

COVID-19 Anti-Vaccine Sentiments

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The analyses uncovered several major issues concerning COVID-19 vaccine hesitancy. The production of the COVID-19 vaccine at an unprecedented speed evoked the fear of skipping steps that would compromise vaccine safety. The unknown long-term effects and duration of protection erode confidence in taking the vaccines. There were also persistent concerns with regard to vaccine compositions that could be harmful or contain aborted foetal cells. The rate of COVID-19 death was viewed as low. Many interpreted the 95% effectiveness of the COVID-19 vaccine as insufficient. Preference for immunity gains from having an infection was viewed as more effective. Peer-reviewed publication-based data were favoured as a source of trust in vaccination decision-making.

Keywords: antivaccine ; social media ; vaccine hesitancy

1. Introduction

The SARS-CoV-2 vaccine development efforts began with the onset of the novel coronavirus outbreak, which first emerged in Wuhan, China, in late December 2019. The coronavirus disease 2019 (COVID-19) eventually became an ongoing pandemic with no specific treatments or vaccines available for prevention. The COVID-19 vaccine is likely to be the most effective and sustainable approach for controlling the pandemic. Unprecedented research effort and global coordination resulted in the rapid development of vaccine candidates and the initiation of many clinical trials worldwide. As of 12 November 2020, according to the World Health Organisation's draft landscape of COVID-19 vaccines, there were 48 candidate COVID-19 vaccines in clinical trial evaluation and 164 in preclinical evaluation stages ^[1]. The acceptance of a COVID-19 vaccine has been reported in several studies worldwide. An early study of COVID-19 vaccine acceptance in France conducted 10 days after the nationwide lockdown revealed 74% acceptance ^[2]. A higher acceptance rate was found among the Asian population. Evidence from two studies from Southeast Asian countries conducted in April 2020 reported higher COVID-19 vaccine acceptance rates of 94.3% ^[3] and 93.3% ^[4], respectively. A large sample study in China reported 83.3% acceptance among the public in China in May 2020 ^[5]. A relatively lower acceptance rate (67.0%) was reported in a study in the U.S. conducted in May 2020 ^[6]. A recently published global survey of 19 countries conducted in June 2020 reported acceptance rates ranging from 54.95% to 88.6%, with the lowest reported in Russia and the highest in China ^[7]. Potential adverse events and negative consequences from COVID-19 trials have begun to emerge in various news media outlets since May 2020, refs. ^{[8][9][10][11][12]} although published clinical evidence from COVID-19 trials has indicated that the vaccines are well-tolerated with mild or moderate severity adverse effects ^{[13][14]}. A recently conducted survey in October 2020 in the US showed a further decline in people's willingness to take the COVID-19 vaccine, with only 51% having expressed vaccination intention ^[15].

Vaccine hesitancy is a growing threat to global health security. The World Health Organization has named vaccine hesitancy as one of the top 10 threats to global health in 2019 ^[16]. Tracking public responses to COVID-19 vaccination is crucial to understanding any concerns and acceptance regarding the forthcoming vaccines. Often, anti-vaccine viewpoints are widespread in social media ^[17]. Of late, there has been remarkable popularity in international news channels broadcasting using social media platforms such as Facebook, Twitter, and Instagram. As global social media usage continues to grow, the potential to harness data generated from social media users has also grown ^[18]. In particular, the activities of social media users, by commenting or messaging, serve as new research avenues with which to harvest empirical insights on public perception. We, therefore, examined public opinion on social media following the first press releases of data showing the high effectiveness of COVID-19 vaccines and the announcement that they would soon be available.

2. Current Insights

Despite the enormous global effort to develop a vaccine for COVID-19 as rapidly as possible, the COVID-19 vaccine is not spared from skepticism. This study uncovered a broad range of barriers to COVID-19 vaccine acceptance that may

hinder the aim of achieving herd immunity through vaccination.

The urgency of having a vaccine in response to the unprecedented COVID-19 pandemic has resulted in many academic institutions and pharmaceutical industries expediting their respective vaccine development. Nevertheless, the rush for a vaccine created fear among some members of the public as many believed that speeding up the process may imply skipping essential steps, which undermine public confidence in the vaccines. This suggests that it is important to improve communication to debunk the fear among the public surrounding the expedited COVID-19 vaccine development timelines. Furthermore, the public needs to be convinced that the production of COVID-19 vaccines in such a short time does not imply skipping steps that would compromise safety. Researchers are accelerating the entire development process due to the catastrophic impact of the pandemic. The new mRNA vaccine technology enables rapid development and large-scale production of the vaccines in an expedited timeframe alternative to conventional vaccine approaches ^[19]. Nonetheless, it remains a great challenge in introducing the new mRNA technology that neither has been used in commercially available vaccines nor tested in large-scale human trials ^{[19][20]}. The benefits of the mRNA vaccine along with its safety ^{[19][21][22][23]} should be highlighted to demystify the unfounded conspiracy theories, especially with regard to misinformation about mRNA vaccines potentially altering or resulting in human genetic modification.

It remains a challenge to convince the public to accept a new vaccine with the unknown long-term sequelae of vaccination and duration of protection. As most of the concern regarding the long-term side effects of the vaccine surrounds the issues of the constituent of the vaccines, it is of utmost importance to ensure the public about the safety record of the vaccine constituents. The vaccine compositions should be made known to gain the public's trust in its safety and to address the concern of people who are allergic to certain vaccine constituents, for example, egg proteins. Likewise found in this study, the use of thimerosal, a mercury-based preservative, has been subjected to intense concern as it was thought to cause autism. Mounting evidence shows that the amount of thimerosal in vaccine is small and the risks of serious complications from preventable infections outweigh the risks of its adverse consequences ^[24]. Hence, the introduction of the COVID-19 vaccines should also be accompanied by messages to demystify the rumors around the mercury-based vaccine preservative. Additionally, hesitancy is also rooted in the ethical concerns of the use of human fetal cells in COVID-19 vaccine development. People with religious convictions expressed hesitancy about COVID-19 vaccines due to ethical concerns that human fetal cells were used in its development ^[25]. This finding highlights the key role of faith leaders as they are highly trusted individuals in communities ^[25].

Most importantly, the safety of the vaccine composition needs to be highlighted during vaccine promotion ^[26]. Another stream of concern identified is the belief that protection after vaccination may be inferior to that acquired after a natural infection. Uncertainties surrounding vaccine protection is one of the fundamental new vaccine development conundrums yet to be adequately addressed. It is currently unknown if any of the candidate COVID-19 vaccines will elicit a better immune protection response than that of the natural infection. Relatively little has been published comparing vaccination-acquired immunity versus immunity acquired following natural infection. To date, there is insufficient evidence comparing the immunity acquired following vaccination versus natural infection. While preliminary results from the ongoing vaccine clinical trials suggest good protection against SARS-CoV-2 infection, it is not yet established whether vaccination may also prevent transmission of the virus. Similarly, it is not known if the acquisition of a natural infection would limit transmission. Nevertheless, the public should be enlightened that vaccines in general have been largely successful in eradicating many infectious disease threats and that the risks of building up immunity to the coronavirus through natural infection outweigh the risks of immunisation. While studies on anti-SARS-CoV-2 antibodies are still ongoing, current evidence is suggestive that protective immunity against SARS-CoV-2 infection is short-lasting ^{[27][28]}, hence, there is little evidence supporting the benefit of reliance solely on natural immunity in protection against COVID-19.

The mutations of SARS-CoV-2 have been speculated to adversely affect the efficacy of most vaccines, resulting in fear around the need for repeat vaccination, similar to that of seasonal influenza vaccines. Nonetheless, recent evidence indicates that vaccines are unlikely to be affected by the 'D614G' mutation (Aspartate-to-Glycine change at position 614) of the SARS-CoV-2 spike protein ^[29]. Engagement with vaccine sceptics highlighting the well-established scientific data is important as they may lack access to trusted sources of vaccine information, hence, becoming more susceptible to anti-vaccine theories ^[30]. Highlighting these evidence-based facts will be useful to counteract the misinformation.

According to a recent meta-analysis, the global aggregated estimate of COVID-19 infection fatality rate was 0.68% (0.53–0.82%) ^[31]. Furthermore, claims circulating on social media stating the CDC reported that the coronavirus has a high survival rate of 99.997%, 99.98%, 99.5%, and 94.6% for the age groups of 0–19, 20–49, 50–60, and 70 years old and above; this has perhaps undermined the public perception of the severity of COVID-19. This is especially misleading if the mortality is calculated simply over the total number of cases ignoring the high mortality rates among those that are vulnerable, such as the elderly and those with co-morbidities. The public should be enlightened that measuring the impact

of COVID-19 goes beyond mortality statistics [32]. The severe effects of SARS-CoV-2 infection should not be underestimated although the survival rate is high among those who are otherwise healthy and receive sufficient medical care. On the other hand, the long-term health consequences of SARS-CoV-2 infection remain unknown. Significant pulmonary sequelae such as persistent respiratory symptoms and lung abnormalities have been evidenced months after infection with SARS-CoV-2 [33][34][35]. Evidence of post-recovery negative effects in younger patients implies that the potential long-term effects of COVID-19 should be a concern, even for children [36].

The public should also be made aware that no vaccine confers 100% protection against SARS-CoV-2. A recent study reported that the COVID-19 vaccine has to have an efficacy of at least 70% to 80% to end the pandemic [37]. Lastly, as trustworthy information is warranted, providing research-based evidence of vaccine effectiveness would greatly improve COVID-19 vaccine confidence and reduce controversies. Findings of the COVID-19 vaccine clinical trials should be published in order to cease the widespread concerns about the safety and effectiveness of the vaccine. Concerted efforts of the pharmaceutical industries and health authorities on local, national, and international levels are needed for improving or restoring vaccine confidence [38].

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