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## Review article

# Myths and conspiracy theories on vaccines and COVID-19: Potential effect on global vaccine refusals



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## ABSTRACT

The current coronavirus disease 2019 (COVID-19) pandemic is one of the international crises and researchers are working collaboratively to develop a safe and effective COVID-19 vaccine. The World Health Organization recognizes vaccine hesitancy as the world's top threat to public health safety, particularly in low middle-income countries. Vaccine hesitancy can be due to a lack of knowledge, false religious beliefs, or anti-vaccine misinformation. The current situation regarding anti-vaccine beliefs is pointing towards dreadful outcomes. It raises the concern that will people believe and accept the new COVID-19 vaccines despite all anti-vaccine movements and COVID-19-related myths and conspiracy theories. This review discusses the possible detrimental impacts of myths and conspiracy theories related to COVID-19 and vaccine on COVID-19 vaccine refusals as well as other vaccine programs.

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## Mitos, teorías conspiratorias y COVID-19: efecto potencial en los rechazos globales a la vacunación

## RESUMEN

La pandemia actual de COVID-19 (enfermedad por coronavirus de 2019) es una crisis internacional y los investigadores están trabajando conjuntamente para desarrollar una vacuna efectiva contra ella. La Organización Mundial de la Salud reconoce la renuencia a la

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vacuna como una de las principales amenazas para la seguridad de la salud pública, particularmente en los países con bajos ingresos medios. Dicho rechazo a la vacuna puede deberse a falta de conocimiento, falsas creencias religiosas o desinformación acerca de la anti-vacunación. La situación actual con respecto a las creencias apunta a resultados terribles. Suscita la inquietud de que las personas crean y acepten las nuevas vacunas frente a la COVID-19 a pesar de todos los movimientos anti-vacunación y los mitos y teorías conspiradoras relacionados con esta enfermedad. Esta revisión trata sobre el posible impacto perjudicial de los mitos y teorías conspiradoras relacionados con la COVID-19 y el rechazo a la vacunación frente a la misma, así como a otros programas de vacunación.

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## Background

The spread of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome-related coronavirus 2 (SARS-CoV-2), has resulted in an unprecedented humanitarian and economic crisis.<sup>1,2</sup> SARS-CoV-2 is an enveloped and positive-sense single-stranded RNA virus and a member of the genus *Betacoronavirus*.<sup>2</sup> There are no current specific treatments for COVID-19<sup>3–5</sup> but more than 100 vaccine candidates have been in the development pipeline and researchers have worked collaboratively to develop the vaccines against COVID-19.<sup>6</sup> However, this international effort could be hindered by vaccine hesitancy, which is an internationally prevalent phenomenon.<sup>7</sup> Vaccines have been approved as a highly efficacious and cost-effective community health measure for disease prevention since it could reduce the mortality and morbidity rate of the diseases.<sup>8</sup> However, the vaccination program is still assumed as an unsafe and unnecessary by many individuals both in developed and developing countries.<sup>9</sup> For example in the US, due to inadequate vaccine coverage, measles outbreaks occurred in California between 2014–2015 and 5–10% of the population had anti-vaccination beliefs.<sup>10</sup> A study in 2012 based on population surveys or registers from the US, European Union, New Zealand, and Australia, found that 20–30% individuals were categorized as being hesitant concerning about vaccination.<sup>11</sup> Lack of knowledge and confidence in vaccination are now considered to be the greatest threat to the success of vaccination programs.<sup>9</sup> Vaccine hesitancy may decrease the vaccine coverage and increase the risk of vaccine-preventable diseases and the outbreaks.<sup>9</sup>

## Vaccine acceptance and hesitancy determinants

Vaccine acceptance and hesitancy depend upon the beliefs in vaccination, its safety, the trust placed in the system that delivers the vaccines, health issues, fear of side effects, and lack of a healthcare workers recommendation.<sup>12</sup> Beliefs regarding the benefit and effectiveness of vaccines, wariness of the motives behind, the influence of family especially parents' attitude and conversation with friends on vaccination decisions are also influence the vaccine acceptance and hesitancy.<sup>12</sup> A study conducted in Indonesia found that 15% out of total respondents concerned about the safety

and efficacy of the vaccine and therefore showed hesitancy towards pediatric vaccination.<sup>13</sup> Different social, cultural, and political views also play important role in decision making in vaccination.<sup>9</sup> In addition, lack of knowledge about “who, where, and when” one should be vaccinated and self-estimated sufficiency of information about vaccination or satisfaction are frequently associated with vaccination decisions.<sup>9</sup> Fear of needles and pain after vaccine injection is also documented as one of the greatest opponents of vaccination.<sup>14</sup>

## Social media and vaccination

Media have played an immense role in keeping vaccination scares alive, even in the era of strong evidence of the fortification and effectiveness of vaccines.<sup>15</sup> Different types of facts about vaccines conveyed via media have a gigantic impression on vaccine hesitancy.<sup>16</sup> Controversies on vaccine safety, that circulate vigorously in news headlines, talk shows, and popular articles<sup>17</sup> also upsurge the vaccine hesitancy and anti-vaccine behavior in the community.<sup>9</sup> In addition to traditional media, internet has also provided other podiums for various social media<sup>18</sup> to multiple anti-vaccine vocals through which they reach the general population to diffuse the wrong or negative messages.<sup>19</sup> Anti-vaccination contents on internet have widely broadcast the rumors, myths, and inaccurate beliefs regarding vaccines and they have detrimental impacts on vaccine uptake.<sup>20</sup> A study conducted in Atlanta at the time of the 2009 National Immunization Survey have shown that individuals who delayed or refused the vaccines are more likely to have searched for vaccine information on the internet.<sup>21</sup>

## Role of negative beliefs and faith

Vaccination refusal is also frequently related to philosophical beliefs and moral faiths regarding health and immunity making “natural” superior over “artificial” medicines.<sup>22</sup> It has also been associated with strong religious beliefs. Anti-vaccine propaganda in 2011 intensified that vaccine is western intrigue to sterilize Muslim girls and that vaccine is made up of gelatin from porcine which is *haram* and therefore forbidden in Islam.<sup>23</sup> It is also cogitating as a partial fact that some vaccines are produced using porcine-based enzymes which is intolerable for some Islamic scholars, particularly concerning

the *haram* notion.<sup>24</sup> Another untrue fact become unacceptable for some scholars is aborted to produce vaccine especially virus-based-vaccines that require culturing of the virus in specific human cells.<sup>25</sup> However these are fringe views and in almost every major religious authority has denounced such use of their religion and vaccination does not violate the religions because vaccination preserves health and duty to community.<sup>26</sup>

Concerns on overloading the child's immune system by giving several vaccines at the same time are beyond the pale in many backward areas. In fact, combination vaccines also mean fewer injections which are a good step to reduce parental anxiety and hassle on the child.<sup>27</sup> In addition, vague information regarding both vaccine safety and the process contributing to vaccine licensure and enormous problems for public health clinicians, policymakers, and for patients as well.<sup>9</sup>

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### Myths and conspiracy theories on COVID-19 and their consequences

In some places, people do not believe in COVID-19 existence, the virus is intangible and not very concrete and for some individuals, it is really hard to accept that a "flu-like illness" could be life-threatening.<sup>28</sup> Some believe that COVID-19 is a business for health care workers (HCWs) and doctors are diagnosing every fever as COVID-19 for their benefits.<sup>28</sup> Ironically, in some places, people attacked HCWs in the hospitals for not handing over the dead body immediately to the family.<sup>28,29</sup> The claim that COVID-19 is a pre-planned project to cover the Bill Gates trackable microchip conspiracy was also raised.<sup>30,31</sup> With that, the storm of "infodemic", conveyed by social media is of great concern.

Myth about the origin of virus was also emerged<sup>32,33</sup> and people also believe that government is providing false number of COVID-19 cases because a large number of cases will get more profit and donation.<sup>33,34</sup> Many people also believe that it is from God as a punishment,<sup>33</sup> the 5G technology directly transmits the virus and weaken the human immunity,<sup>32</sup> and some consider that the virus is a bio-warfare weapon.<sup>31,32</sup> In addition, the video "Plandemic" that shows that COVID-19 pandemic is a conspiracy of pharmaceutical companies to sell their products also have become viral through social media platforms adding the list of conspiracy theories.<sup>32</sup> All these raise the question: will people believe the COVID-19 vaccine and will they accept it? In addition, the most unwanted domino effect is it might decrease childhood immunization practices due to trends of conspiracy theory. Therefore, well-designed mass campaign might need to be implemented in the community to reduce the COVID-19 related myths.

It should be noted that the core of anti-vaccine beliefs is a conspiracy theory that vaccines do not work and/or are actively harmful because cause autism, autoimmune disease, infertility in teenaged girls or others. Opposition against vaccines manifests not only in theological arguments but also object to them for political and legal reasons. Anti-vaccine activists such as Robert F. Kennedy, Andrew Wakefield, Del Matthew Bigtree, Jennifer McCarthy Wahlberg have kicked into overdrive and public health experts fear that their messag-

ing could further harm the response to the pandemic. One of the hallmarks of the anti-vaccine movement is the sense of selfishness and lack of concern for other people's health. Anti-vaccine activists like to talk about rights and freedom but what they really want is freedom without consequences. Vaccine critics, for example, have long championed the false claim that vaccines cause autism, and that the US Centers for Disease Control and Prevention (CDC) has tried to cover up that information and they are now rebranding themselves as advocates of medical freedom. Therefore, scientific data and messages on vaccination, such as information from the WHO and the CDC, are relevant to the discussion on immunization. Therefore, increasing the knowledge and understanding of the people is important to reduce the detrimental effects of anti-vaccine movement in community.

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### COVID-19 vaccine challenges

Enormous efforts have been made to invent an effective vaccine that might be the best measure to end the current COVID-19 pandemic. However, the effectiveness of the vaccine not only will depend on its efficacy but also the uptake (i.e., the acceptance) of the vaccine in population.<sup>8</sup> In Australia, among 4,362 surveyed adults 85.8% would accept the COVID-19 vaccine<sup>35</sup> while in the US only 67% out of 672 surveyed participants would accept the vaccine if it is recommended.<sup>36</sup> A survey in 19 countries that included 13,426 people found that 71.5% of participants would be very or somewhat likely to take the COVID-19 vaccine, ranged from almost 90% (in China) to less than 55% (in Russia).<sup>37</sup> In Iran, 73.2% out of 1,480 respondents stated they would accept an approved COVID-19 vaccine if it were to become available.<sup>38</sup> Many factors influence the vaccine acceptance<sup>35-39</sup> including the vaccine efficacy. In Indonesia, a study found that 93.3% out of 1,359 surveyed respondents would like to be vaccinated with the vaccine that has a 95% efficacy but it dropped to 67.0% when the vaccine has 50% efficacy only.<sup>40</sup> Studies found that inadequate health literacy, lower education level, concerned about vaccine efficacy and safety, low trust in government, and low income were associated with COVID-19 vaccine hesitancy.<sup>35,37,39</sup>

The implementation of the vaccination program will be an important factor for COVID-19 vaccination success and this depends fully on community acceptance of the vaccine. What if large parts of the general population refuse to take the vaccine, once it is available? Therefore, a campaign at mass level is needed to increase the public knowledge and awareness of COVID-19 to reduce COVID-19 vaccine refusals and ultimately to increase the vaccine coverage.

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### A way forward

Community education is one of the primary aspects that needs to be enhanced in a timely manner and the foundation for COVID-19 vaccine acceptance for the public should be plotted beforehand in order to ensure COVID-19 vaccination success. In addition, the government and health community should follow certain aspects to promote the upcoming

COVID-19 vaccine uptake. First, the COVID-19 vaccination program should be rigorously delivered to the public via social media and HCWs should raise voice about the potential obstacles to vaccine hesitancy using etymological and ethnical competent messages.<sup>41</sup> Second, public health NGOs and public figures (celebrities and religious leaders) should develop a forceful COVID-19 vaccine educational and awareness campaign and transfer COVID-19 vaccine knowledge focusing on misinformation.<sup>41</sup> Third, frontline HCWs should recommend COVID-19 vaccination as soon as it becomes available. Finally, the government should make sure the vaccine will be enough in the market to the public as soon as the trial is completed and its efficacy and safety ensured. In addition, subsidy from the government is one of success key to achieve high COVID-19 vaccine coverage since the acceptance is price sensitive.<sup>42,43</sup>

## Conclusion

Social, cultural, and political contexts play the vital role in decision making regarding vaccine acceptance and refusal. Anti-vaccine controversies concerning vaccine safety are vigorously circulating by social media via different platforms, upsurge the vaccine hesitancy among community members. The anti-vaccine behaviors among community due to misinformation might potentially hamper the COVID-19 vaccine program and to have domino effects on other vaccination program. Therefore, efforts to diminish the myths and conspiracy theories on COVID-19 and vaccines that involving multi-sectorial elements are needed to increase the acceptance of COVID-19 vaccine when it is available in the near future.

## Ethical approval

Not required.

## Authors' contributions

I.U. and K.S. conceived the idea, I.U., K.S., M.J.T., H.H. & A.A. wrote the initial manuscript, and H.H. and A.A. revised and reviewed the final manuscript. All authors have read and agreed to the published version of the manuscript.

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