S. Food and Drug Administration's

website include: mRNA, potassium chloride, lipids, monobasic potassium phosphate, dibasic sodium phosphate dihydrate, sodium chloride, and sucrose. None of the other COVID-19 vaccines available worldwide, manufactured by Moderna, AstraZeneca, Janssen, Sinovac, CanSino and Sputnik V, contain graphene oxide, according to ingredients lists.^[1]

10. "COVID-19 vaccines shed or release their components".

There is no live virus in any of the COVID-19 vaccines. Because vaccine shedding only happen when a vaccine contains a weakened version of the virus, it is impossible to occur in COVID-19 vaccines.^[1]

11. "COVID-19 vaccine will alter DNA".

COVID-19 vaccines do not interact with or change DNA in any way. Both mRNA and viral vector COVID-19 vaccines deliver instructions (genetic material) to the cells to start building protection against the virus that causes COVID-19. However, the material never enters the nucleus of the cell, where DNA is kept.^[16]

12. "Women planning to have a baby one day, should not get a COVID-19 vaccine".

Recently, COVID-19 vaccination is recommended for everyone 5 years of age or older, including women who are trying to get pregnant now or might become pregnant in the future, as well as their partners.^[19] COVID-19 vaccination is recommended for pregnant and breastfeeding women.^[20] Women might want to have a conversation with healthcare provider about COVID-19 vaccination. It is not required before vaccination although it might be helpful. Currently, no evidence shows that any vaccines, including COVID-19 vaccines, cause fertility problems in women or men.^[20] Meanwhile, findings from a study published in *The Lancet* showed that fertility was unaffected by vaccination with ChAdOx1 nCoV-19 (AstraZeneca).^[21]

13. "COVID-19 vaccine causes abortion and miscarriage".

A study done on 13,956 women with ongoing pregnancies published in the *New England Journal of Medicine* (2021) found no evidence of an increased risk for early pregnancy loss after Covid-19 vaccination.^[22] Furthermore, "compared with women who received the control vaccine, there was no increased risk of miscarriage and no instances of stillbirth in women vaccinated before pregnancy in global clinical trials of ChAdOx1 nCoV-19," the authors concluded.^[23,24] These data, along with published data on mRNA vaccines, can provide evidence to support women in making decisions regarding vaccination.^[25]

14. "COVID-19 vaccine causes COVID-19 infection".

None of the authorized COVID-19 vaccines contain the live virus that causes COVID-19. This means that a COVID-19 vaccines cannot cause COVID-19 infection.

COVID-19 vaccines teach the immune system how to fight the virus that causes COVID-19. Sometimes this process can cause symptoms, such as fever. These symptoms are normal while the immune system is reacting against the virus of COVID-19.^[26]

15. “The menstrual cycle can be affected being near someone who received a COVID-19 vaccine”.

The menstrual cycle cannot be affected by being near someone who received a COVID-19 vaccine. While, a lot of factors can affect menstrual cycle, including stress, sleep disorders and changes in diet and exercise. Also, Infections may also affect menstrual cycles.^[27]

16. “COVID-19 vaccines during breastfeeding, infect baby with COVID-19”.

COVID-19 vaccines cannot cause infection in anyone.^[26] Vaccines are effective at preventing COVID-19 in breastfeeding women. Additionally, breastfeeding women who have received mRNA COVID-19 vaccines pass antibodies in their breast milk, which could help protect their babies. The Centers for Disease Control and Prevention and the Academy of Breastfeeding Medicine recommend that lactating women receive the vaccine and that breastfeeding should not be stopped around the period of vaccination.^[19,20]

17. “COVID-19 vaccine causes breast cancer”.

There is no scientific evidence that COVID-19 vaccines cause any problems with breast tissue or would lead to breast cancer. The mRNA vaccines are processed by the body near the injection site and activate immune system cells that travel through the lymph system to nearby lymph nodes. In this manner, an individual may experience swelling under the arm where the vaccine was administered due to swelling of the axillary lymph node. Additionally, the vaccines did not affect hormone levels, nor they travel throughout the body or affect other body organs, such as breast tissue. Swollen lymph nodes can appear in a mammogram even if women can't feel them. Hence, the Society of Breast Imaging recommends women delay any routine mammography scheduled within four weeks after their most recent COVID-19 vaccination.^[7,13]

18. “COVID-19 vaccine cause test positive for COVID-19 on a viral test”.

None of the authorized and recommended COVID-19 vaccines cause test positive results on viral tests, to see if you have a current infection. After the body develops an immune response to vaccination, some antibody tests may result positive. Antibody tests indicate either a previous infection or presence of some level of protection against the virus.^[16]

19. “After getting a flu vaccine or another vaccine, you need to wait for certain period of time before getting a COVID-19 vaccine”.

Absolutely false, COVID-19 vaccines and other vaccines, including a flu vaccine, can be given at the

same visit. Experience with other vaccines has shown that the way of development an immune response, and possible side effects after getting vaccinated are generally the same when given alone or with other vaccines. So, more than one vaccine can be taken safely at the same time.^[28]

20. “If you have already recovered from COVID-19, you do not need to get vaccinated with a COVID-19 vaccine”.

Everyone 12 years and older should be vaccinated regardless of whether already had COVID-19 because research has not yet shown how long protection from getting COVID-19 again after you recover from COVID-19. So, vaccination helps protect the body even if you've already had COVID-19.^[29] Unvaccinated people who already had COVID-19 are more than 2 times as likely as fully vaccinated people to get COVID-19 again. Evidence is emerging that people get better protection by being fully vaccinated compared with having had COVID-19. If the patient were treated for COVID-19 with monoclonal antibodies or convalescent plasma, he should wait 90 days before getting a COVID-19 vaccine. There is no exact data about how long vaccines protect against COVID-19. CDC will update information as new evidence becomes available.^[30]

21. “The best COVID-19 vaccine is Pfizer-BioNTech vaccine”.

CDC does not recommend one vaccine over another. All currently authorized and recommended COVID-19 vaccines are safe and effective. Widespread vaccination is the goal to stop the pandemic. So, you have to take the decision to get a COVID-19 vaccination as soon as possible.^[11]

22. “You do not need to avoid close contact with others or wear a mask, if you are fully vaccinated”.

After vaccinated with two doses of COVID-19 vaccine you do not need to wear a mask in outdoor settings. In areas with high numbers of COVID-19 cases, consider wearing a mask in crowded outdoor settings and when you are in close contact with others. For people with chronic conditions or taking medications that weaken their immune system, they may not be fully protected even if they are fully vaccinated. Those patients should continue to take all precautions recommended for unvaccinated people, including wearing a well-fitted mask, until advised otherwise by healthcare provider.^[2-4]

23. “The second dose of mRNA COVID-19 vaccine is not necessarily the same type of the first dose”.

The safety and effectiveness of a mixed-product series of COVID-19 vaccines have not been evaluated. Hence, COVID-19 vaccines till now are not interchangeable.^[4] So, make every effort to determine which vaccine product was administered as the first dose to ensure the subject completes the second dose with the same product. When the vaccine product given for the first dose is no longer available or cannot be determined, the

subject can take any available mRNA COVID-19 vaccine, or you may consider administering a single dose of Janssen COVID-19 vaccine with at least 28 days between doses.^[3] To ensure subjects will receive the second dose with the appropriate product and interval between doses, every vaccine recipient should be provided with a COVID-19 vaccination record card. Also, Record each recipient's vaccination in the immunization information system (IIS) and record vaccine administration information in the patient's medical record. Make an appointment for the next dose before the subject leaves to increase the likelihood that subject will return to the same health care center for the second dose. Make sure that the subject has a reminder for the second appointment.^[31]

24. "People who received passive antibody therapy as part of their COVID-19 treatment did not need COVID-19 vaccine".

People who previously received passive antibody therapy (monoclonal antibodies or convalescent plasma) as part of COVID-19 treatment, should postpone vaccination for at least 90 days after receipt of passive antibody therapy. This recommendation applies to both people who receive passive antibody therapy before receiving any COVID-19 vaccine dose and to those who receive passive antibody therapy after the first dose of an mRNA COVID-19 vaccine.^[32]

25. "Patients with underlying medical conditions are contraindicated for vaccination".

Patients with underlying medical conditions; such as immunocompromised patients or patients who take immunosuppressive medication, autoimmune conditions, a history of Guillain-Barré syndrome, a history of Bell's palsy or a history of dermal filler use can receive any currently FDA-authorized or approved COVID-19 vaccine. Advisory Committee on Immunization Practices (ACIP) does not recommend certain vaccine.^[33]

DISCUSSION

The US Food and Drug Administration's (FDA) Vaccines and Related Biological Products Advisory Committee (VRBPAC) has voted in favour of issuing an Emergency Use Authorization (EUA) to the Pfizer-BioNTech BNT162b2 coronavirus disease 2019 (COVID-19) mRNA vaccine in children aged 5 to 11 years.^[34] The FDA's VRBPAC committee voted on the following question: "Based on the totality of scientific evidence available, do the benefits of the Pfizer-BioNTech COVID-19 vaccine, when administered as a 2-dose series, outweigh its risks for use in children aged 5 to 11 years?" The vote was nearly unanimous, with 17 members voting "yes" for the EUA and 1 member abstaining from voting. No member voted against the EUA. The almost 8-hour deliberation covered efficacy and safety data from two paediatric cohorts in the phase 2/3 C4591007 study. The most common unsolicited adverse event was lymphadenopathy, which occurred in 19/1305 children in the BNT162b2 group and in 4/663

children in the placebo group. There were no reports of myocarditis, pericarditis, or anaphylaxis. There were no deaths.^[34] This ensures higher safety and efficacy of the vaccine in different age groups and in all categories of the population. Voting yes to the EUA would allow high-risk children, such as transplant recipients or children with comorbidities, to receive the vaccine. The final decision; FDA authorizes the vaccine for emergency use in children aged 5 to 11 years.^[35]

While most of misinformation, false claims, myths and rumors are related to safety and utilization, COVID-19 vaccines have been used under the most intensive safety monitoring in U.S. history, which includes studies in adolescents, adults and most recently in children aged 5-11 years.^[36-38] CDC recommended children and adolescents receive the same dosage of Pfizer-BioNTech COVID-19 vaccine as adults and will need a second shot of the Pfizer-BioNTech vaccine 3 weeks after their first shot.^[1,11] Because many people tend to gather to celebrate holidays, public and private events, the best way to minimize COVID-19 risk and keep your family and friends safer is to get vaccinated if you're eligible. Safer events tips include: 1) Wear a mask in public indoor settings if you are not fully vaccinated, have a weakened immune system, or if you are in an area with high risk transmission. 2) Avoid crowded, poorly ventilated places. 3) Don't host or attend gatherings if you are sick or have symptoms. 4) Delay travel until you are fully vaccinated. 5) Get tested if you have symptoms of COVID-19 or have a close contact with someone who has COVID-19.^[11]

Both BNT162b2 (Pfizer-BioNTech) and ChAdOx1 nCoV-19 (AstraZeneca) vaccines offered "substantial protection" against death from coronavirus disease 2019 (COVID-19) caused by the B.1.617.2 (Delta) variant, according to a study published in *The New England Journal of Medicine*.^[36] Meanwhile, another study, also published in *The New England Journal of Medicine*, suggests that the BNT162b2 vaccine was highly effective against both documented infection and symptomatic COVID-19 with the Delta variant among adolescents between the ages of 12 and 18 years.^[37] In a recent randomized trial involving 1983 vaccinated adolescents between the ages of 12 and 15 years with no history of SARS-CoV-2 infection, investigators estimated that the vaccine effectiveness of two doses of BNT162b2 was 100% (95% CI, 75 to 100) against symptomatic infection by non-delta variants.^[38] So, the science is clear, approved COVID-19 vaccines safe and effective in different age groups, in women planning to have pregnancy, pregnant and lactating women, in previously infected people, free of microchips or fetal cells, and cannot alter DNA. Collectively, we have to check the information to ensure that it comes from a credible source, free of myths and rumors and is updated on a regular scientific basis before considering vaccine information on the Internet.

CONCLUSION

The recent data indicate that the vaccines are perhaps the only hope for ending the COVID-19 pandemic. So, accurate vaccine information is critical and essential. One COVID-19 vaccine has received full FDA approval, and two more have emergency use authorization. The current pandemic created a virulent legacy of misinformation, false claims, myths and rumors that spreads so easily and quickly largely through social media networks that are considered major barrier to high vaccination coverage. So, we have to check the information to ensure that it comes from a credible source, free of myths and rumors and is updated on a regular basis before considering vaccine information on the Internet. While social media posts and some news outlets may make it harder to keep up with what is fact or fiction, the science is clear, approved COVID-19 vaccines safe and effective.

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Conflict of interest

No any conflict of interest.

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