



## **Modern Economic Realities, Coronavirus, Vaccination: Interrelation and Challenges to the Future**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/JPRI/2021/v33i54A33755

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Complete Peer review History, details of the editor(s), Reviewers and additional Reviewers are available here:

<https://www.sdiarticle5.com/review-history/77336>

**Original Research Article**

**Received 02 October 2021**

**Accepted 07 December 2021**

**Published 11 December 2021**

### **ABSTRACT**

The purpose of the work is to consider the relationship between the current economic situation and the pace of development of coronavirus infection, which has had a direct impact on various spheres of society. Doctors around the world are calling on citizens to be vaccinated, because only the formation of the so-called global immunity will allow to resist the further development of the pandemic.

The situation with the wave-like development of morbidity, which causes the announcement of more and more restrictive measures and, as a result, a decrease in the economic activity of the population, also testifies in favor of universal vaccination. The prospects for future economic development at such rates of infecting the population in various countries are rather vague, so the promotion of vaccination is gaining momentum. However, the choice of a particular vaccine often becomes a difficult issue for most citizens, since all vaccines were developed in a fairly short time, their adaptation took place at an ultra-high pace, and many citizens question the side effects of vaccines.

It seems to us that the problem can be solved by the common "elimination of illiteracy" in the field of vaccination against coronavirus and formation of a collective understanding of the need to join the vaccinated on the basis of explanatory work among potential patients of vaccination offices, based on scientific facts and submitted in a popular scientific form.

*Keywords: Coronavirus; vaccination; modern economic realities; collective immunity.*

## 1. INTRODUCTION

In the second half of 2019, the world received news that the coronavirus had caused thousands of deaths, that its origin was unknown, and that new behaviors should arise due to the global pandemic. Its official name was "Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)", but commonly known as "Coronavirus" or "COVID-19". After this news, a race began in the scientific world, especially in the field of health sciences, to develop effective treatments and vaccines to combat it. The new patterns of behavior imposed by governments consisted in social isolation, and in some cases in self-isolation [1].

These measures led to a global economic crisis, when the government needed additional financial resources to combat pandemics. However, the social isolation of the population leads to the bankruptcy of several companies. Consequently, several million jobs disappear, which reduces the collection of state taxes. As a result, there has been disagreement among government officials, researchers and the general population about how best to deal with this tragic and deplorable situation.

On the one hand, advocates of a tougher course of action, such as global isolation, arguing that life is priceless and economic indicators are secondary. On the other hand, there is an opinion that such rigid isolation cannot be practiced, since it contributes to unemployment and poverty, and that hunger also kills. Supporters of the second position believe that universal isolation is preached by those who have insured wages, and that the government should be wise enough not to impose restrictions on freedom. Finally, they also mention that

restrictive actions on transport that prevent people from going to work may actually hide less noble political interests. In the midst of all this, the population is confused and scared.

The daily academic debate about the coronavirus revolves around two aspects. The first one concerns advances in treatment and the discovery of a vaccine. The second one relates to the economic aspect, the second wave, which causes countries' concern about the impact of the virus on the economy. Therefore, the purpose of this work is formulated as follows: to consider the relationship between the current economic situation and the pace of development of coronavirus infection, which has had a direct impact on various spheres of society.

## 2. MATERIALS AND METHODS

In the process of writing this study, a voluminous array of literature on the problem under consideration was analyzed, and analytical and comparative methods were also applied. The studied sources showed the following: T. Acter et al. touched upon the problem of the development of coronavirus infection and highlighted the ways to reduce its spread. M.S. Crocco et al. investigated the features of modern technologies in the fight against the studied disease. Other authors (R.M. Elavarasan et al., M. Javaid et al, M. Nicola et al, B. Long et al) considered the peculiarities of the social consequences of the spread of coronavirus infection and the peculiarities of the response of various segments of the population to vaccination. In general, an analysis of the literature has shown that, despite the significant number of opponents of vaccination, the benefits of the vaccine are quite high, for this reason, the future of the fight against coronavirus is primarily associated with the formation of collective immunity.

### 3. RESULTS

In the context of the global pandemic caused by coronavirus, one can see, how the world meets the productivity of supercomputers, as they help humanity find a quick solution to possible combinations of drugs that are more effective in combating coronavirus. The greatness of this feature is undeniable, but have you ever thought about how many highly educated scientists are being replaced by these supercomputers and their algorithms? Do we understand that more and more we trust our lives and destiny to machines? What will happen when all or almost all of us are replaced by machines?

Research on autonomous transport systems has been presented to the public for several years. The technologies associated with this are becoming more consolidated, which makes it possible to implement it. The debate in most countries has focused on concerns about the need for new legislation on this topic, since the algorithms of these computers on wheels will need to be programmed to make difficult decisions in some situations [2]. As millions of drivers around the world will lose their jobs, people have started to think about the importance of transport applications created by autonomous vehicles. At the peak of this crisis, it was very difficult to move around the cities. In addition, in a model of transport services consisting of autonomous vehicles, passengers will not be at risk of infection by drivers.

The social isolation caused by the coronavirus contributes to the approval of laws regulating the movement of autonomous vehicles. This, in turn, will lead to increased social isolation. After the introduction of autonomous vehicles, millions of parents will not take their children to and from school. In addition, there will be no need for friends and couples whose relationships have been strengthened by sharing cars, as well as women from different countries around the world who have improved their quality of life by working as drivers [3]. Some note, in addition to holders of license rights to these technologies, such advantages as the ability to drink without fear that they will be stopped by the police. However, there is another problem in the imbalance of this new order: important social and moral barriers to control alcohol consumption will be lost in a society where loneliness, unemployment and income concentration tend to increase.

Another change concerns distance learning (DL), which has grown in recent years, as well as trust

in it. This form of learning and knowledge exchange reduces costs and optimizes the transport logistics of students, but, on the other hand, it is associated with social distance and the use of computing resources.

Another problem is ensuring confidentiality, as the fourth industrial revolution turns every company into a technological one. The food, retail and banking industries are moving to digital technologies and collecting huge amounts of personal data about their customers. The fact that companies store large amounts of data worries consumers when it comes to personal privacy.

The concern increases when we face all this movement related to the vast lobby of large companies in favor of 5G technology. Such technology should increase the data transmission capacity, which, combined with logical operation, the Internet of Things (IoT) interface, big data and the cloud, causes even more concern on this topic. However, the singularity can be achieved immediately with the development of the quantum Internet and quantum computing. This, combined with a new pattern of social normality, can coexist with the Internet of Thoughts. This is provided when initiatives like the Neuralink initiative can be put into practice on a global scale [4].

Several countries have social protection systems, and the percentage of their GDP, intended for this purpose, varies. Some countries use only financial resources, others distribute food, offer scholarships, help pay rent, among other local options, however, there is a tendency for most governments to provide this type of assistance to alleviate the conditions of poverty of their population, and therefore living in poverty is characteristic of living with state aid.

It happens that governments need to collect taxes to pay for their social protection systems, and for this they depend on the consumer market with minimal activity, however, if the fourth industrial revolution occurs, most jobs will be eliminated. Two problems may worsen: governments will be left without sufficient tax collection to be able to maintain social protection systems, simultaneously with an increase in requests for assistance, an increase in poverty and a concentration of global income.

Today, social credit models similar to those adopted in China have been adopted, as well as

for managing people's behavior, the main arguments in favor of such a policy are usually related to maintaining order in large urban centers, and this is done with the help of computers, facial recognition cameras and software. Related algorithms also monitor users' computers and cell phones and establish a pattern of usage and behavior related to social punctuality.

The attention should be paid to the evidence that the interests of the fourth industrial revolution are present in the existing lobby around renewable energy sources. Assessing three aspects of sustainability: environmental, economic and social, we compare the introduction of biodestructors with photovoltaic plates or wind turbines with photovoltaic plates for energy production. Photovoltaic panels are easier to produce using machines, and even a generating plant can be installed almost entirely by them with very little human involvement, which cannot be said about wind turbines or bioreactors, and, coincidentally, the same appeals are not considered in their protection [5].

A similar situation is happening with an electric car, which is easier to make autonomous and coincidentally has a strong lobby, since hybrid cars are the best engineering solutions that meet the three dimensions of sustainability, and yet there is no equivalent appeal for hybrid cars. A lobby that promotes unemployment among people and income concentration.

Accordingly, all of the above mentioned is a significant threat to the existing world order if people do not take all the necessary measures and do not make this process controllable. For this reason, vaccination should be given a special place in everyone's life.

#### 4. DISCUSSION

More than 300 different candidate vaccines against coronavirus 2019 (COVID-19) are at different stages of development. More than twenty vaccines are currently used in clinical practice.

In the corresponding registration randomized clinical trials (RCTs), it was shown that these vaccines have a different range of efficacy using similar, but not identical endpoints [6]. Individual RCTs had significantly different test protocols, endpoint definitions, triggers for RT-PCR testing, procedures for establishing and duration of

observation. Moreover, the conditions of various RCTs differed greatly in terms of the risk of infection with severe acute respiratory syndrome caused by coronavirus 2 (SARS-CoV-2), and the dynamics of transmission, circulating SARS-CoV-2 variants of concern and compliance with non-drug control interventions.

COVID-19 vaccines are often compared based on the results of their effectiveness. However, without careful consideration and textualization, such direct comparisons can be misleading. Randomization can provide comparability of groups within individual trials, but does not allow comparisons between trials.

The possible disparity in the results of the COVID-19 vaccine trials was not unexpected. In its COVID-19 vaccine development project, the World Health Organization recommended an adaptive trial design in which multiple candidates are evaluated in parallel compared to a single placebo and in accordance with a common protocol. It is important to note that strict regulatory oversight and transparent trial reporting are key elements for an informed assessment of the benefits and risks associated with COVID-19 vaccines. Unfortunately, such elements were not always noticed [7].

Usually randomized controlled trials of vaccines are conducted under ideal conditions to ensure reliable evaluation and support official marketing authorization. The effectiveness of the vaccine represents the relative risk reduction achieved in vaccinated and unvaccinated populations under randomized controlled clinical trial conditions. Once introduced into the wider population, the effectiveness of the vaccine describes the relative risk reduction associated with the vaccine in real conditions.

The effectiveness of a vaccine does not necessarily predict its effectiveness in specific conditions. For example, the vaccine efficacy achieved with BNT162b2 (Pfizer-Biotech) or ChAdOx1 (AstraZ.-Oxford) vaccines in national deployments matched or exceeded the efficacy reported in their respective randomized trials [8].

On the other hand, BBIBP-CORV (Beijing Institute-Sinopharm) and WIBP-CorV (Wuhan Institute-Sinopharm) were associated with an efficiency of 64% to 78.1% in their phase III RCTs, but their effectiveness in real conditions seems to be low.

The ultimate goal of COVID-19 vaccines is to mitigate severe health consequences, including death, and to reduce the impact of COVID-19 on health services. However, it is impossible to conduct adequate randomized controlled clinical trials to assess the severe form of COVID-19, especially among younger age groups and individuals without concomitant medical comorbidities. In addition, the interpretation of the effect of the vaccine on the severity of the disease may be difficult due to differences in risk reduction methods among high-risk groups, as well as different access to high-quality medical care and therapeutic agents that can reduce the risk of disease progression (for example, monoclonal drugs) or mortality (for example, systemic corticosteroids, tocilizumab), as well as locally circulating variants of SARS-CoV-2 [9].

Although severe outcomes of COVID-19 are often assessed in the randomized controlled clinical trials as secondary, comparisons of different vaccines remain subject to the same disparity between trials mentioned above. On the other hand, useful differential clinical efficacy can be observed in some real-world vaccine efficacy studies. However, the non-randomized nature of these studies may limit their internal validity [10].

Another important goal of COVID-19 vaccines is to prevent or reduce asymptomatic infections and transmission of SARS-CoV-2. If such benefits are demonstrated, mass vaccination against COVID-19 can facilitate the removal of various restrictions related to COVID-19 and accelerate economic recovery. However, in order to record such results, COVID-19 clinical trial protocols should include regular testing of test participants with the help of RT-PCR. In most published randomized controlled clinical trials of the COVID-19 vaccine, these estimates were either absent or limited to small subgroups. In the modern period, evidence that COVID-19 vaccine reduces asymptomatic SARS-CoV-2 infections has been obtained from the analysis of subgroups from registration trials of mRNA-1273 (Moderna) and ChAdOx1 (AstraZeneca-Oxford), as well as observational studies of nursing home residents and health care workers.

Evidence of reduced transmission due to COVID-19 vaccination is based on epidemiological studies. Although some of these observational studies have adjusted their analysis to account for potential distorting factors, an unmeasured systematic error cannot be ruled out. Reports of a decrease in asymptomatic SARS-CoV-2

infection and transmission of infection are certainly encouraging. However, they are not enough to prefer some COVID-19 vaccines to others.

In addition to the effectiveness of the vaccine, safety is an important factor. Careful post-marketing surveillance is necessary to identify rare adverse events that may not be detected in the registered randomized controlled trials. Postvaccine thrombosis with thrombocytopenia syndrome (TTS), characterized by acute arterial or venous thrombotic events with low platelet count and detectable antibodies to platelet factor-4-heparin, has been reported in combination with vaccines such as ChAdOx1 (AstraZeneca-Oxford) and Ad26.COVS.2 (Janssen). The estimated frequency of TTS is 1-10 and 1-7 per million in recipients of ChAdOx1 (AstraZeneca-Oxford) and Ad26.COVS.2 (Janssen), respectively [11].

After a thorough assessment of the risk-benefit ratio, the European Medicines Agency concluded that the risk of severe outcomes of COVID-19 exceeds the rare risk of TTS associated with ChAdOx1 (AstraZeneca-Oxford). Similarly, the U.S. Advisory Committee on Immunization Practices reported that the benefits of Ad26.COVS.2 (Janssen) outweigh the extremely small risk of TTS.

Neither the European Medicines Agency nor the US Advisory Committee on Immunization Practices consider ChAdOx1 (AstraZeneca-Oxford) or Ad26.COVS.2 (Janssen) contraindicated for any gender or age group. There have also been rare reports of myocarditis and pericarditis associated with BNT162b2 (Pfizer-BioNTech) and mRNA-1273 (Moderna). However, the association of myocarditis and pericarditis with COVID-19 vaccines has not been confirmed.

It is noteworthy that of all the COVID-19 vaccines currently in use, potentially serious side effects have been identified only in connection with COVID-19 vaccines, which are allowed in countries with reliable pharmacovigilance procedures and regulatory monitoring. Although the reporting of serious adverse events potentially related to COVID-19 vaccines was intended to assess, quantify and contextualize any potential adverse events related to vaccines, this has led to negative publicity and inconsistent public health messages. In turn, this contributed to a decrease in public recognition of some

brands of COVID-19 vaccines and an increase attention to others.

Perhaps unwittingly, some ended up preferring COVID-19 vaccines without publicly available post-marketing data on efficacy or safety to vaccines with exhaustive and carefully calibrated benefit and risk assessments. In order to make informed decisions about vaccination against COVID-19, policy makers, healthcare professionals and the general public need to understand what and how the effects of the vaccine are reported. After deployment, real efficiency and safety studies are required to assess the relative and absolute benefits and risks in the conditions of interest [12].

Regardless of how effective and safe the COVID-19 vaccine is, large-scale production and distribution is needed to meet global demand. Almost all existing COVID-19 vaccines have experienced periods of shortage and delayed delivery. In the case of the Sputnik-V vaccine, which consists of the first dose of adenovirus with 26 vectors and the second dose of adenovirus with 5 vectors, delays in the delivery of the second dose forced some national programs to cancel their orders or use alternative vaccines. as a second dose. It has been shown that the use of heterologous ChAdOx1 nCoV-19 and mRNA vaccines leads to a strong induction of S-specific antibodies SARS-CoV-2. However, there is no clinical data that has passed expert evaluation for heterologous vaccination against COVID-19.

## 5. CONCLUSION

Differentiation of available vaccines against COVID-19 requires not a direct comparison of data on the effectiveness of vaccines, but a thorough assessment of the available evidence as a whole. At the same time, the information conveyed to consumers should be clear, understandable and accessible to their perception. Otherwise, a significant number of myths and negative reviews are born, directly affecting the interest of citizens in vaccination. And if specialists are able to develop a program to inform citizens about the need for vaccination on the basis of explaining to them the mechanism of action of the vaccine, the correct behavior of vaccinated and first aid measures, self-help in case of adverse reactions, in our opinion, the number of people willing to voluntarily vaccinate will increase significantly, and the ranks of anti-vaccinators will noticeably thin.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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