



Pseudoscience and fraudulent products for COVID-19 management

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Abstract

As of now, the COVID-19 pandemic has become uncontrolled and is spreading widely throughout the world. Additionally, new variants of the mutated viral variants have been found in some countries that are more dangerous than the original strain. Even vaccines cannot produce complete protective immunity against the newer strains of SARS-CoV-2. Due to such a dreadful situation, lots of fear and depression have been created among the public. People are looking for the treatment of the disease at any cost and there is a race in the market to provide treatment and make money, whether it is effective or not! In such a condition, many fraud products, remedies, and myths have come into the market, which is falsely claimed to be effective for the disease and can harm the patients. Hence, FDA has banned such products and remedies. In this review, we have compiled all such fraudulent and pseudosciences identified for COVID-19. Currently, in the pandemic time, health agencies are approving the repurposed medicines based on the small-scale clinical data for emergency uses that become ineffective (most of the cases) after large randomized clinical studies. Proper vigilance strategies need to be defined by the regulatory agencies of the nation and routine awareness programs shall be arranged for educating the people and healthcare workers on routine updates.

Keywords COVID-19 · SARS-CoV-2 · Vaccine · Fraudulent product · Pseudoscience · Myth

Introduction

The novel coronavirus outbreak first started in the Wuhan Huanan seafood market. It led to the closing of the market on the 1st of January 2020 for environmental sanitation and disinfection (Ilyas et al. 2020). The onset of COVID-19 in December 2019 was suspected to be the epicenter of this pandemic and has spread substantially infecting over 532 million people worldwide and with over 6.3 million deaths as of June 2022. Before this outbreak, coronavirus was not considered highly pathogenic to humans until the emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a recombined form of the severe acute

respiratory syndrome (SARS) that was first observed when unexplained pneumonia cases were noted in China (Chavda et al. 2021f, b).

The SARS-CoV-2 that caused the coronavirus disease 2019 (COVID-19) pandemic is closely related to SARS-CoV as well as the Middle East respiratory syndrome coronavirus (MERS-CoV) (Cui 2019; Zhou et al. 2020). Currently, the virus has undergone substantial alterations and mutations, resulting in the formation of several strains. Each strain differs in terms of virulence, disease severity, and inflammatory reactions. The alpha variant (B.1.1.7), beta variant (B.1.351), gamma variant (P.1), and delta variant (B.1.617.2) are the variant of concerns (VOCs) defined by the world health organization (WHO) with their origin from London, South Africa, Brazil, and India respectively (Harvey et al. 2021; Chavda et al. 2022d). The extensively mutated Omicron variant (B.1.1.529) is the current VOC with less severe disease, immune evasion, and high transmissibility (Chavda and Apostolopoulos 2022a, b).

COVID-19 is a fast-spreading disease with symptoms ranging from mild and moderate to even severe one. Home isolation along with symptomatic treatment in case of mild symptoms is required. Whereas in case of severe symptoms,

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hospitalization and medical attention are needed. Preliminary pandemic research shows that the majority of SARS-CoV-2 transmissions are not asymptomatic throughout the course of illness and that transmission by presymptomatic individuals accounts for around 40–60% of transmission, while asymptomatic cases account for 15% of transmission (Ramanan et al. 2020; Krishnan et al. 2022). The “WHO Therapeutics and COVID-19: living guideline” includes data about the treatment, clinical management, and approved drugs for COVID-19 management. A list of approved anti-viral, anti-allergens, therapies such as convalescent plasma therapy, etc. are mentioned, but none of them has proven to be 100% effective in treatment (Basu et al. 2022; Chavda et al. 2022c). The recently developed vaccines have proved to be effective to some extent against the emerging variants (Chavda and Apostolopoulos 2021; Chavda et al. 2021e, a, c, d). Because of the mutations, the vaccines are also not 100% effective (as all the vaccines are designed based on viral S protein); this is the reason people believe the pseudoscience data and are not confident in taking vaccines (Nohynek and Wilder-Smith 2022). But the vaccines have shown effect in a very less time and now booster doses have also come, which is preventing the infection in many individuals (Chavda and Apostolopoulos 2022a). Due to the short development period and the novelty of the chosen technology, these vaccines will be launched with several unsolved difficulties that will only be rectified as time passes. Lastly, we assess that, in the long term, many vaccines will be required to provide fair worldwide access, protection of varied populations, and immunization against virus variations.

Communities can effectively prevent the spread of COVID-19 via the use of lockdowns. Significant lockdown delays result in a huge rise in cumulative case numbers. Consequently, the timing of the lockdown relative to the number of cases is an essential factor in limiting the pandemic in communities (Fasano et al. 2021; Huang et al. 2021). Along with the spread of the virus, there has been a rise in misbeliefs, fake news, conspiracy theories, and suspicion around it. “5G cellular technology gave rise to Coronavirus” (Ahmed et al. 2020), “Bill Gates being the mastermind behind the virus to suppress humanity by implementing a global control” (Shahsavari et al. 2020), “Deliberate leaking of the modified virus to infect humans from the Wuhan research facility,” and “The Wuhan Lab-leak” (Lawton 2021) are some of the prevailing theories to name a few. The biggest challenge with these flourishing conspiracy theories is that it is often backed by social and political identities (Douglas 2021). Social movements like antimaskers, antivaccine activists, and “QAnon” supporters have the potential for violent activity. They also demonstrate a reluctance to engage in preventive measures for the spread of the virus (Douglas 2021).

The objective of this review is to cover all the possible pseudoscience data, myths, false home remedies, and fake social media messages that are spreading and misleading people. We

have also attempted to cover the scientific facts that could prove the myths wrong and mentioned some suggestions and facts that would lead people in the correct direction and make them ready for the future. This work is targeted at a large audience to educate those regarding misconceptions and myths prevailing in society with a scientific explanation around it.

Methodology

This is a narrative review work. However, we have provided our search strategies that will help readers better understand the concepts and our conclusions. The main focus of the article is to identify the spread of pseudoscience amongst the people related to the COVID-19 virus and its infection. Other than that, we have also focused on the myths, home remedies, social media-related fake messages, and vaccine hesitancy that are spread and believed by people. The methodology for the article starts with searching on major databases like Google Scholar, Springer, Pubmed, Web of Science, and Scopus articles, through different keywords. The keywords searched were “Pseudoscience AND Covid-19,” “social media AND Covid-19,” “Twitter AND Covid-19,” “Whatsapp AND Covid-19,” and “Fraudulent products for Covid-19,” “Myths and home remedies AND Covid-19,” and “Vaccine hesitancy.” The peer-reviewed, English language, and full-text articles were included while the other language and non-accessible articles were excluded from the paper. The facts, medical remedies, and COVID-19 official data are all extracted from the official websites of WHO and CDC. We have also referred to some of the websites to identify the prevailing pseudoscience materials via social media. The article also gives facts and suggestions which can be utilized and prepare us for future pandemic situations.

Theoretical framework

As mentioned by WHO on their site, the mode of transmission of the virus was in a droplet form. Droplet transmission occurs when a person is in contact with another infected person within a 1-m distance (Johansson et al. 2021). The infected person may show no symptoms or show symptoms like coughing or sneezing, so there is a risk that the droplets might spread through the mouth or nose, and that is the reason why masks were implemented and were compulsory (Frederick et al. 2021). The transmission may also occur by coming in contact with the surfaces or objects used by the infected person; this is called fomite transmission and so disinfecting the surfaces and objects thoroughly went necessary (Goldman 2020). Another mode is airborne transmission, which occurs when there is the dissemination of droplet nuclei (aerosols) that remain infectious when suspended in air over long

distances and time. This transmission of SARS-COV-2 can occur during medical procedures using aerosols.

The R_0 value is the reproduction ratio or rate, which is an epidemiological metric used to measure the transmissibility of infectious agents. Although the infectivity and duration of infection of a pathogen are biological constants, R_0 depends on this parameter because of the varying degrees of human interaction. This explains the importance of social distance during the COVID 19 pandemic. Also, note that R_0 for COVID 19 is higher than R_0 for SARS and MERS (Hu et al. 2021). The R_0 range in India for SARS-COV-2 was 2–2.5. The correct ratio of population that must have a vaccination to prevent the epidemic is given a $1 - 1/R_0$ —herd immunity threshold (Gupta et al. 2021). To control the infection and decrease the R_0 rate, vaccination of the public is important. Vaccinations play a crucial role in decreasing the number of cases and have health benefits for patients. The vaccination drives are now available for everyone above 18 years and so the more the number of people have been vaccinated the less the spread of infection.

It is important to note that during this COVID-19 pandemic period, there have been many misconceptions, misunderstandings, and whatnot that have made people do many silly things. Further, this review focuses on all these things and justifies the same.

The psychological impact of the COVID-19 pandemic

As every coin has two sides, there have been positive as well as negative repercussions. An increase in people's sense of community and trust along with presenting an unparalleled challenge to food systems, global economy, and mental health has put millions of lives at risk. This has largely

affected poorly protected and low-paid jobs, older workers, and migrants (Serafini et al. 2020). Figure 1 depicts the impacts of the COVID-19 pandemic on mental health. Marital status, age, education, living with other individuals, and having kids were not said to be related to psychological outcomes (Rodríguez-Rey et al. 2020). Health-care personnel were more stigmatized than the public.

Impact on food and nutrition

Many people lost their jobs during the lockdown. For many of them, no income means no food. Along with trade restrictions and border closures, farmers were unable to access the marketplace, and trade their produced goods, which affected the global food chain supply. This mainly affected low-income countries, marginalized populations, small-scale farmers, and indigenous peoples (Aday and Aday 2020; Carducci et al. 2021).

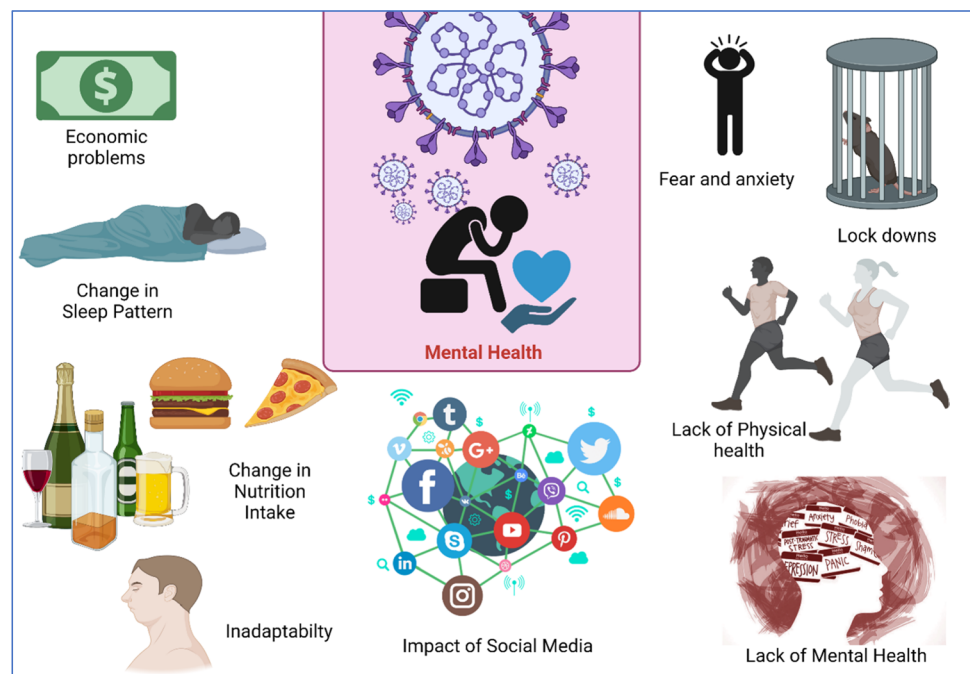
Economic activities

Lockdown has affected the global economy. Industries such as manufacturing, tourism, hospitality, retail, and small & medium enterprises experienced a standstill. The pandemic has decimated jobs and placed millions of livelihoods at risk (Kaushal and Srivastava 2021).

Mental health and wellbeing

COVID-19 has also had a significant influence on human behavior by raising anxiety/depression following the lockup and signaling longer-term mental health concerns (Serafini et al. 2020; Santomauro et al. 2021). Health emergencies may also affect individuals and communities through isolation, stigma, job insecurity, or inadequate resources for medical response (Simon et al. 2020). Psy-

Fig. 1 Impacts of the COVID-19 pandemic on mental health



chological imbalance of people with many of them suffering from post-traumatic stress disorder (PTSD), anger, annoyance, fear, frustration, guilt, helplessness, isolation, loneliness, nervousness, sadness, worry, and were having less happiness (Brooks et al. 2020). These all the outcomes have a major impact on mental health (Serafini et al. 2020). Figure 2 talks about how the four waves of COVID-19 infection have affected health.

- Worries about financial security, home life, and the future
The lockdown has made people stay in their homes for longer periods; this has increased the cases of domestic violence and suicides which have eventually affected mental health (Banerjee et al. 2021). Other than this, people have also lost their jobs; many small- and large-scale companies have been shut down and have removed many of their employees. Some of the people were also stuck at the work locations for several months as traveling was also banned. The children were affected because the schools were closed and they remained inside the house (Santomauro et al. 2021). The biggest loss was losing the close ones and not even meeting them once before dying. Because of the offices, being closed or shutting down, many have not received their salary and many got a cut in it. The pandemic has an impact on both the lower class and higher-class people. The migrant workers who lived on their daily-based job were out of the job and so had no money to eat also. These all factors have a great impact on individuals' future (Harper et al. 2020).

The dissemination of misinformation and belief system

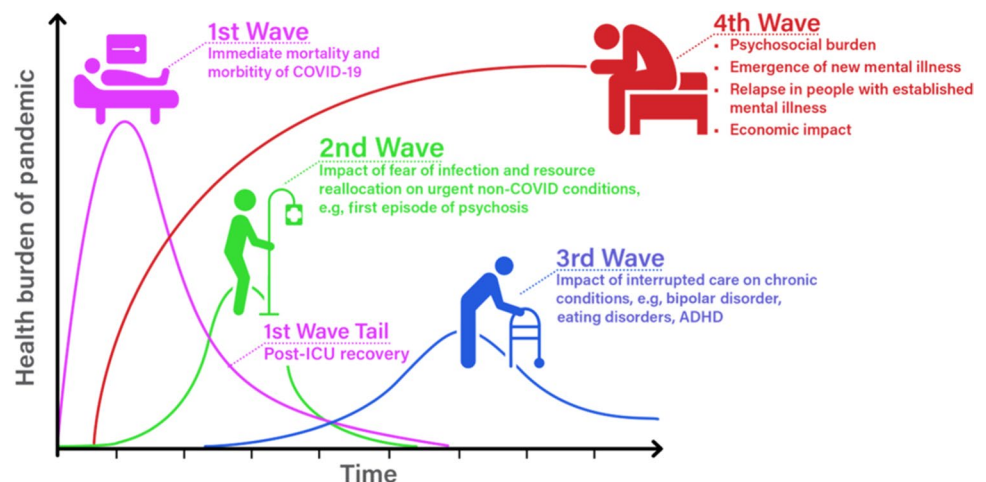
The WHO labelled COVID-19 a pandemic on March 11, 2020, because of the steady rise in cases (Asselah et al. 2021). During a pandemic, where physical contact and communication were hindered, the only source of information

became “Media.” People started to believe what they see on various news platforms. The belief system spread the fear in different countries so strongly that any piece of information was considered true. Hence, it was tough to distinguish between authentic and forged news. In an article of Springer nature, Heidi Larson stated, “the era full of digitally enabled grander outbreak due to emotional contagion” (Larson 2018). A lack of critical thinking and appropriate information, as well as the use of familiarity and source heuristics, is associated with poor truth discerning. In addition, there is a wide gap between what individuals think and what they post on social media, which is mostly due to inattention rather than deliberate dissemination of false information (Pennycook et al. 2021). Effective interventions may encourage social media users to consider truthfulness and can use crowdsourced veracity ratings to enhance social media ranking algorithms (Pennycook and Rand 2021).

Social media is the largest source to disseminate the information and a promising tool that served throughout the pandemic. It is a prodigious tool if the shared information is evidence-based, rather than being false and rumored. The year 2019 to 2021, when the coronavirus outbreak astonished the whole world, may perhaps be termed as a year of “Infodemic” wherein a whirlwind of misinformation got full media coverage. The famous social media platforms like WhatsApp, Facebook, Twitter, etc., where millions of people update and share information daily, a cluttered handful of foraged information. (Kunguma 2021). This phase of “infodemic” is proven through previous studies that determined the maximum number of people to share false news rather than evidence-based information (Orso et al. 2020). A 2-day analytical survey of Twitter on the 6th and 7th February of 2021 displayed a thousand tweets that circulated false information (Pulido et al. 2020).

As we are aware, the pandemic hit hard on Italy (the most affected city with many cases); a quantitative survey was carried out to acknowledge the fake news and the results

Fig. 2 The four waves of health needs associated with the COVID-19 pandemic. Source: Graph adapted from Dr. Victor Tseng—Pulmonary & Critical Care Physician: University of Colorado



were contumacious. The results specified that health and digital literacy should be upgraded and that the well-known media networks must consecutively work before broadcasting any news. These changes will help in combatting fear and stress (Moscadelli et al. 2020). The urge to spread the news comes from a lure mounted by social media in a way that focuses more on the factors rather than the accuracy of the content. Although a person might not think to forward any such news on social platforms like WhatsApp, Facebook, or Twitter, they aimlessly do so because the news is framed in an attractive manner (Pennycook et al. 2020). Recently, the WHO informed us about the new variant of coronavirus discovered in South Africa on 24 November 2021. Social media created a hue of panic with all sorts of fortified claims and rumors (Apuke and Omar 2021). India Today reported that the media pushed the panic button by reporting the new variant to be deadlier than the all-known variants and stating that it cannot be detected by RT-PCR tests. All sorts of Facebook posts started to surface, stating that the virus is not domicile only to the nasal portion, rather it infected the lungs directly (Kundu 2021). Thus, social media played a major role in the transmission of fear.

The right implementation of any information is a key to decluttering the misinformation with a good paradigm shift. Social media is the center of attraction during COVID times that could be utilized for a good cause, i.e., by spreading scientific information worldwide (Cinelli et al. 2020). In times so grim, the spread of quality scientific and evidence-based information is needed worldwide. There is a report of remarkable support of social media in spreading awareness regarding the importance of vaccination. Although there is anti-vaccine propaganda dispersed around, social media had played a keen role to raise the voice against the issue. This approach can support scientific evidence, spread awareness, and save millions of health around the world (Rzymiski et al. 2021).

As it is said, “there is no age for learning, learning can happen anytime.” Thus, when it comes to fake news, a person can self-help and self-detect nuances. In an article, a self-learning semi-supervised network was designed with a confidence layer of the network that enables the correct results wherein a fake news net dataset was utilized for accuracy. A well-established way of decluttering the fake news and structuring the algorithm in such a way that it only commutes the positive, i.e., genuine news (Li et al. 2021).

Different countries tackled the mishap of fake news accordingly. In a report from Peru, the ministry insisted to spread no misinformation. They also had 2–4 years of a prison sentence for any person going against the law and contributing to upraising the false rumors, disturbing the tranquillity of the citizens (Charles et al. 2021).

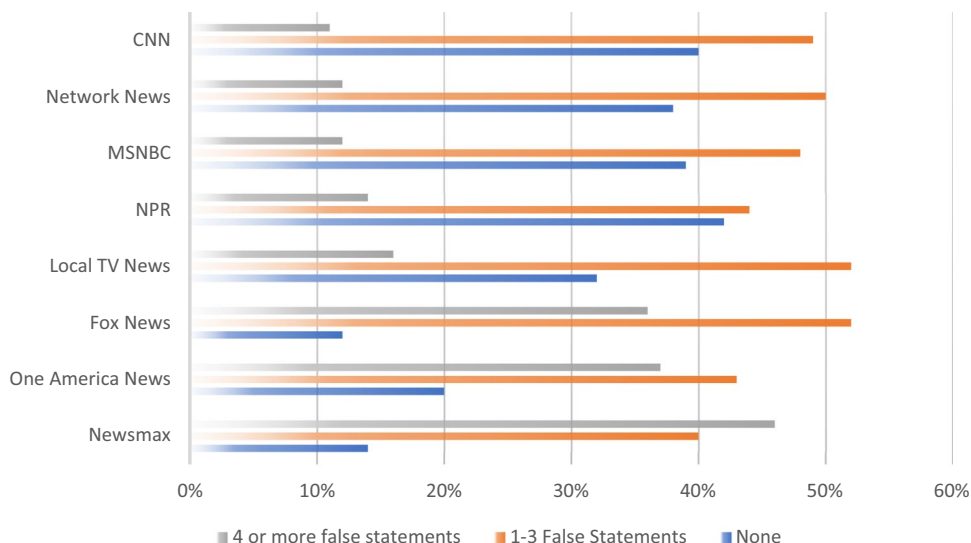
According to a survey-based study in November 2021, using the KFF COVID-19 vaccine monitor, the belief in misinformation largely depended on the news platform

people chose to watch daily. The public who watched CNN, MSNBC, network news, NPR, and local television had no belief in any of the eight false statements, while a small portion about 11 to 16% was mostly unsure about at least four of the eight false statements. It is shocking to know that those who watched leading news and new sources were inclined to believe fabricated information easily (Palosky 2021). Figure 3 gives the assessment of the trust in news channels shaping the belief in false statements.

The series of misinformation is not just limited to highly rated social networks. Nowadays, new religious agendas are seen in India regarding coronavirus infection. It is established that faith in religiosity is directly proportional to the high trust in misinformation (Al-Zaman 2021). In a survey, religious scriptures were used to dissolve the belief system built on myths. Remarkable results were noted as people reduced the uptake of false information. If a particular religious dissonance is targeted, it will benefit in reducing the long-fought beliefs. Although such a task is tedious to carry out in India (a country of diverse religious norms), thorough knowledge of religion and information that is to be corrected should be established beforehand (Piwko 2021). Information from MENA (the Middle East & North Africa) region had a similar issue, where religion had a lasting impact during the COVID time (Alimardani and Elswah 2020). The circulation of false hadith and viral religious advice was way far more contagious than the infection itself. According to some news by BBC Persian in 2020, the ministry of Iran declared no serious threat of COVID-19. There was a member of Iran’s Assembly of Experts, Ayatollah Mohammad Mehdi Mirbaqeri, actively commenting his viewpoints on online platforms regarding lockdown or social distancing, demanding it to be unnecessary in comparison to previous epidemics (Alimardani and Elswah 2020). Thus, science and medicine are highly questioned due to such statements from Iran’s religious elite. A similar situation was with Ayatollah Tabrizian, formally known as the “Father of Islamic Medicine”—rejecting global science, as the coronavirus cases increased in Iran, he advised his followers to swab their anuses with a cotton dipped in violet oil. Even this remedy went viral on his telegram channel, the Persian language social platform. Such examples favor augmenting Islamophobia. The case seems to worsen as telegram did not support much to remove such content as the pandemic was increasing. The alternative to YouTube in Iran was Iranian YouTube—Aparat, where content moderation rules were regulated according to Iran censorship rules, leaving such foul remedies online for millions of people to practice and be unchecked for life (Alimardani and Elswah 2020).

Data from a cross-sectional study in July–August 2020, randomly 1052 subjects were selected from using their mobile databases and made to respond to an anonymous structured questionnaire. The response rate was 40%,

Fig. 3 Assessment of the trust in news channels—data analyzed by KFF COVID-19 vaccine monitor. The CNN (Cable News Network), MSNBC (Microsoft/National Broadcasting Company)-A cable news outlet, NPR (National Population Register), network news, and local television are all sources of information watched by millions of people worldwide



wherein 89% of participants believed COVID-19 was a threat, 52% were likely to get vaccinated, 19.7% were exposed to fake news often, and 63% were exposed sometimes (the reason which was platforms like Facebook and WhatsApp). The overall study described the trust in social media and delivered the exposure to fake news in Lebanon. This event highlighted the vaccination intent of the public (Ghaddar et al. 2022). The spread of misinformation is not due to sub-standard practices of media rather it is poor practices (Ali 2020). This can be justified by an example of local healthcare crises covered by Wojczewski et.al. in Ugandan newspapers, the approach was qualitative, wherein researchers selected two top newspapers in Uganda. They then compare the data and concluded that, although there were several articles published, they attributed issues with the healthcare system too weak governmental working, corruption, and lack of attention to the healthcare system. All the newspaper did was targeted the issue, again making it politically involved and leaving behind the important concern at hand, i.e., health care (Wojczewski et al. 2015). The misinformation can be settled by a few of the tricks and strategies shared by the Center for Disease Control (CDC). The key is the communication of authentic information, filling and addressing information gaps, and providing evidence to support the truth. Also, not forget the FWFF, i.e., Fact, Warning, Fallacy (Unintentional/Intentional), and Fact check (National Center for Immunization and Respiratory Diseases 2021).

The information from social media-initiated panic among people and contaminated their belief system. The above data of different countries tell us that social media has given the most negative impact and so we should be careful when believing the fake messages. We should also concern with the health professionals like doctors and always check the information on the official sites of WHO, CDSCO, CDC, and other countries' specific regulatory bodies.

Most harmful was the information regarding false drugs on the market, home remedies that claimed to cure COVID-19, and believing that the hospital is more of a death bed than a healthcare center (Anwar et al. 2020; Naeem et al. 2021). During the COVID times, many such myths, medicines, and home remedies surfaced that claimed to cure COVID-19 symptoms. Table 1 mentions the same (Park et al. 2020; Atehortua and Patino 2021; Chen et al. 2022). From the Table 1, it is evident that the people that do not have any standard evidence believe many myths, home remedies, and medical claims. Therefore, before trusting on any such myths and consuming the false products ask health care professionals and take suggestions from them. Many of such myths, herbal home remedies, and medicinal claims as a part of drug repurposing were published in peer-reviewed journals; however, they lack proper clinical pieces of evidence; most of them are published with only in vitro studies while those which are published with in vivo studies are with limited enrolment. Some were found useful initially and later on based on the large clinical study they found ineffective in the COVID-19 management like chloroquine (Kashour et al. 2021), ivermectin (Reis et al. 2022), etc.

Fraudulent health claims

With the upraise in COVID-19 cases during the peak of the pandemic, rumors with numerous claims, fear, conspiracy theories, and health claims with the fraud news started to resurface (Grimes 2021). COVID-19 was a disease full of uncertainty, and this ambiguity created curiosity. People started to believe false news, took home remedies (impacting health severely), and believed fraudulent health claims. The fraudulent health claims are majorly due to pseudoscientific health therapies (Callaghan 2019). Generally, this practice promoted fake tests and cures. Homeopathy, alternative

Table 1 List of myths, home remedies, and other medical claims for the treatment of coronavirus

| Sr. no | Myths | Home remedies | Medicinal claims |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Health supplement myth:</p> <ul style="list-style-type: none"> The deficiency of Vitamin D in the Black and Asian population globally can increase their chances to be infected by SARS-CoV-2 (Weir et al. 2020) | <p>Health supplement Remedy:</p> <ul style="list-style-type: none"> Vitamin D can prevent as well as treat COVID-19 & its symptoms Eat mushrooms and fortified foods, try UV treatment, and consume more see food (https://www.healthline.com) | <p>Health supplement medicinal claims:</p> <ul style="list-style-type: none"> Vitamin D: High doses of Vitamin D are very harmful as it is not water-soluble, thus, elimination is not possible as it gets stored in fatty tissues and can lead to toxicity (Marcinowska-Suchowierska et al. 2018) Silver solution or Colloidal silver: Generally, purchased as a dietary supplement. People should understand silver is not an essential mineral and can be way far dangerous to health (Chung et al. 2010). Thus, DTC & FDA issued a warning letter stating, "The FDA considers the sale and promotion of fraudulent COVID-19 products to be a threat to public health" Vitamins Cure COVID-19: There is no such guidance available that confirms the use of multivitamins in curing the disease (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters) |
| 2 | <p>Vaccination Myth (Cerdá and García 2021):</p> <ul style="list-style-type: none"> Vaccination can cause infertility Mask can be put off once vaccinated | <p>Food Remedy in place of vaccines:</p> <ul style="list-style-type: none"> Intake of alkaline food will eliminate the virus from the body without having a vaccine (Dunn 2021) The addition of pepper in the meal will not prevent/treat or cure getting sick due to infection without having a vaccine (Q&A 2021) Honey can cure the COVID-19 symptoms (Hossain et al. 2020) A Sri Lankan drink recently got viral, claiming to cure the symptoms of the virus on Facebook. It was confirmed afterward that the drink has serious complications, and it is harmful to the health | <p>Medicinal claims (Already in use to treat other diseases):</p> <ul style="list-style-type: none"> Chloroquine: A well-known anti-malarial agent is hazardous when ingested without the Dr consent. According to a report, after ingestion of chloroquine by a couple, the husband died, and the wife was in a critical condition (Deyno et al. 2020) Hydroxychloroquine or chloroquine: The clinical trial data officially confirmed that these medicines have little to no impact on illness, hospitalization, or death (Gasmi et al. 2021) Dexamethasone for all infected patients? It is suggested by WHO, not to use this agent generally and save it for patients who are in the utmost care and need (The RECOVERY Collaborative Group 2020; Inchingolo et al. 2021) |
| 3 | <p>The myth related to previous diseases & Hygiene:</p> <ul style="list-style-type: none"> The coronavirus infection is transmitted through mosquitoes (Huang et al. 2020) Wearing gloves replace cleaning hands and will keep the hygiene (https://www.osthealthcare.org) Touching the communal bottle of sanitizer will most likely infect the person (Ghafoor et al. 2021) The virus is transmitted through swimming (Yaacoub et al. 2021) | <p>Ayurvedic Remedies related to previous diseases & Hygiene (Steam, naturally acting agents & rinses):</p> <ul style="list-style-type: none"> Taking steam along with certain traditional herbs would paralyze the virus (Gowrishankar et al. 2021) Eating garlic prevents coronavirus infection: Although it has anti-microbial properties, there is no such evidence (Khubber et al. 2020) Rinsing the nose with saline solution regularly can prevent the infection: Evidence suggests it can help you recover from the common cold but not the coronavirus infection (Casale et al. 2020) Turmeric can prevent & cure covid (Rattis et al. 2021). Although turmeric has anti-inflammatory, it has no role in treating the infection | <p>The medical claim related to previous diseases & Hygiene</p> <ul style="list-style-type: none"> Pneumonia Vaccine: The false rumors of the pneumonia vaccine were spread, that it could cure the COVID infection. As the virus strain is completely different, a specific vaccine is required to fight this completely new strain of the virus. (https://www.cdc.gov/pneumonia/prevention.html) Ivermectin: The drug is used to prevent parasitic infections in animals, and it is not a drug to treat viruses and has not been approved yet by FDA to treat or prevent COVID-19 (Caly et al. 2020) |
| 4 | <p>Climate, temperature, environment & phototherapy related myths:</p> <ul style="list-style-type: none"> COVID-19 is transmitted in a cold climate and not in a hot or humid climate (Heibati et al. 2021) UV bulbs that are used for disinfecting can kill coronavirus on our bodies (Mackenzie 2020) The likelihood of spreading of infection is very low | <p>Medicinal plants & false remedies:</p> <ul style="list-style-type: none"> The fruit of Datura was falsely promoted, claiming it to treat coronavirus infection in all weather conditions | <ul style="list-style-type: none"> Drinking Methanol/Ethanol or Bleach: These substances are poisons and are not intended to be consumed. Drinking these agents causes disability and death. They have no use in treating coronavirus |

medicine, herbal medicine, and ancient quackery are popular and well-promoted fraudulent practices that promise to heal infections, eradicate viruses from the body, and increase/boost a person's immunity (Jayawardena et al. 2020). The fake products in the market might contain adulterated ingredients rather than the one claimed on the package with the desired quantity mentioned or they might not contain any such promised ingredients at all. The diversity of products on the internet increased as the pandemic leaped forward.

This information is intended to spread awareness by pointing out the misleading fraudulent products that might still be sold in the market and are a great threat to common beings. There are so many manufacturers claiming to provide self-diagnostic kits online. Currently, FDA had sent countless warnings letters to such manufacturers (Keni et al. 2020). One such example is Bodysphere, which sold coronavirus antibody detecting kits, claiming to diagnose and cure the infection. Practically, such devices should not be used as they have no authorization from the FDA.

The rising myth affected public actions in general, in a YouTube video from the Philippines the hand sanitizer prepared using rum, bleach, and fabric softener went viral and promoted to the point that, a statement was released from the Integrated Chemists of the Philippines (ICP), “such ingredients when mixed produces a very noxious substance i.e., chloroform and it is dangerous” (ICP 2020). The ostensibly increasing myths regarding nasal rinsing products, various inhalants, and gargling products thrive in the market. The compounds like 0.5–3% hydrogen peroxide nebulizers are claimed to cure coronavirus infection and saltwater gargles are claimed to kill the virus (de Toledo Telles-Araujo et al. 2020; Panta et al. 2021). The people do not understand the severity of the ongoing pandemic and use them in ways that are insanely dangerous and harmful in every facet. The myths also include temperature, warmer temperature kills the virus, and that virus could not sustain in such temperatures and cold temperatures are favorable or vice versa. This even continued with the UV-radiation; people believed that UV exposure could cure a person and would kill a virus in the body (Colunga Biancatelli et al. 2020; Mackenzie 2020). From fake kits in the market to holding breathing for 10 s are not the diagnostic options to rely upon. These kinds of beliefs are a real stressor for scientists relying on scientific evidence (Fleming 2020). Naeem and Caulfield stated “The fight against pseudo-science is weakened if trusted medical institutions condemn an evidence-free practice in one context and legitimize it in another. We need good science all the time, but particularly during disasters.” (Naeem et al. 2021).

These false claims have increased the demand for plant and animal parts, claiming as an effective treatment option. The parts of endangered species like a rhino (horn), tiger (bones), and rare orchids came into the highlight, explaining the urge to promote the use of these agents that suscep-

a human subject towards fraudulent health claims (Macfarlane 2020). Similarly, in a search of public media in Europe, North America, New Zealand, and Australia, misinformation regarding claims of chiropractic treatment to increase immunity was highlighted. Any such scientific references towards this condition and health implications were missing and clinical effectiveness was spurious. This is a major health issue; these claims when posted on social media surely create bizarre outcomes, especially when people start to practice them on regular basis without taking any consent of the health practitioner (Axén et al. 2020). Amidst the resurfacing of such delusional information, pharmacists played a major role in the pandemic to spread awareness. As pharmacy is a major source of local dispensing, every type of person visits the pharmacy to take their medications. Thus, pharmacist should provide education and focus on patient safety and public health. They not only educated about the medication but also helped to educate the non-vaccinated community, briefed on the safety of generic medicines. These health care providers transmit the information in local friendly linguistic forms and make it understandable (Marwitz 2021). As this pandemic continues, so does the emphasis on health decisions to be made should be clarified and made based on scientific and public-based evidence. The restorative approach should be adopted by the journals and health care news, focusing on core scientific truth and data that are valid. Lastly, public education and community settings for a better understanding of ongoing health hazards, disease risks, how infectious diseases are a threat, and why vaccination is important in the long run should be accentuated (Cheema et al. 2020).

Fraudulent products for COVID-19

The COVID times entertained not only fake news but also fraudulent products, leading to severe health impacts (Rocha et al. 2021). The manufacturing and selling of substandard and falsified products that include diagnostic kits, infection preventive medicines, etc. date to the time of previous pandemics. It is not something new in the market. The measures were taken then, and measures are applied now but the health impact is severe and dangerous (Bauchner et al. 2020). According to an estimation by WHO, about 10.5% of medicines worldwide are substandard and falsified (SF) and the percentage is higher in low and middle-income countries. Africa consists of 18.7% of SF, Asians had a prevalence of 13.7% of SF, and 14.4% were found in other regions (Borse et al. 2021).

Such fraudulent products flooded the market when there was a scarcity of effective vaccines and cures. Hence, the US Food and Drug Administration (FDA) issued a warning letter for numerous such websites between March 2020 to July 2020. It was estimated that around 3,139 applications

were issued amongst which a fair share was focused on COVID-19-related drugs, devices, biologics, and dietary supplements. In the process, FDA successfully highlighted the blatant and potentially harmful quackery of the vendors across the globe (Bramstedt 2021).

In a survey carried out by Jay P. Kennedy et al., they reported the experience of over 2200 American adults with COVID-19-related frauds to understand the fraud targeting and victimizations (Kennedy et al. 2021). Many herbal medicines are being supportive alone for the treatment of coronavirus infection. In a survey, by Damaris Silveira et al., participants with mild to moderate symptoms, mostly adults, were evaluated to assess the role of herbal medicines as an adjuvant given alongside paracetamol, ibuprofen, and codeine (Silveira et al. 2020). A total of 39 herbal medicines were studied, the ones which are commonly known by everyone. The results concluded that out of 39 herbal medicines, 5 had a positive outcome as an adjuvant, promising was rest 12 species and rest were unknown. Thus, considering the clinical aspects, these agents will not work individually and case studies like these will help to spread awareness regarding common herbal agents used as a medicine, and their false aims on behalf of dangerous infections like coronavirus (Silveira et al. 2020).

The scenario of COVID was full of anxiety, fear, and depression, making the loss of human life an eminent part. Hence, people started to explore all possible options, trying to avoid the infection. Amidst all of this, social media played a major role in spreading information and selling products on websites that claimed to have the ability to cure coronavirus infection (Ahmad and Murad 2020; Anwar et al. 2020). As the situation got out of hand, on 20 March 2020, the consumer protection (CPC) authorities of the Member States issued a CPC on the scams that were mostly reported, and on 23 March 2020, the Commissioner of Justice and Consumer Didier Reynders asked to various online product-selling websites, i.e., Amazon, eBay, etc., to remove such products. The enforcement led to the removal of hundreds of millions of listings worldwide (Bavel et al. 2020). The first news of fraud broke in when counterfeit coronavirus kits were seen at Chicago's International Airport. The kits not only consisted of coronavirus kits but also meningitis and salmonella. They were then seized by the FDA (Di Crosta et al. 2021). Even reports of falsifying the vaccination certificates were recently unveiled (Deguma and Deguma 2021). According to the Federal trade commissioner, a consumer loss of \$500 million was estimated from 2020 to 2021 due to fraudulent products in the market in COVID times. Almost 558,000 complaints are received by the agency related to frauds since 2020. The final amount of loss aggregated was \$501 million on July 22. Therefore, here is a list of fraudulent COVID-19 products that swamped the market, disrupted the economy, and risked human health (Table 2).

The list of products does not just end here. It is hard to even imagine the number of fraudulent products that stacked the market. A product from block Scientific sold the QUIK-PACII COVID-19 antibody test kit and the long island biotech COVID-19 Antigen Rapid Test (Colloidal Gold). These products promised to cure and diagnose the coronavirus infection. The issue came under highlight when FDA issued a warning letter against the company and accused the website of its detrimental claims under violation of various sections (MARCS-CMS 609533). The pharmacy is under strict scrutiny as fraudulent products are increasing. Looking at the current scenario, pharmacists need to pay attention before selling any new agent to the patient. The solution requires better inventory management that could suppress drug deviation activities (Mason 2020). The products like fake masks were also seen in the market; they could be detected by checking particle infiltration efficacy. Due to many reasons and especially awareness, it is not always feasible to check the efficacy of the mask before wearing them. Henceforth, FDA should possess some stringent guidelines to stop the production of the low-quality mask (Lam et al. 2020). It is important to take the advice of health care providers before consuming any product that promises to treat infection and related symptoms. To emphasize a more evidence-based approach and belief system, it is better to believe the scientifically relevant things rather than the one built over a delusional system of fraudulent claims.

Anti-vaccine pseudoscience

Scientists and researchers in the world have successfully launched vaccines as a cure to prevent COVID-19 infection in a very less period (Goodman et al. 2020). Currently, there are 38 vaccines are approved for emergency use in the various part of the world (Chavda et al. 2022a, b). Despite devastating scientific knowledge proving the vaccines are safe and effective, misleading and false information has weakened the public's confidence in their safety and uptake (Cascini et al. 2022). For people without scientific knowledge, understanding and interpreting the graphs of data of COVID infections is difficult (Miller 2020). Vaccine hesitation is defined as a delay in accepting or refusing immunizations irrespective of their availability (Darby et al. 2017; Razai et al. 2021).

The anti-vaccination movements started from the small-pox pandemic, where despite the greater number of deaths taking place the vaccine hate was still there (Riedel 2005; Wagner et al. 2020). The US vaccination act was passed in 1840 and 1853 and vaccination was made compulsory for all (Gibelli et al. 2022). On the other side, anti-vaccination leagues were formed and numerous anti-vaccination tracts, books, and journals appeared in the 1870s and 1880s (Wolfe and Sharp 2002). While in the golden age, i.e., the 1950s and

1960s of vaccination, the anti-vaccine movements declined but the opposition still existed. In May 1974, an Expanded Programme on Immunization (EPI) was initiated by WHO, which was aimed to vaccinate all children against killer diseases; polio, diphtheria, tuberculosis, pertussis, measles, and tetanus. In this digital era of the Internet, the anti-vaccination activists have opportunities to spread the message to the great public, and media platforms have become influential to spread vaccine hesitancy. On the safe side, immunization experts have made people shift from vaccine hesitancy to vaccine resistance (Dube and Macdonald 2015; Child and Health 2017).

The traditional and social media platforms are the important source for sharing the current affairs in the world; they have both negative and positive impacts on people's minds. In the spread of misinformation regarding the COVID-19 infection and its treatment, these platforms have played a crucial role (Mostajo-Radji 2021). With little information and uncertainty, social media exposure to erroneous disease news has elevated anxiety and risk perception in society (İkişik et al. 2021). WhatsApp, Instagram, Facebook, YouTube, and Twitter are the most commonly used platforms by people nowadays. A study was performed regarding the spread of pseudoscientific content through YouTube. The study performed crowdsourcing of the content and observed that YouTube takes measures to spread the harmful information related to critical and emerging topics like COVID-19 (Papadamou et al. 2020). Twitter is also a big platform where scientists or media who report science-related information communicate health-related messages. But sometimes there is a bad impact on people because of the misinformation spread by the bigger celebrities and politicians, as people start believing them (Claassen 2021). In Latin America because of this fake message spread, wrong steps were taken to fight COVID-19 infection, which included administration of hydroxychloroquine and ivermectin and use of untested plasma therapy. Further, they also used “chlorine dioxide” as a treatment for the COVID-19 infection without any evidence. A clinical trial was only registered and there are no results yet for the trial. Chlorine dioxide is used as a disinfectant to clean medical equipment and treat residual waters and, on high doses, it inhibits microbial and viral activity. A study on animal models showed that it causes thyroid suppression, DNA damage, and neurotoxicity; therefore, it is not safe for human consumption. The people in Latin America followed the pseudoscientists who were presented as experts in media; they watch them in the same position as those of epidemiologists, public health officials, and science diplomats. This was all because of misinformation and pseudoscience (Mostajo-Radji 2021).

Vaccine acceptance or refusal has been mentioned in many published reviews. The parents' decisions to use or avoid immunization for their children are complex and

multidimensional. These parents either refuse some vaccines or accept other vaccines; they take decisions based on their schedule. Due to the increasing number of refusals, the immunization program is getting less response (Dube and Macdonald 2015).

Science the Wire wrote an article “What drives vaccine hesitancy among India's educated and privileged?” they mentioned all the facts and important points regarding the vaccine hesitancy of Mumbai people. Vaccine hesitancy is mostly observed in poor and marginalized people. The people are in doubt because of unfriendliness behavior, anger, and suspicion against the state and the agencies. The three main factors observed for vaccine hate are as follows:

1. Misinformation in the majority of people. The spread of fake messages and information regarding the disease and its cure is misleading the majority of the population. People are not understanding the facts because of low science literacy, many low-baked data available on the internet, and lessened ability to analyze the available data. There are misconceptions that people think they have higher immunity as they live in such a dirty environment and where a good vaccine takes 4–10 years of research to develop, and the COVID vaccine developed in hurry it might be unsafe.
2. Vaccines kill. This has been proved in front of people's eyes that vaccines can kill, as with coming variants, the fully vaccinated people have also died, and that is the proof for them.
3. Big Pharma Conspiracy. According to anti-vaxxers in western countries, Big Pharma companies have created the current crisis, or at least a mass hysteria against universal vaccination.

The vaccine hate is also because of some myths that people believe in; these myths can be contradicted by the scientific facts that prove that vaccines are good for human health. There are some myths and facts listed by Centres for Disease Control and Prevention (CDC), and these are mentioned below in Table 3.

A strong correlation exists between anti-vaccination and belief in conspiracy theories in addition to a strong connection between anti-vaccination and resistance to having your freedoms taken away. The hesitancy amongst the people can be vanished by conducting awareness programs and campaigns in the major areas. A collaborative attempt by doctors, pediatricians, governments, public health officials, and civil society will decrease the spread of myths and misinformation about vaccines (Health 2019). The localities with proper scientific knowledge can also guide the people by giving them proper suggestions, advice, and making them aware to take the vaccine. If we as a human face failure in this, the unvaccinated children and the unvaccinated community will have to suffer greatly in the future.

Table 2 The list of fraudulent products in the market for trade and warning letter issued against it by the USFDA for all manufacturers to justify the fortified claims

| Sr.No | Product name | Company | False claim | Justification |
|-------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Rhinodol CBD nasal spray products | New Leaf Pharmaceuticals, LLC | Pain & inflammation Nervousness (anxiety) Sleeplessness Myalgia Congestion (MARCS-CMS 609744) | “The Rhinodol CBD was claimed to be an unapproved new drug under section 505(a) of the Federal Food, Drug, and Cosmetic Act (the FD&C Act), 21 U.S.C. 355(a). Also, delivery to interstate commerce of unapproved drugs violates 301(d) of FD&C Act, 21 U.S.C. 331(d) and misbranded drugs under section 502(f)(1) of FD&C Act, 21 U.S.C. 352(f)(1).” |
| 2 | Flu Immune Drops L-Lysine Lysine Extra Monolaurin | Riverstone LLC | Flu Immune Drops: The product can mitigate, diagnose, treat, prevent & cure COVID-19 L-Lysine & Lysine Extra: Improve immune response and act as an anti-viral agent Monolaurin: Immune support (MARCS-CMS 608645) | “The FDA reviewed the products and stated that these come under unapproved new drugs and violate section 505(a) of the FD&C Act, 21 U.S.C. 355(a). As these products are misbranded, they come under section 502 of FD&C Act, 21 U.S.C. 352, and the delivery for introduction into interstate commerce is prohibited under 301(a) and (d) section of FD&C Act, 21 U.S.C. 331(a) and (d).” |
| 3 | Closys Oral Closys Oral Spray Closys Non-Irritating Rinse | Rowpar Pharmaceuticals | Treat Covid-19 infection Closys Rinse: Eliminate the virus up to 98.4% in 30 s Closys Oral Spray: Eliminate the viral load up to 98.4% in 30 s (MARCS-CMS 611759) | “The products violate section 505(a) of FD&C Act, 21 U.S.C. 355(a). They are Misbranded drugs under section 502 of the FD&C Act, 21 U.S.C. 352. Delivery into interstate commerce is prohibited under section 301(a) and (d) of FD&C Act, 21 U.S.C. 331(a) and (d).” |
| 4 | OraCare OraCare Health Rinse OraCare Operatory Pre-Rinsing Set | Pro Breath MD, LLC dba Dentist Select and OraCare | OraCare claimed to kill 99.99% of coronavirus in 1 min (MARCS-CMS 610686) | “The products violate section 505(a) of FD&C Act, 21 U.S.C. 355(a). They are Misbranded drugs under section 502 of the FD&C Act, 21 U.S.C. 352. Delivery into interstate commerce is prohibited under section 301(a) and (d) of FD&C Act, 21 U.S.C. 331(a) and (d).” |
| 5 | Tru Niagen Tru Niagen 300 mg, Tru Niagen 150 mg, Tru Niagen Stick packs (the “Tru Niagen products”) | ChromaDex | The product claim to increase NAD + levels, as it will support the immune system. In another post by the website, it claimed to go through a preclinical animal model study to assess its therapeutic potential. They even posted regarding phase 2 clinical trial and the results imply that it reduced the overall recovery time in the group of patients in Turkey (MARCS-CMS 607692) | “The products violate section 505(a) of FD&C Act, 21 U.S.C. 355(a). They are Misbranded drugs under section 502 of the FD&C Act, 21 U.S.C. 352. Delivery into interstate commerce is prohibited under section 301(a) and (d) of FD&C Act, 21 U.S.C. 331(a) and (d). FDA banned the product and suggested not to use it anymore.” |

Table 2 (continued)

| Sr.No | Product name | Company | False claim | Justification |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Physician 360 kits Physician 360 Rapid Strep Test, Physician 360 Rapid Flu Test (collectively referred to as Physician 360 Rapid Tests), Physician 360 COVID-19 Rapid Test | Physician 360, Inc | These tests were intended to be purchased and tested by the consumer at home. Wherein, desired steps were mentioned. The agency is not aware of the repercussions. As the tests first require premarket approval (MARCS-CMS 604202) | “They violate section 201(h) of the Act, 21 U.S.C. 321(h). As they do not have premarket approval, they violated section 513(f) (1) of the Act, 21 U.S.C. 360c(f)(1). As they have no approval to use such devices, they violate act 515(a) of Act, 21 U.S.C. 360e(a), 520(g) of the Act, 21 U.S.C. 360j(g), they are therefore declared adulterated under section 501(f)(1)(B) of the Act, 21 U.S.C. 351(f)(1)(B) and declared misbranded under the section 502(o) the Act, 21 U.S.C. 352(o). Lastly, as the firm failed to notify about its interstate commerce for distribution it violated section 510(k) of the Act, 21 U.S.C. 360 (k).” |
| 7 | Invisi Smart Mask ISM5 Invisi Smart Mask ISM5 Invisi Smart Mask (Black Edition) ISM30 Invisi Smart Mask | Invisi Smart Technologies UK LTD | They were proposed to use for the prevention and cure of coronavirus infection. The product is justified to be tested against no weaker strain of the virus. They also claimed to kill viruses and bacteria and possess self-disinfecting technology that can be used without frequent washing (MARCS-CMS 614512) | “The product claims to be used for treating the infection, hence, the device comes under section 201(h) of FD&C Act, 21 U.S.C. 321(h). Even the device is adulterated under section 501(f)(1)(B) of Act 21 U.S.C. 351(f)(1)(B). The firm was devoid of any premarket approval, thus, section 515(a) of the Act, 21 U.S.C. 360e(a) or section 520(g) of the Act, 21 U.S.C. 360j(g) is applied. The product is misbranded, leading to section 502(o) of the Act, 21 U.S.C. 352(o). Even it violated section 510(k) of the Act, 21 U.S.C. 360(k) as no intimation of the commercial distribution was given to the agency.” |

Table 2 (continued)

| Sr.No | Product name | Company | False claim | Justification |
|-------|------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 | COVxRDA Antigen Test Kits COVxRDA Saliva Antigen Test COVx-RDA Nasal Antigen Test | Viverra Pharmaceuticals, Inc | These kits were addressed to mitigate, treat, prevent, diagnose, and cure coronavirus infection (MARCS-CMS 614412) | “The device comes under section 201(h) of Act, 21 U.S.C. 321(h). The test kits are adulterated under section 501(f)(1)(B) of the Act, 21 U.S.C. 351(f)(1)(B). The firm has no premarket approval and thus comes under section 515(a) of the Act, 21 U.S.C. 360(a), even has no approved application for investigational device, leading to section 520(g) of the Act, 21 U.S.C. 360(j)(g). As the kits are misbranded it comes under section 502(o) of the Act, 21 U.S.C. 352(o). The firm even did not notify the agency regarding its commercial distribution as mentioned under section 510(k) of the Act, 21 U.S.C. 360(k). The interstate delivery of the product has also been prohibited under section 301(a) of the Act, 21 U.S.C. 331(a).” “The product violated the new drugs sold act, under section 505(a) of the Act, 21 U.S.C. 355(a). As being the misbranded agents, they violate section 502 of the Act, 21 U.S.C. 352. Also, interstate delivery of this product is prohibited under section 301(a) and (d) of the Act, 21 U.S.C. 331(a) and (d).” |
| 9 | OCLO Products “OCLO 3000” (Various Chlorine Dioxide Products) | OCLO LLC/OCLO Nanotechnology Science | The product consists of chlorine dioxide, which according to the viewpoint of the company, is an effective therapy to treat the infection and share a major contribution to treating autoimmune diseases and strengthening the immune response. It also acts as an oxidative agent The product also claims to prevent coronavirus infection (MARCS-CMS 614310) | |

Table 2 (continued)

| Sr.No | Product name | Company | False claim | Justification |
|-------|-----------------------------------------------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | Colloidal Silver Products Silver Soul Immune Support Silver Soul Body Spray and Vitality C60 | Allure Imports | There are many false claims in the market, that usage of colloidal silver prevents coronavirus infection. This product from Allure imports has similar viewpoints too as a good antiviral agent (MARCS-CMS 613211) | “The product is an unapproved new agent sold in violation of section 505(a) of the Act, 21 U.S.C. 355(a) and misbranded under section 502 of the Act, 21 U.S.C. 352. As Vitality C60 intends to treat coronavirus infection in animals, it violates act 201(g)(1)(B) of the Act, 21 U.S.C. 321(g)(1)(B). The product is also not approved under the new animal drug application or listed under sections 512, 571, and 572 of the Act, 21 U.S.C. 360b, 360ccc, and 360ccc-1. Hence, it is considered unsafe under section 512(A) of the Act, 21 U.S.C. 360b (a) and adulterated under 501(a)(5) of the Act, 21 U.S.C. 351(a)(5). The interstate delivery of these products is prohibited under section 301 (a) and (d) of the Act, 21 U.S.C. 331(a) and (d).” |
| 11 | “DuThermX” | Dubak Electrical Group | The product was intended to measure the human body temperature and is known to be used for COVID-19 (MARCS-CMS 613511) | “As the product was known to be used for COVID-19 purposes it comes under section 201(h) of the Act, 21 U.S.C. 321(h). The product didn’t have any FDA authorization or clearance for market and sale in the United States therefore it was declared adulterated under section 501(f)(1)(B) of the Act, 21 U.S.C. 351(f)(1)(B). The product had no premarket approval and came under section 515(a) of the Act, 21 U.S.C. 360e(a) nor an approved application for investigational device exemptions. The company did not notify the FDA regarding interstate commerce and delivery of the product and therefore was charged for those sections |

Table 2 (continued)

| Sr.No | Product name | Company | False claim | Justification |
|-------|-------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | “ TL-120GTS ” | Omega Engineering Inc | The product was introduced for measuring human temperature during COVID-19 and had no approval by the FDA (MARCS-CMS 613560) | The device comes under section 201(h) as it claims to treat, prevent, diagnose and cure COVID-19 infection in people. The health-care providers had already started to rely on this product which makes it even more perilous. It also demands screening group elevated body temperature It has been put under other sections as it had no authorization from FDA nor does the manufacturers have any pre-market approval or interstate commerce permission for trading the product.” |
| 13 | Cannabidiol (CBD) products Balance CBD Drops Relief CBD Drops Relax CBD Drops Relief CBD Salve | Cannafyl | The product was sold as dietary supplements. Even demanded to be the cure of a handful of diseases like Epilepsy, Multiple sclerosis, Amyotrophic lateral sclerosis, Depression, Bacterial Infection, Heart diseases, etc Help in managing cancer growth Seek relief in drug addiction behaviour The product was even intended to cure COVID-19 infection and displayed positive effects (MARCS-CMS 611957) | “The FDA incorporated the CBD products under sections 201(ff)(3)(B)(i) &(ii) as they are excluded and cannot be used as dietary supplements. It also comes under the section for unapproved drugs 201(g)(1) of the Act, 21 U.S.C. 321(g)(1) These drugs are new agents and CBD-consisting drugs are prohibited and affect human health, hence come under section 201(p) of the Act, 21 U.S.C. 321(p). The sections were applied for interstate commerce and delivery without the permission of the agency. The CBD compounds are misbranded under section 502(f)(1) of the Act, 21 U.S.C. 352(f)(1). The label of the products had no adequate labeling according to the section under 21 CFR 201.100(c)(2) and 201.115, FDA- requires justification. These sections insist that the label should be adequate so that a layperson can also understand it. The Pet drop comes under new animal products under section 201(v) of the Act, 21 U.S.C. 321(v). Also, they have no authorization to legally market the product which charges many other sections on them.” |

Table 2 (continued)

| Sr.No | Product name | Company | False claim | Justification |
|-------|--------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14 | Products Immunoral Immune Plus MD Immune Support Spray MD CVK-365 Mouth Spray | Ageless Global, LLC | Immunoral (CBD, nano-silver, specialized mineral oxide NSF-60 water, and Vitamin C): Promises natural defense against the SARS-CoV-2 pathogen and supports the immune system Immunoral CVK-365 : Defensive against the virus Immunoral Mouth Spray : Prevention against the COVID-19 infection, and inactivation of the SARS-CoV-2 virus at over 98% within 2-min with no regrowth in 48-h (MARCS-CMS 612865) | “The product falsely claims to cure, prevent, diagnose, and treat the COVID-19 infection. It is an unapproved new drug sold under section 505(a) and misbranded under section 502 of the Act, 21 U.S.C. 352. The instruction of delivery into interstate commerce is prohibited under section 301(a) and (d) of the Act, 21 U.S.C. 311(a) and (d).” |
| 15 | serology test: LUNGENE [sic] CLUNGENE [sic] | Orvic dba Webstore-USA | LUNGENE [sic] : It is a Covid-19 IgG/IgM rapid antibody test cassette (to detect previous coronavirus infection) CLUNGENE [sic] : Rapid test kit (MARCS-CMS 610208) | The device violates section 201(h) of the Act, 21 U.S.C. 321(h) due to its false claims The device had no marketing approval, clearance, or premarket approval thus violating the section and coming under it. The device also doesn't have approval for interstate clearance and delivery |
| 16 | COVID-Aid Tincture | Dr. Paul's Lab | The product is advised to take 1 cc under the tongue at least 4–6 times daily. The consumption period is until the symptoms subside (MARCS-CMS 612964) | Based on the FDA review the drug violates section 505(a) of the Act, 21 U.S.C. 355(a). As the product is misbranded, it violated section 502 of the Act, 21 U.S.C. 352. The delivery into interstate commerce without permission violates section 301(a) and (d) of the Act, 21 U.S.C. 331(a) and (d) |
| 17 | Thermal Scanners Artemis TI-CS-T11 Thermal Scanner Artemis Gateway | CreativeStar Solutions | The website entails the product as a solution for the prevention of covid-19 They promised it to be a leading solution in prevention (MARCS-CMS 613535) | This device comes under section 201(h) under the Act, 21 U.S.C. 321(h). As the device has no authorization and clearance it violates the sections under it. It is also misbranded and has no market approval, to begin with. It had no interstate commerce permission from the agency |
| 18 | Thermal Scanner Therm-App MD Therm-App MD Pro | Opgal Optronic Industries Ltd | Help minimize the coronavirus outbreak | This device comes under section 201(h) under the Act, 21 U.S.C. 321(h) and violated other sections too. The FDA generated a warning letter against the supplier and requested to revert soon |

Table 2 (continued)

| Sr.No | Product name | Company | False claim | Justification |
|-------|---------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 | Buffered C Powder Get Well 2 Day Vit- A Get Well 2 Day Vit-D3 Robynzyme OMG Cell Protek | PYRLess Group, LLC dba Dr. Fitt | These products consist of Iodine and the composition of Robynzyme is hydrochloric acid, digestive enzymes, and vitamin B. As iodine is a halogen, it has the property to kill bacteria, viruses, and fungi at a 99% kill rate. Vitamin D is supported by the fact that it is a hormone that stimulates protein production and thereby supports the immune system. Vitamin C has anti-viral properties. Thus, these agents were supplied over such claims that have not been proven at all. Although it can be one of the intrinsic properties, that does not mean a person can cure the infection just by incorporating these agents (MARCS-CMS 611424) | The drug comes under section 505(a) of the Act, 21 U.S.C. 355 (a). As the products are misbranded section 502 of the Act, 21 U.S.C. 352 is applied. The products are prohibited from interstate commerce. The FDA demands an explanation in due time |
| 20 | Corona Destroyer Tea | AusarHerbs | The tea is a two-formula option i.e., prevention & reversal The formula claims to destroy the coronavirus It claims to reverse covid in 7 days and symptoms to be gone in 3 days (MARCS-CMS 610976) | The product violates section 505(a) of the Act, 21 U.S.C. 355(a). It is a misbranded agent under section 502 of the Act, 21 U.S.C. 352. It is also prohibited to introduce or deliver into interstate commerce but it violates that section |

Data collected from: <https://www.fda.gov/consumers/health-fraud-scams/fraudulent-coronavirus-disease-2019-covid-19-products> and <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters>

This vaccine hesitancy has become the critical barrier to achieving the COVID-19 vaccine coverage. It is unclear whether the people are willing to take the vaccine or not. A study was performed in the USA to assess the association of people with vaccine hesitancy and vaccine acceptance. The studies reported that among the people who have vaccine hesitancy, 32% have taken 1 or more doses, 37% are likely to be vaccinated, and 32% are unlikely to be vaccinated. On the other side, the people who are likely to take vaccine among them 54% have taken 1 or more doses, 39% are likely to be vaccinated, and 7% people are unlikely to be vaccinated. The studies conclude that hesitancy has been decreased between late 2020 and early 2021 (Siegler et al. 2021). Another study was performed to analyze the vaccine willingness and perspectives of the public in India. The main concerns because of which people are not willing to take the vaccine were safety and side effects, effectiveness, and rapid development of vaccines (Chandani et al. 2021). The unwillingness and refusal of vaccine administration and vaccine hesitations are among the top ten most significant global health threats (İkişik et al. 2021). In one of the article, authors mentioned vaccine hesitancy in the era of COVID-19; they wrote about Maya Goldenberg, a philosopher who wrote about ideas on vaccine hesitancy, its genesis, rationale, and potential solutions using a multi-disciplinary approach to ground the arguments in her book “*Vaccine Hesitancy: Public Trust, Expertise, and the War on Science*” (Adhikari and Cheah 2021).

We as authors believe that there is a tremendous amount of information available on the internet and social platforms that should be taken in the positive sense and should be read and spread by educated professionals so that none of the persons remains unvaccinated in one-two coming years.

The US government interagency divided these SARS-COV-2 variants into three classes, variant of interest, variant of concern, and variant of high consequence. Table 4 classifies the variants according to classes, their time of emergence, and S protein mutations (Vasireddy et al. 2021).

These variants have caused COVID-19 infection to fully vaccinated people also. Some variants had caused few symptoms and some have led to the deaths of the patients. To prevent the infection, the simplest way is by following the COVID-19 protocols. Some important measures to follow:

1. washing of hands frequently.
2. when hands are not clean, avoid touching eyes, nose, or mouth.
3. when outside use hand sanitizer.
4. the use of medical masks is compulsory.
5. follow social distancing in public places.
6. avoid crowded places.
7. stay quarantined or isolate yourself if symptoms are observed.

Result and discussion

The pandemic has made us acknowledge the fact that another such pandemic might hit soon, and we must be prepared for it. This pandemic had already taught the importance of hygiene, to stop the exploitation of nature, and human interactions highlighted the importance of mental health and disciplining the overall human life. In addition, remembering the fatality of the pandemic defined the paramount of human life and our loved ones. Thus, we should be adaptive to certain measures like a consultation with a healthcare practitioner if unusual symptoms are observed, avoiding home remedies, colliding myths, and religious beliefs to treat a disease, etc.

Along with the pandemic, the false news and misinformation surfaced instigated fear in people. This triggered them to omit consultation with healthcare practitioners, news-demeaning vaccines as fatal, stating home remedies as superior, or myths that caused the ongoing situation to grimmer. Amidst the false news, there were certain websites claiming medicines, inhalers, and testing kits available to treat and cure the symptoms of COVID-19. Such products were to be discovered all over the internet, even links directed to these websites could be found. Thus, looking at the severity FDA sends warning letters to the claimers under the sections of the Federal, Food, Drug, and Cosmetic Act that are discussed in this article. The social media influence discussed in this review talks about how it has played a crucial role in people's behavior and actions.

The number of vaccines approved by the WHO to date is 10 which includes *Nuvaxovid* by Novovax, *Covovax*, and *Covidshield* by serum institute of India, *Spikevax* by Moderna, *Comirnaty* by Pfizer/BioNTech, *Ad26.COV2.S* by Janssen Johnson & Johnson's, *Vaxzevria* by Oxford/AztraZenca, *Covaxin* by Bharatbiotech, *Covilo* by Sinopharm, and *CoronaVac* by SinoVac (Francis et al. 2022). However, none of them is 100% effective and thus people have no confidence in the vaccine. There are many other factors such as its manufacturing method, the contents of the vaccine, the small period in which the vaccine was developed, etc., which have come across people's minds and have caused vaccine hatred (Mose et al. 2022). One of the major issues is maximum people in the small rural areas are not aware of the vaccines to date, so vaccination drives should be amplified in such rural areas, also campaigns and awareness programs will help in increasing the scientific knowledge of the poor and underprivileged people. As of 1st June 2022, Our World In data reports that 63.1% of the world population has taken at least one dose of the COVID-19 vaccine out of which 11.77 billion doses have been administered globally and 24.77 million are administered each day.

Table 3 Myths and facts about COVID-19 vaccines

| Sr. No | Myths | Facts | References |
|--------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | The COVID-19 vaccine is made of dangerous ingredients | Ingredients are the same as that in many foods- fats, sugars, and salts | https://www.hhs.gov/immunization/basics/vaccine-ingredients/index.html |
| 2 | Natural immunity by getting sick with infection is better than vaccination immunity | Vaccination is safe and dependable to build immunity than getting sick with the infection | (Shenai et al. 2021) |
| 3 | Vaccines cause variants | Whereas, COVID-19 vaccines help prevent new variants from emerging | (Fiolet et al. 2022) |
| 4 | All the vaccines have some adverse effects, all of those are reported to Vaccine Adverse Event Reporting System (VAERS) | The adverse event caused by any drug or vaccine is reported to VAERS, so it is not clear whether it is because of the COVID-19 vaccine | (Shimabukuro et al. 2015) |
| 5 | The new procedure of making vaccines by mRNA technology is not good | The mRNA technology vaccines work differently but immunize in the same way | (Rosa et al. 2021) |
| 6 | Microchips are incorporated in COVID-19 vaccines | They don't contain microchips; their main focus is to fight the disease and not track your movement [85] | https://www.forbes.com/sites/brucelee/2021/05/09/as-covid-19-vaccine-microchip-conspiracy-theories-spread-here-are-some-responses/?sh=19d0ee77602d |
| 7 | Receiving the COVID-19 vaccine makes you magnetic | It does not make you magnetic, including at the site of vaccination which is usually the arm [85] | https://www.forbes.com/sites/brucelee/2021/05/09/as-covid-19-vaccine-microchip-conspiracy-theories-spread-here-are-some-responses/?sh=19d0ee77602d |
| 8 | COVID-19 vaccine alters DNA | It does not alter DNA | (Silveira et al. 2021) |
| 9 | COVID-19 Vaccines make you sick with COVID-19 infection | None of the authorized COVID-19 vaccines in the U.S contains live viruses, so they would not make you sick | https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html |

Some questions come to our mind what if another such pandemic occurs in the coming 25–50 years again. What new implementations and learnings from this pandemic we are going to take to decrease the fatality rate? What new ideas we can execute to avoid mistakes that occurred during the COVID-19 pandemic? What can we do so that the infection does not affect the GDP of a nation?? Researchers have already studied the COVID-19 data thoroughly and have generated results that will help us to make quick decisions in the future. A statistical analysis study suggests that lesser air pollution, high healthcare spending, and high GDP per capita are the factors associated with low rates of fatality of COVID infection in countries (Coccia 2021a). A study also says that the ideal level of vaccination was achieved after the growth of the covid infection wave. In the initial phase of the pandemic there was a lower level of doses administered per 100 inhabitants, but as the waves were coming the level was improved from 46.75 (in March 2021) to about 90 doses of vaccines in May 2021 (Coccia 2022a) that is more than 100 doses, currently. Vaccine hesitancy is one of the factors that should be kept in mind as it affects the performance of nations. The performance of the nation also depends on public relations and the public trust which would be a strength in crisis management during a pandemic. Many other factors would prepare the nation to deal with a pandemic, and these factors are stated in a study by Coccia Mario (Coccia 2022b). Some lessons can be learned and strategies can be made to prevent pandemics related to Health, Environmental and Institutional, etc. (Coccia 2021b).

On September 22, 2021, FDA approved the booster dose of the Pfizer/BioNTech vaccine to be administered after the completion of six months of the primary series. The booster dose is aimed to restore vaccine effectiveness clearly stated by WHO, especially advised for immunocompromised patients. Additional doses of a vaccine may be needed as part of an *extended primary series* for target populations where the immune response rate following the standard primary series is deemed insufficient. Persons with weakened immunity are recommended to take the booster dose after the primary doses are taken. Researchers and scientists are taking everyday efforts to fight the COVID-19 infection. We as individuals should contribute and co-operate with the ongoing process by accepting necessary measures recommended by government bodies and healthcare practitioners.

In summary, many pseudoscience and fraudulent products are prevailing in the market for COVID-19 management. We have summarized all such possible gimmicks in this narrative review. As seen from the tabulated summaries of the products that are banned by the USFDA, many fraudulent products are sold in the market without regulatory approval. We have also tried to scientifically prove many of

such gimmicks wrong. In addition, the COVID-19 pandemic has become an advantage for scammers to earn money. To avoid such frauds, we need to understand some points that should be kept in mind for our safety. Most of the frauds are happening through online advertisements.

1. Avoid giving personal information to unknown sources.
2. Be aware of the fake test and bogus cures.
3. Third-party orders of medicines should be avoided.
4. If you receive an unsolicited email offering information, supplies, or treatment for COVID-19 or requesting your personal information for medical purposes, do not respond. Legitimate health authorities will not contact the public this way.
5. Avoid sending money using wire transfers, gift cards, or the mail, or sending payments in cash to businesses, charities, or individuals. Do not send money using these methods or channels.
6. Only use contact information from a trustworthy source when trying to reach a company or your bank.
7. Keep an eye out for websites and email addresses that provide COVID-19-related information or services.
8. Never respond to unsolicited offers for a COVID-19 vaccine, treatment, or cure. If a vaccine becomes available, you will not hear about it through an email, online ad, or telemarketing pitch.
9. Make sure any company offering COVID-19 supplies or products has positive reviews on the internet. Avoid companies with negative reviews.
10. Any business, charity, or individual requesting payments or donations in cash, via wire transfer, gift card, or through the mail should be avoided. Do not use these payment methods or channels.

Some help-line numbers and websites will help if any fraud occurs.

- a. HHS-OIG Hotline-1-800-HHS-TIPS (tips.hhs.gov)
- b. FBI Hotline-1-800-CALL-FBI (ic3.gov)
- c. CMS/Medicare Hotline- 1-800-MEDICARE
- d. Social Security Scams (SSA) oig.ssa.gov
- e. Federal Emergency Management Agency (FEMA)—for Funeral expenses, they provide help.

Currently, in the pandemic time, health agencies are approving the repurposed medicines based on the small-scale clinical data for emergency uses that become ineffective (Most of the cases) after large randomized clinical studies. Proper vigilance strategies need to be defined by the regulatory agencies of the nation and routine awareness

Table 4 Classification of variants of SARS-CoV-2, time of emergence, and prominent Spike protein mutations

| Sr. No | Classes | Variant names | Specific S protein mutations | Time of emergence |
|--------|-----------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 1 | Variant of interest | B.1.5265 (Eta) (Chavda et al. 2022d) | Del Y144, D614G, L5F, T95I, D253G, E484K | December, 2020 |
| | | B.1.526 (Iota) (Annavajhala et al. 2021) | L5F, T95I, D253G, E484K, D614G, and A701V | December, 2020 |
| | | P.2 (Zeta) (Aleem et al. 2022) | L18F; T20N; P26S; F157L; E484K; D614G; S929I; and V1176F | January, 2021 |
| 2 | Variant of Concern | B.1.1.7 (Alpha) (Socher et al. 2021) | 69del,70del,144del, (E484K*),N501Y, A570D,D614G,P681H,T716I,S982A, D1118H (K1191N*) | September, 2020 |
| | | B.1.351 (Beta) (Planas et al. 2021) | D80A, D215G, 241del, 243del, K417N, E484K, N501Y, D614G, and A701V | September, 2020 |
| | | P.1 (Gamma) (Faria et al. 2021) | L18F, T20N, P26S, D138Y, R190S, K4171T, E484K, N501Y, D614G, H655Y, and T1027I | December, 2020 |
| | | B.1.617.2 (Delta) (Chavda and Apostolopoulos 2022c) | T19R, (G142D*), 156del, R158G, L452R, T478K, D614, E484K, N501Y, D614G, and A701V | December, 2020 |
| | | B.1.1.529 (Omicron) (Chavda et al. 2022a; Chavda and Apostolopoulos 2022b) | A67V, del69-70, T95I, del142-144, Y145D, del211, L212I, ins214EPE, G339D, S371L, S373P, S375F, K417N, N440K, G446S, S477N, T478K, E484A, Q493R, G496S, Q498R, N501Y, Y505H, T547K, D614G, H655Y, N679K, P681H, N764K, D796Y, N856K, Q954H, N969K, and L981F | November, 2021 |
| 3 | Variant of high Consequence | No variants belong to this category until now | Not applicable | - |
| 4 | Other Variants | B.1.427 and B.1.429 (Epsilon) (McCallum et al. 2021) | S13I, W152C, L452R, L452R, and D614 | September, 2020 |
| | | B.1.621 & B.1.621.1 (Mu) (J. et al. 2022) | R346K, E484K, N501Y, D614G, P681H, D950N, and N1074K | January, 2021 |
| | | B.1.1.617.3 (Yadav et al. 2022) | Data not available | February, 2021 |

programmes shall be arranged for educating the people and healthcare workers on routine updates.

Conclusion

This narrative review describes all possible pseudoscience and fraudulent products for COVID-19 management. We have also attempted to cover the scientific facts that could prove the myths wrong and mentioned some suggestions and facts that would lead people in the correct direction and make them ready for the future. The prevalence of such false products and home remedies is more in under-developed countries than in developed ones. The information gathered here is mostly from published peer-reviewed literature, official websites of regulatory bodies, and some well-known web pages. Apart from that, there is tons of information spreading through Whatsapp, Facebook, and other social media pages that we have not considered here.

All this information will demand awareness for the common people and educate them to get proper treatment and get vaccinated first as early as possible to get global eradication of SARS-CoV-2.

It is claimed that the most critical lesson learned from COVID-19 is that policymakers must act quickly to implement containment and mitigation policies (Giordano et al. 2020; Lavazza and Farina 2020). It was reported that 95% of cases could have been stopped if China had acted on time and alerted the world with its own experiences (Sample 2020; Wang et al. 2020). This demonstrates the importance of pace when grappling with a pandemic, as well as the much greater risks that inaction poses. We may also see that, in order to preserve public confidence in the face of crises like this, elected officials should make straightforward, succinct choices and adhere to them without backtracking. Another message from the pandemic that elected officials should take away is the value of creating an economy that can change to better serve our lifestyle and business. The capitalist world operates on a

“disposable” economy, in which we buy goods, discard them, and recycle them. After the COVID-19 pandemic has ended, the most valuable lesson that political leaders can learn is the importance of a self-sustaining, circular economy, which can help us both plan for and cope with the pressures on foreign markets that pandemics can cause. It should be remembered, however, how important it is for policymakers to adopt strategies that flatten infection risk curves rapidly. At the end, it is important to have consistency on implementation of appropriate measures during the pandemic time in regions and countries. This requires global participation and co-operation.

It is anticipated that COVID-19 will become endemic at some point, which essentially means that the virus will not disappear, but rather, sufficient numbers of people will develop immunity through vaccination or infection, resulting in fewer hospitalizations and deaths despite the virus' continued circulation in the community.

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