REVIEW ARTICLE

Covid-19, the anti-vaccine movement and immunization challenges in Brazil: a review

Covid-19, o movimento anti-vacina e os desafios da imunização no Brasil: uma revisão

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ABSTRACT

AIMS: The COVID-19 pandemic suddenly and significantly increased hospitalizations for pneumonia with systemic inflammatory disease. Since its appearance, COVID-19 has affected more than 200 countries, with more than 90 million cases and almost 2 million deaths. So far, there is no quality evidence regarding the specific pharmacological therapy for COVID-19; most treatments usually involve off-label use of existing drugs and have unproven efficacy. The global effort converges on the development of a vaccine; however, the greatest challenge is to achieve collective immunization in the face of increasing vaccination hesitancy.

METHODS: This study investigated the impact of vaccine hesitancy movements on the goal of COVID-19 immunization in Brazil. An integrative bibliographic review was performed with an electronic search on PubMed and SciELO that yielded 13.535 articles. Inclusion and exclusion criteria were applied which included 29 interventional and descriptive studies.

RESULTS: The results of the 29 studies revealed that the most frequent reasons for hesitation is skepticism about the true interests of the industry and politicians, the lack of trust in research, and inaccurate information on social media.

CONCLUSION: The main factors that lead the population not to believe in vaccines were the real interests of industry and politicians, lack of confidence in research, and the amount of false information that circulates massively on social media and because of that it is possible that Brazil will face some challenges in achieving collective immunity due to the anti-vaccine movement.

KEYWORDS: COVID-19; SARS-COV-2; Vaccine; Anti-Vaccine Movement; Vaccine Hesitancy

RESUMO

OBJETIVOS: A pandemia de COVID-19 aumentou repentina e significativamente as hospitalizações por pneumonia com doença inflamatória sistêmica. Desde o seu surgimento, a COVID-19 afetou mais de 200 países, com mais de 90 milhões de casos e quase 2 milhões de mortes. Até o momento, não há evidências de qualidade em relação à terapia farmacológica específica para COVID-19; a maioria dos tratamentos geralmente envolve o uso off-label de medicamentos existentes e sem eficácia comprovada. O esforço global converge para o desenvolvimento de uma vacina; entretanto, o maior desafio é conseguir a imunização coletiva diante do aumento da recusa à vacinação.

MÉTODOS: Este estudo investigou o impacto dos movimentos de recusa à vacina no objetivo de imunização com COVID-19 no Brasil. Foi realizada uma revisão bibliográfica integrativa com busca eletrônica no PubMed e SciELO que resultou em 13.535 artigos. Foram aplicados os critérios de inclusão e exclusão que incluíram 29 estudos de intervenção e descritivos.

RESULTADOS: Os resultados dos 29 estudos revelaram que os motivos de hesitação mais frequentes são o ceticismo sobre os verdadeiros interesses da indústria e dos políticos, a falta de confiança em pesquisas e informações imprecisas nas redes sociais.

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CONCLUSÃO: Os principais fatores que levaram a população a não acreditar nas vacinas foram os reais interesses da indústria e dos políticos, a falta de confiança nas pesquisas e a quantidade de informações falsas que circulam massivamente nas redes sociais e por isso é possível que o Brasil enfrente alguns desafios para alcançar a imunidade coletiva devido ao movimento anti-vacinas.

PALAVRAS-CHAVE: COVID-19; SARS-COV-2; Vacina; Movimento Anti-Vacina; Recusa de vacina

ABBREVIATIONS: COVID-19, Coronavirus disease 2019; SARS, Severe acute respiratory syndrome; WHO, World Health Organization,

1. INTRODUCTION

In December 2019, several cases of pneumonia due to an unknown cause were reported in Wuhan City, Hubei Province, China. Analysis of the genetic material isolated from the virus was carried out and it was discovered that it was a new beta-coronavirus; it was initially called 2019-nCoV by the World Health Organization (WHO) (1). The coronavirus disease 2019 (COVID-19) pandemic has led to a significant and sudden increase in hospitalizations for pneumonia with systemic inflammatory disease of those most susceptible. Since its emergence, COVID-19 has affected more than 200 countries, resulting in more than 90 million cases and almost 2 million confirmed deaths and the numbers keep on increasing (2).

Treatment involves supportive therapy such as isolation, rest, oxygen therapy, antibiotics for secondary bacterial infections, anticoagulants and corticosteroids (3, 4).

The global effort converges not only in the search for an efficient drug, but also in the development of a vaccine that can induce immune memory. However, the challenges of vaccination make it difficult to achieve group or collective immunity (5). Active immunization through vaccination is an effective mechanism for the prevention of infectious diseases. From an epidemiological point of view, vaccines are considered a medical technology with excellent cost benefit and a high degree of resolvability for public health (6), preventing thousands of deaths per year and exponentially increasing the life expectancy of the population.

In recent years, a significant portion of the population has demonstrated hesitancy and/or hesitation to use vaccination as an immunopreventive measure despite the fact that immunization is effective and safe. In connection with this, instability and delays in vaccinations have led to low levels of vaccination coverage and consequently, to the increase in the incidence of previously eradicated diseases. One example is the measles epidemic which is afflicting Brazil again (7). The challenges of immunization arise mainly from the antivaccine movement that has been gaining prominence in the United States, Brazil, and the world (8). A study on the intention of the population to vaccinate against H1N1 in the United States showed that at the beginning of the pandemic in 2009, the intention was about 50% but decreased considerably to 16% in the following year, January 2010. This demonstrates the low adherence of the population to vaccination (9).

According to the Brazil Ministry of Health, vaccination coverage rates for polio and measles during the 2018 vaccination campaign reached around 40%, much less than the ideal value set by the WHO, which was at least 95%. Parents who had not been exposed to these diseases did not take them seriously and chose not to vaccinate their children. This revealed that the adult population possibly misinterpreted vaccination and followed their own instinct. Studies proposed that the increased number of some preventable diseases result from heterogeneity of vaccination coverage, and that unvaccinated individuals tend to interact with each other, creating subpopulations that are susceptible to new local outbreaks; people who hesitate vaccination also tend to be close with each other (10).

In this sense, the best scientific evidence demonstrates that the elimination and/or control of communicable diseases is intricately linked to the concept of collective immunity. This is essential for the control of the current COVID-19 pandemic and it is necessary to understand the possible problems that Brazil may face in the eventual attempt to immunize its population.

This paper aims to answer the question: Does the growing anti-vaccine movement represent a challenge to immunization against COVID-19 in Brazil? It is important to emphasize the consolidated understanding that severe adverse

effects after vaccination are predominantly rare and that the currently available vaccines are considered safe and efficient, presenting an infinitely lower risk in their application than the natural course of an immunopreventive disease. It is necessary to clarify this concept to the growing anti-vaccine movement of Brazil and the world.

2. MATERIALS AND METHODS

2.1. Study Description

The research method used in this study was integrative bibliographic review with qualitative method approach.

2.2. Data Research and Analysis Procedure

To carry out this literature review, the precepts of the exploratory study were followed through an extensive bibliographic search of scientific articles on the subject. A search was carried out in the PubMed database between January and June 2020 using these keywords in English and their corresponding Portuguese translation: "VACINA E COVID-19," "VACINA E SARS-COV," "ANTI-VACINAÇÃO or ANTI-VACCINE," "CONFIDENCE IN VACCINE," and "VACCINE HESITANCY/REFUSAL." The selection of articles was carried out by three independent evaluators, after which they met and checked if there was a difference of opinion, and these were resolved through a consensus. The selection was initially made through titles, followed by abstracts, and when selected, by a complete reading of the articles.

2.3 Inclusion and Exclusion Criteria

For inclusion, the studies needed to be complete articles or national ordinances, published in the years 2000 to 2020, and only written in Portuguese and/or English. The time frame chosen was due to the limited number of studies carried out on the subject in question.

For the exclusion criteria, all studies that did not fit the theme or objectives addressed and studies that did not fit the article modality (such as theses, monographs, reviews, and abstracts) were excluded. Articles that were not free and/or not available in their full format were also not added.

3. RESULTS AND DISCUSSION

In the proposed manner, the electronic search returned 12.148 articles based on the keywords mentioned in the PubMed database and 1.387 articles in the SciELO database. After reading the titles and applying the inclusion and exclusion criteria, 12.119 articles were discarded. The final list consists of 29 interventional and/or descriptive studies. The data are shown in **Table 1** for PubMed and **Table 2** for SciELO.

TABLE 1 – Articles selected in PubMed database according to the descriptors and selection criteria.

Data base	Keywords	Initial result	Selection criteria				Final Reading	Excluded
			Period	Title	Abstract	Free-Access		
PubMed	Vaccine and COVID-19	1.444	1.444	94	11	8	8	1.436
	Vaccine and SARS-COV-2	1.123	1.123	61	6	5	5	1.118
	Anti-Vaccination	265	252	54	9	4	4	261
	Anti-Vaccine	192	180	39	7	3	3	189
	Vaccine Confidence	7.842	7.190	33	6	5	5	7.837
	Vaccine Hesitancy/ Refusal	1.282	1.210	76	8	4	4	1.278
TOTAL	-	12.148	11.399	357	47	29	29	12.119

TABLE 2 – Articles selected in SciELO database according to the descriptors and selection criteria.

Data base	Keywords	Initial result	Selection criteria				Final Reading	Excluded
			Period	Title	Abstract	Free-Access		
SciELO	Vaccine and COVID-19	16	16	3	1	1	1	15
	Vaccine and SARS-COV-2	1	1	1	0	0	0	1
	Anti-Vaccination	558	556	20	5	2	2	556
	Anti-Vaccine	683	677	17	6	5	5	678
	Vaccine Confidence	129	123	2	1	0	0	129
	Vaccine Hesitancy/ Refusal	0	0	0	0	0	0	0
TOTAL	-	1.387	1.373	43	13	8	8	1.379

The stakes for the development of a vaccine are high, and if not carried out following all the criteria for safety and efficacy, the repercussions can be devastating for research and for those who are vaccinated. As demonstrated by Schaefer et al. (2020) (11), although they seek to reduce the damage caused by COVID-19, it is necessary to balance ethics, safety, and efficacy of the new product and doing all of these is challenging. One of the main difficulties in developing a COVID-19 vaccine is certainly the main target population, composed essentially of elderly patients, increasing the risk of immunization in this population (11, 12).

The development of a vaccine for COVID-19 will certainly be recorded. In April this year, there were already 19 candidates, 7 of whom were already undergoing human tests, though the results and effects of these vaccines were not disclosed at the moment. Although the estimate is that an efficient vaccine will be ready within 18 months, WHO suggested that countries do not depend on a vaccine and look for ways to reduce viral spread (13). One of the strategies for speedy vaccine production is knowledge of viral antigens, which makes it possible to synthesize the vaccine more quickly without using inactivated virus (14).

When ready, it is possible that the acceptance of the population to the vaccine will be difficult. As demonstrated by Khan et al. (15) anti-vaccine speculations are already evident in Muslim countries such as Pakistan. It is possible that candidate participants are not really volunteers, and data can easily be omitted (16). According to Fadda et al. (17), the population trusts vaccines that take years to develop, but if a product was developed rapidly, it is possible that adhesion will fall. In addition, there is a notable increase in the dissemination of false information about vaccines by movements that oppose vaccination. With the speed of communication, once a citizen's understanding is established, it is difficult to make him understand the benefits and vaccine safety.

The rise of anti-vaccination movements in parts of the western world poses a terrible threat to people's health and collective immunity. Recently, people of all ages have been victims of measles outbreaks, one of the most notable "eliminated" diseases that have returned as a direct consequence of not reaching the ideal percentage of vaccination coverage. These outbreaks not only put pressure on national health systems, but also cause fatalities. As demonstrated by Hussain et al. (18), even parents that favor vaccination may

be confused by the ongoing debate and may question their choices; moreover, those most in need of information are the most susceptible.

The internet is prone to spread false information. Anti-vaccine movements usually flood the platform with different forms of messages, as indicated by Isaacs (19). Although the public is still skeptical about online information, the growth of these conspiracy theories is notorious. A research by Johnson et al. (20) showed that the anti-vaccine expression in a social network (Facebook) is upward, challenging, and has a higher growth rate when compared to the groups in which pro-vaccination is discussed. Anti-vaccination groups tend to create conspiracy theories and plots that are easily understood by the undecided, captivating this portion of the population. This was observed in 2019 during the measles outbreak and may indicate a possible problem when COVID-19 vaccines become available.

During a pandemic, the population is expected to be more receptive to vaccines, but this was not what was observed by Megget (21). In a survey in New York with a total of 1,000 participants regarding whether they would receive a vaccine, only 59% were positive and only 53% would vaccinate their children. The anti-vaccination community is expected to observe everything that goes wrong in the development of COVID-19 vaccine and will gain strength. As mentioned, "COVID-19 will disappear before the anti-vaccination movement." Still, people need to be aware that vaccination is not just a matter of individual rights, but a community health strategy.

As demonstrated by Jolley and Douglas (22), there is a theory that pharmaceutical companies and governments are covering up information about vaccines to achieve their own goals, which it is not true. According to the most popular theories, pharmaceutical companies make such huge profits from vaccines that they bribe researchers to falsify their data, cover up evidence of harmful side effects of vaccines, and increase the effectiveness of vaccines.

Vaccination offers many economic and health benefits to society, and communication is essential to guarantee people's confidence in vaccines. Vaccination rates fell below expectations in both developed and developing countries, according to the research presented by Hardt et al. (23). On one hand, health authorities need to develop vaccine implementation plans, on the other, industries need to be transparent about their development. Companies need to be as clear as possible when it comes to results to avoid the mistrust of the population. Gaining the trust of the population takes a lot of effort, but it can be achieved with transparency and collaboration.

According to Larson et al. (24), the confidence in vaccination is dynamic and contextual and depends on the perceptions of the population regarding the competence and motivation of the manufacturer and/or pharmaceutical industry, researchers, and health professionals. Trust in the vaccine is not only an individual phenomenon, but also a social and political one. For example, Nigeria was the scene of one of the most significant episodes of vaccination confidence crisis between 2003 and 2004, affecting the vaccination of poliomyelitis. This had an impact on an outbreak in Nigeria itself and on three continents, with a financial loss of approximately $500 million and social damage with more than 1000 confirmed cases. Other countries such as the United Kingdom, Greece, and Pakistan have also faced or will face vaccine hesitancy due to mistrust or politics.

These beliefs are already widespread in several countries. In the United States, about 3% of children were not vaccinated, and this number could jump to 20% depending on the community. In a UK study, parents who believed in anti-vaccine conspiracy theories were less likely to vaccinate a child (25). In Brazil, the movement has been gaining strength. As described by Mendonça et al., adolescents and young adults have little information about preventable diseases in the city of Teresina-PI; the study indicates that this fact arises mainly from the inadequate way that the subject is addressed (26). In another study, Barbieri et al. (27) showed that parents who vaccinated their children in the city of São Paulo felt that it was a parental duty to carry out vaccination.

While the scientific community works to create a vaccine against COVID-19, a small and noisy anti-vaccine group is mobilizing and working against it. Activists are spreading strange narratives: they falsely say that coronavirus vaccines will be used to implant microchips in people, and falsely claim that a woman who participated in a UK vaccine test died. In April, some displayed posters with anti-vaccine slogans at rallies in California. Last week, a now deleted YouTube video promoting wild conspiracy theories about the pandemic and claiming (without evidence) that vaccines would "kill millions" received over 8 million views as it was reported in Nature (28).

In a study by Brown et al. (7), coverage of measles, mumps, and rubella vaccine in Brazil has been falling steadily since 2013, causing concerns about the formation of pockets of non-immunized people. A persistent factor in vaccination reluctance is distrust of the product (including information about the vaccine), the provider, the policy maker, and the surrounding policy. This distrust (not accepting vaccination) has negative impacts on public health and results to significant costs, as seen in the case of the Global Polio Eradication Initiative. In addition to mistrust, it was also noted that the child's discomfort during vaccination could hold back parents. Data from one study showed that out of 1000 participants with children, 6 were completely opposed to vaccination, and issues of trust was the major reason for hesitation. In this study, young adults under 25, single parents, low family income, and lower level of education were least likely to be vaccinated.

For Badur et al. (29), regaining confidence in vaccination is essential. Vaccination is one of the greatest success stories of medicine and is effective in reducing the prevalence and reducing the mortality in the population. Communication planning should not be limited to crisis management, but should be continuous, proactively providing messages directed directly to the most crucial public concerns while considering social and cultural characteristics as well as the influences of geographic location. Only in this way is it possible to restore the uncertainty caused by the anti-vaccination movement, and that the COVID-19 vaccine will succeed when

available (29). Therefore, as proposed by Harrison et al. (30), it is essential that the study of the COVID-19 vaccine has good results and is only put into practice if effective and safe; as the opposite movement may gain strength with the least number of mistakes and result to a catastrophe.

4. FINAL CONSIDERATIONS

It is well known that the advance of anti-vaccine thinking leads to an increased risk of resurgence of previously eradicated diseases. There are conspiracy theories around the world from developed to developing countries. In Brazil, this chain was responsible for disseminating false information, and a significant drop in the country's vaccination coverage was observed. The main factors that lead the population not to believe in vaccines were the real interests of industry and politicians, lack of confidence in research, and the amount of false information that circulates massively on social networks. In Brazil, young people and single parents with lower income and educational status are least likely to vaccinate. These factors are important if a possible vaccine for COVID-19 is developed. It is certain that the virus will circulate for a long time in the most affected countries and only effective vaccination coverage will be able to reduce it, reducing the damage caused by the virus' permanence. It is possible that Brazil will have difficulties in achieving vaccination coverage and community immunity if anti-vaccine thinking continues to be disseminated and Brazilians hesitate to vaccinate.

Notes

Funding

Conflicts of interest disclosure

The authors declare no competing interests relevant to the content of this study.

Authors' contributions.

All the authors declare to have made substantial contributions to the conception, or design, or

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acquisition, or analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content; and to approve the version to be published.

Availability of data and responsibility for the results

All the authors declare to have had full access to the available data and they assume full responsibility for the integrity of these results.

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