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COVID-19 VACCINE ACCEPTANCE: BELIEFS AND BARRIERS ASSOCIATED WITH VACCINATION AMONG THE GENERAL POPULATION IN INDIA

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KEYWORDS

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Vaccine hesitancy

Public perception

ABSTRACT

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel zoonotic coronavirus that emerged from Wuhan, China. Development of SARS-CoV-2 specific vaccine is considered as the only solution that could control this pandemic. However, the success of COVID-19 vaccination programme will be dependent on the development of effective and safer vaccines and also on the public acceptance which in turn reliant on the beliefs and perception towards the vaccine. Therefore, this study was aimed to analyse the beliefs and barriers associated with COVID-19 vaccination among the general population in India. The study conducted using an online self-administered questionnaire that was distributed among the general population of India during the month of October 2020. The online questionnaire addressed several variables including the socio-demographic parameters, beliefs toward COVID-19 vaccine/vaccination, COVID-19 vaccine acceptance, potential barriers that may prevent from being vaccinated and factors that can improve COVID-19 vaccine acceptance. Among the 351 participants, 55% believed that the COVID-19 vaccination will be safe while only 46.2% believed that it will be effective. Majority of the participants (86.3%) were planning to get COVID-19 vaccination, whereas 13.7% admitted hesitancy. However, only 65.8% of the participants responded that they will receive vaccination as soon as possible whenever the vaccine is available. The study also identified that the

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concerns regarding the vaccine side effects acted as the key barrier for vaccine acceptance. The major findings of this study can be utilized in planning vaccination campaigns. Furthermore, the level of vaccine acceptance can be increased within the population if additional studies can confirm the safety and effectiveness of available vaccine candidates.

1 Introduction

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), is believed to have originated from the Huanan Seafood Wholesale Market, Wuhan, Hubei province, China which was declared as a pandemic by the World Health Organization (WHO) (Dhama et al., 2020a). Since its discovery, the SARS-CoV-2 has crossed boundaries of almost more than 200 countries across the globe, affecting tens of millions of people and killing more than one million (Cucinotta & Vanelli, 2020; Sharun et al., 2020a). The outbreak of SARS-CoV-2 has also caused huge negative impacts to the public health system as well as the economic status of many countries (Lucero-Prisno et al., 2020; Ogunkola et al., 2020). Currently we are following WHO guidelines in prevention, early diagnosis, and treatment as there is no specific antiviral medications for COVID-19 (Callaway, 2020; Wang et al., 2020). During the past several months, researchers have evaluated many repurposed drugs for treating COVID-19 both in terms of efficacy and safety (Frediansyah et al., 2020; Haritha et al., 2020; Sharun et al., 2020b). Among these therapeutic candidates, a few have exhibited potential to reduce mortality among the patients with COVID-19 (Sharun et al., 2020c). Nevertheless, it is clear that humans cannot go with social distancing and using of face masks for a long period. Hence, the only best strategy to prevent this ongoing pandemic is to develop COVID-19 vaccine which can provide clinical and socio-economic benefits (Sharun et al., 2020d).

Countries all over the world are constantly working for the rapid development of COVID-19 vaccines (Patel et al., 2020; Yattoo et al., 2020). A successful COVID-19 vaccine should pass potency, efficacy and safety testing stages while being free of any adverse reaction particularly in high-risk individual's viz., elderly, pregnant women, people with co-morbidities, healthcare workers and others. To date, it has been reported that there are about 47 candidate vaccines in clinical evaluation stage and 155 candidate vaccines in the preclinical evaluation stage (Lurie et al., 2020; WHO, 2020). However, the mass distribution of a safe and effective vaccine is expected to happen between the early 2021 to 2022 (Callaway, 2020). Although great effort is being put in to developing and deploying vaccines (Sharun et al., 2020e), the vaccine coverage rate among the population is also an important factor that decides successful immunization. Normally, vaccine development would take years and perhaps decades. Hence, the public acceptance for a new vaccine for the ongoing COVID-19 pandemic which is being developed with short period of testing remains uncertain. Thus, vaccine hesitancy may become an important challenge in the immunization against COVID-19 (Yaqub et al., 2014; Dubé & MacDonald, 2016).

Vaccine hesitancy is reported as one of the major threats to global health by WHO. High vaccine coverage is needed to flatten the epidemic curve (Padhi & Almohaithef, 2020). Vaccine hesitancy affects not only the individual who is hesitant to take the vaccine, but the whole community, making it difficult to reach the threshold to confer herd immunity (Adebisi et al., 2020). There are certain beliefs and barriers regarding vaccination among the general population. Vaccine coverage and its acceptance varies with respect to behaviour of the people, geography, and time (Padhi & Almohaithef, 2020). Furthermore, certain key factors such as severity of the disease, previous vaccination history, lack of belief in health care services, route of administration of vaccine, economic and educational status of the individuals, recommendations from doctors, and cost of vaccine also determines the acceptance of vaccines (Nguyen et al., 2011). The first and foremost public concern about the novel vaccines against new emerging pandemics is the safety and effectiveness of candidate vaccines as witnessed in 2009 H1N1 pandemic (Eastwood et al., 2010; Maurer et al., 2010). Reports suggest that the vaccine coverage rate for 2009 H1N1 pandemic have shown unsatisfying results and ranged from 17% to 67% across major countries (Seale et al., 2010; Rubin et al., 2010). The overall morbidity and mortality rate of COVID-19 is high due to its pandemic spread and therefore several countries have initiated research and development of vaccine candidates against this novel disease. However, understanding the common barriers and facilitators for vaccine acceptance helps in improving vaccine coverage rate among the general population (Dubé & MacDonald, 2016; Leung et al., 2020; Kraemer et al., 2020).

In this study, we analyse the variables including the socio-demographic variables, economic variables, beliefs and barriers that prevent participants from being vaccinated based on the online self-administered questionnaire that was distributed among the general population in India.

2 Materials and Methods

2.1 Study design

The cross-sectional study was conducted using a validated, self-administered electronic questionnaire that was distributed through emails (Gmail and Rediffmail) and online social networking platforms such as WhatsApp, LinkedIn, Telegram, ResearchGate, and Facebook during the month of October 2020. The participants of the study were informed about the objective of the study.

2.2 Questionnaire

The outline of the questionnaire was adapted from the previous study conducted by Magadmi & Kamel (2020) with some modifications. The correctness of the questionnaire was validated using a pilot survey. The questionnaire consisted of five major sections that collect data on socio-demographic parameters, beliefs toward COVID-19 vaccine/vaccination, COVID-19 vaccine acceptance, potential barriers that may prevent from being vaccinated, and factors that can improve COVID-19 vaccine acceptance. The questionnaire was prepared in English language. The validated, self-administered electronic questionnaire was uploaded to online survey administration software, Google Forms.

2.3 Statistical analysis

The data was analysed using the Statistical Package for Social Sciences (SPSS) software package for Windows (version 16) (IBM Corporation, New York, USA). The socio-demographic data collected from the participants were presented using descriptive statistics including frequencies and percentage (%).

3 Results

3.1 Socio-demographic characteristics

A total of 351 individuals completed the self-administered electronic questionnaire that was distributed through online social networking platforms during the one-month period (October 1 - October 31). More than half of the participants (73.5%) belonged to the age group that extended between 18-29 years, while individuals of age >60 years constituted only 4.3% of the study population (Figure 1). In addition to that, majority of the study populations were males 58.1%.

Among the study population, 53% were students and 14.8% unemployed while the other participants were engaged in private jobs (22.5%) and government service (9.7%) (Figure 2). More than half of the participants (62.7%) were having a university degree. Other participants were having varying levels of education; primary (1-8th class)(4.3%), secondary (9-12th class) (9.7%), and higher education (23.4%). The majority of the individuals participated in the online survey was from Southern India (61.3%), while the remaining participants originated from Northern (22.5%), Eastern (5.7%), Western (5.7%), and central (4.8%) India (Figure 3).

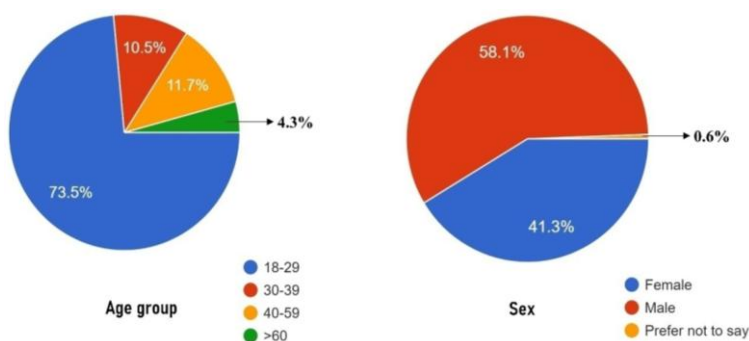


Figure 1 Pie diagram showing the age and sex distribution among the participants of online questionnaire

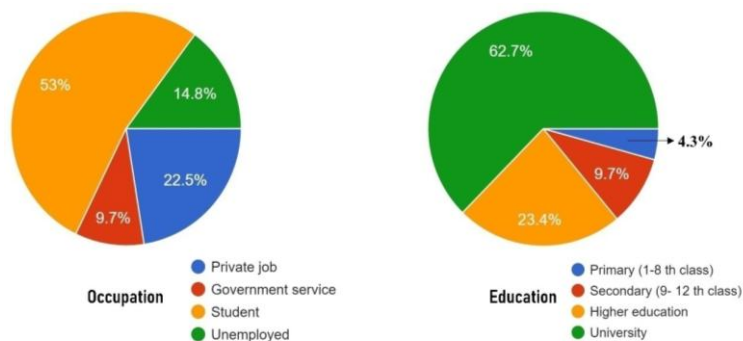


Figure 2 Pie diagram showing the status of occupation and education among the participants of online questionnaire.

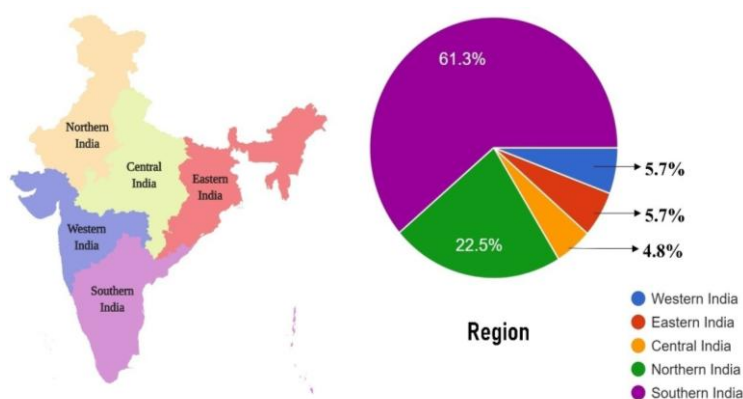


Figure 3 Pie diagram showing the geographical origin and distribution among the participants of online questionnaire

3.2 toward COVID-19 vaccination

We have also studied the existing beliefs regarding COVID-19 vaccines and vaccination among the participants. Among the study population, 55% believed that the COVID-19 vaccination will be safe while only 46.2% believed that it will be effective (Figure 4). In addition to that, participants also expressed uncertainty regarding the safety (38.5%) and effectiveness (45%) of COVID-19 vaccination whenever available. However, the majority agreed (68.1%) to the fact that vaccination is the best way to avoid the complications of COVID-19 (Figure 4). In summary, almost half of the participants showed positive beliefs (safety and effectiveness) toward COVID-19 vaccination.

3.3 COVID-19 vaccine acceptance

Among the study population, 86.3% were planning to get COVID-19 vaccination whenever it is available while the remaining participants (13.7%) were not intending to get vaccinated (Figure 5). However, only 65.8% of the participants responded that they will receive vaccination as soon as possible whenever the vaccine is available. The majority of the participants (60.4%) responded that they do not care about the origin of COVID-19 vaccine (Indian-made vaccine or imported vaccine). However, 32.2% of the participants preferred Indian-made vaccines while the remaining (7.4%) preferred imported vaccines (Figure 5). In summary, more than three fourths of the respondents were planning to get vaccinated whenever it is available however only two third of the respondents were planning to get it as soon as the vaccine is available.

3.4 Barriers associated with COVID-19 vaccination

The barriers associated with acceptance of COVID-19 vaccination were studied using a single question having multiple responses. Since the participants can choose more than one answer, the cumulative percentages exceeded beyond 100%. Among the study population, majority (64.4%) were concerned about COVID-19 vaccine side effects (Figure 6). However, 20.2% of the respondents lacked confidence in the effectiveness of vaccination while 12% supported that COVID-19 vaccine is a conspiracy, whereas a large proportion (25.4%) of the individuals believed in other reasons that may prevent them from getting vaccinated.

3.5 Factors that can improve COVID-19 vaccine acceptance

The factors that can encourage the participants to take COVID-19 vaccination were studied using a single question having multiple responses. Since the participants could choose more than one answer, the cumulative percentages exceeded beyond 100%. Among the study population, majority (72.9%) responded that they will agree to get vaccinated if the safety and effectiveness of COVID-19 vaccines are confirmed using further studies (Figure 7).

A total of 35.3% of the participants responded that they will agree to vaccination if it is recommended by their physician. However, 35.3% of the respondents agree to vaccination if made compulsory by the Government of India (GOI) but only 15.4% if made compulsory by company/institute. In addition to that, a major part (21.1%) of the respondents agreed to get vaccinated if the vaccine is provided free of cost while 8.3% responded that they would not take vaccine in any case.

4 Discussion

Vaccination is one of the game-changing health sector intervention in the 21st century. Despite the benefits of vaccination, this fundamental health protecting tool is facing many obstacles globally. Many factors like geography, time, social class, contextual human behaviour, and ethnicity are affecting the acceptance of vaccination among the population (Larson et al., 2014; Larson et al., 2018; Cooper et al., 2019; Xiao & Wong, 2020; Habersaat & Jackson, 2020;). It has been reported that public perception of the benefits and relative risks of vaccination is a major obstacle for vaccine acceptance (Harmsen et al., 2013).

At present, the number of studies regarding COVID-19 vaccine acceptance are limited, although several studies are being conducted all around the world. Our results indicate that vaccine acceptance is 86.3%, which is in accordance with the results obtained from the studies conducted in USA and People's Republic of China. The study conducted in USA reported that 80% among general population accepted to get vaccinated (Thunstrom et al., 2020). Another study conducted in China stated that 72.5% the population accepted to get vaccinated (Fu et al., 2020). Our report indicates that vaccine acceptance (86.3%) among the participants was higher as compared to some another studies like studies of South Africa (64%), Russia (54%), France (59%), Poland (56%), and Hungary (56%) (IPSOS, 2020). The results of this study also paralleled to the finding of IPSOS survey, where they found a vaccine acceptance rate of 87% among the Indian population (IPSOS, 2020).

Regarding willingness to take vaccine as soon as it is available, the data showed a same trend as other countries except China. Our study found that around 34% of the study population are reluctant to accept the vaccine as soon as it is available. In IPSOS survey it is shown that 12% Brazilians, 12% Aussies, 15% Malaysians, 15% English (Great Britain), 16% Saudi Arabians, 16% South Koreans, 24% Canadians were also not shown an interest to accept vaccine as soon as it available (IPSOS, 2020).

Regarding the strategies for encouraging vaccine acceptance, we found that more people are concerned about the safety and efficacy of vaccine. Based on the overall response, if more studies are conducted to evaluate the effectiveness and safety of vaccines,

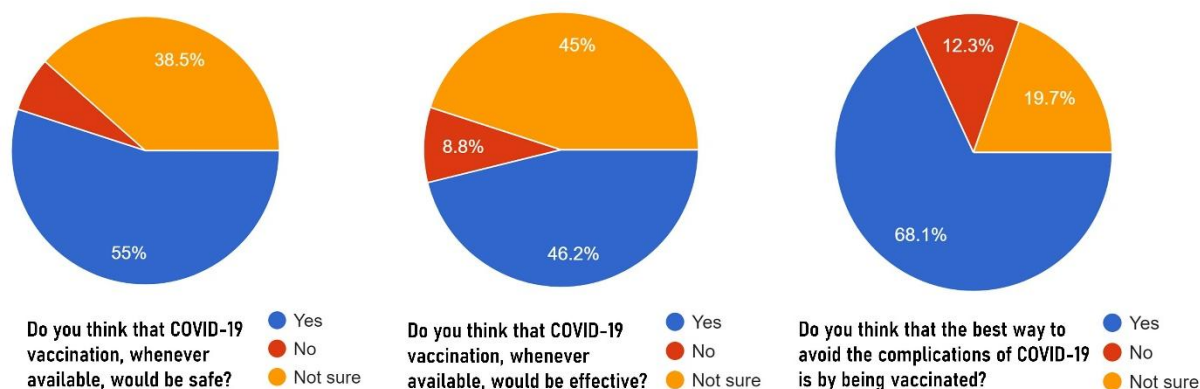


Figure 4 Pie diagram showing the response of participants regarding their beliefs (safety and effectiveness) toward COVID-19 vaccination.

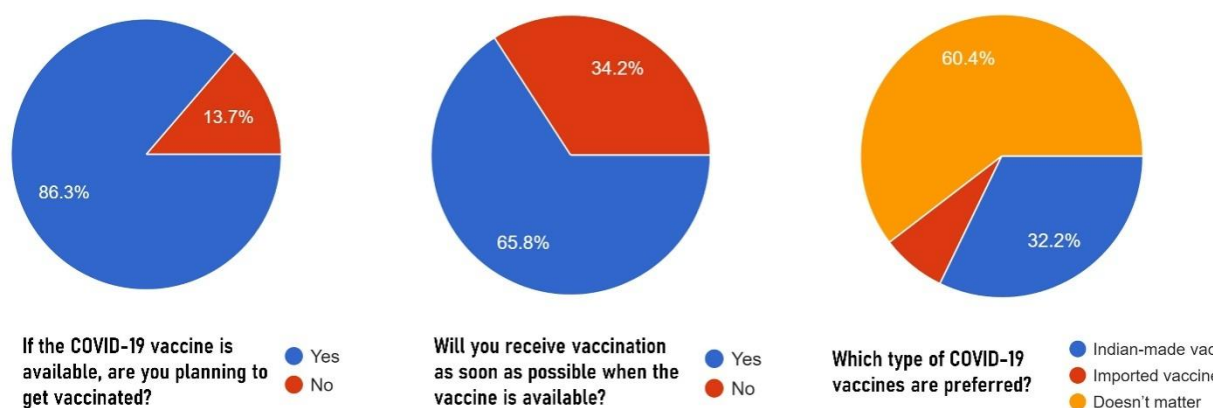


Figure 5 Pie diagram showing the response of participants regarding the acceptance of COVID-19 vaccine.

Barriers that may prevent me from taking the COVID-19 vaccine

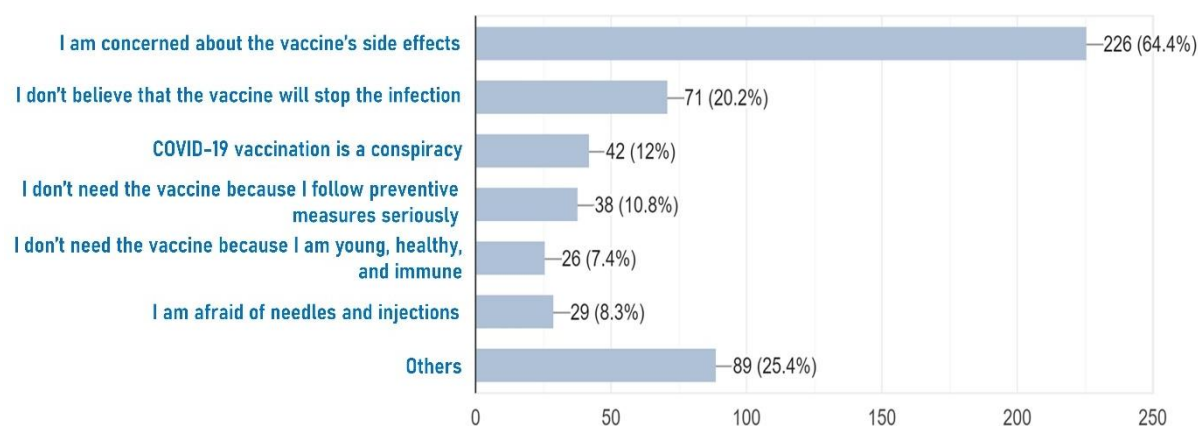


Figure 6 The response of participants regarding the barriers associated with COVID-19 vaccination. The cumulative percentages exceeded beyond 100% since the participants can choose more than one answer

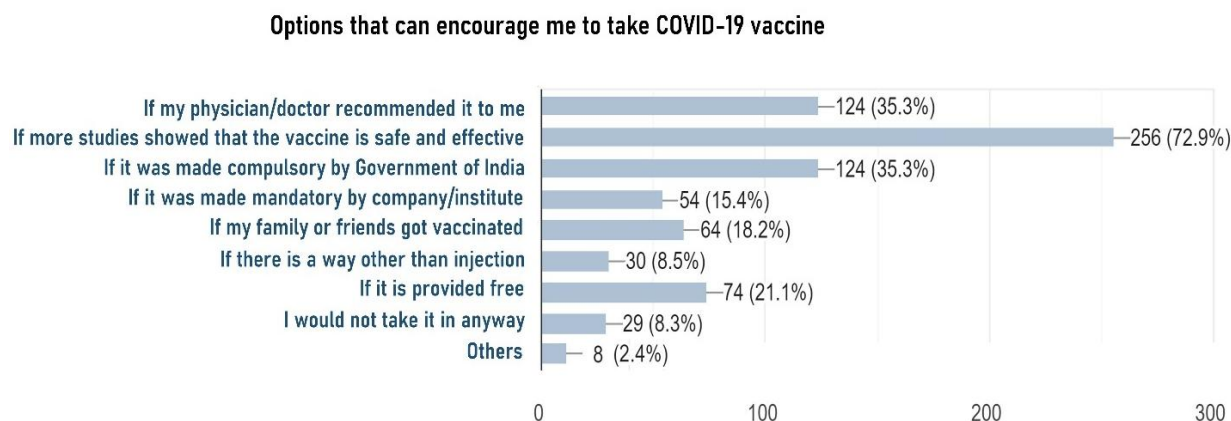


Figure 7: The response of participants regarding the factors that can encourage them to take COVID-19 vaccination. The cumulative percentages exceeded beyond 100% since the participants can choose more than one answer.

more people will accept vaccine. Among the study population, 21% people will prefer to get vaccinated if the vaccine is given free by the Government. This finding was different from the observation of Harapan et al. (2020) those who reported that 65% people from Indonesia will prefer a vaccine with 50% efficiency if it is provided free of cost (Harapan et al., 2020).

The current study was conducted using an online self-administered questionnaire and therefore has certain limitations. Several factors such as availability of the internet and access to social media platforms might have direct impact on the survey population. As a result, reporting bias has to be taken into consideration. Furthermore, disparities were also observed with regard to the response rate across different regions within the country. The highest response rate was reported from the Southern India. Our study has got several limitations. Firstly, the study population was majorly (around 85%) concentrated among highly educated population, and more than three fourth of the respondents belonged to the age category that spanned from 19-29 years. A significant proportion of 'Not sure' response towards the beliefs of vaccine can be due to the rumours associated with vaccination among the population. Another limitation of study was that responses were recorded electronically by using sophisticated methods which are not popular among senior citizens.

Although SARS-CoV-2 and SARS-CoV use the same cellular receptor, angiotensin-converting enzyme 2 (ACE2), the genomic similarity between these viruses were only 80.6-81.1% (Sharun et al., 2020f). The entry of SARS-CoV-2 into the host cell depends on the binding of viral spike glycoprotein or S protein to the cellular receptor, ACE2 (Dhama et al., 2020a). The major vaccine candidates of SARS-CoV-2 targets the S protein as it is the major inducer of neutralizing antibodies (Dhama et al., 2020b; Yattoo et al., 2020). Several vaccine candidates have already entered clinical trials while a few of them are near to completion (Patel et al.,

2020; Yattoo et al., 2020). A few of these major candidate vaccines that are currently under clinical trials and their platforms are illustrated in Figure 8.

Conclusion

The major findings of this study can be utilized in planning vaccination campaigns. The study identified concerns among the responders regarding the potential efficacy and safety of COVID-19 vaccines thereby providing an important perspective for possible interventional educational programs to enhance vaccination rates. The study also identified that the concerns regarding the vaccine side effects acted as the key barrier for vaccine acceptance. The rapid development of COVID-19 vaccine might have contributed to the emergence of concerns among the general population. These concerns have the potential to hamper the achievements of the scientific community by blocking the attempts to disseminate the vaccine. Furthermore, the level of vaccine acceptance can be increased within the population if additional studies can confirm the safety and effectiveness of available vaccine candidates. However, more studies are required preferably in a larger population to get an insight on the acceptance, willingness to pay for vaccine, public behaviour and perceptions on the upcoming COVID-19 vaccines. This will help the decision makers to formulate efficient strategies that can help to implement the COVID-19 vaccination programme successfully in India.

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Major Vaccine Candidates for COVID-19

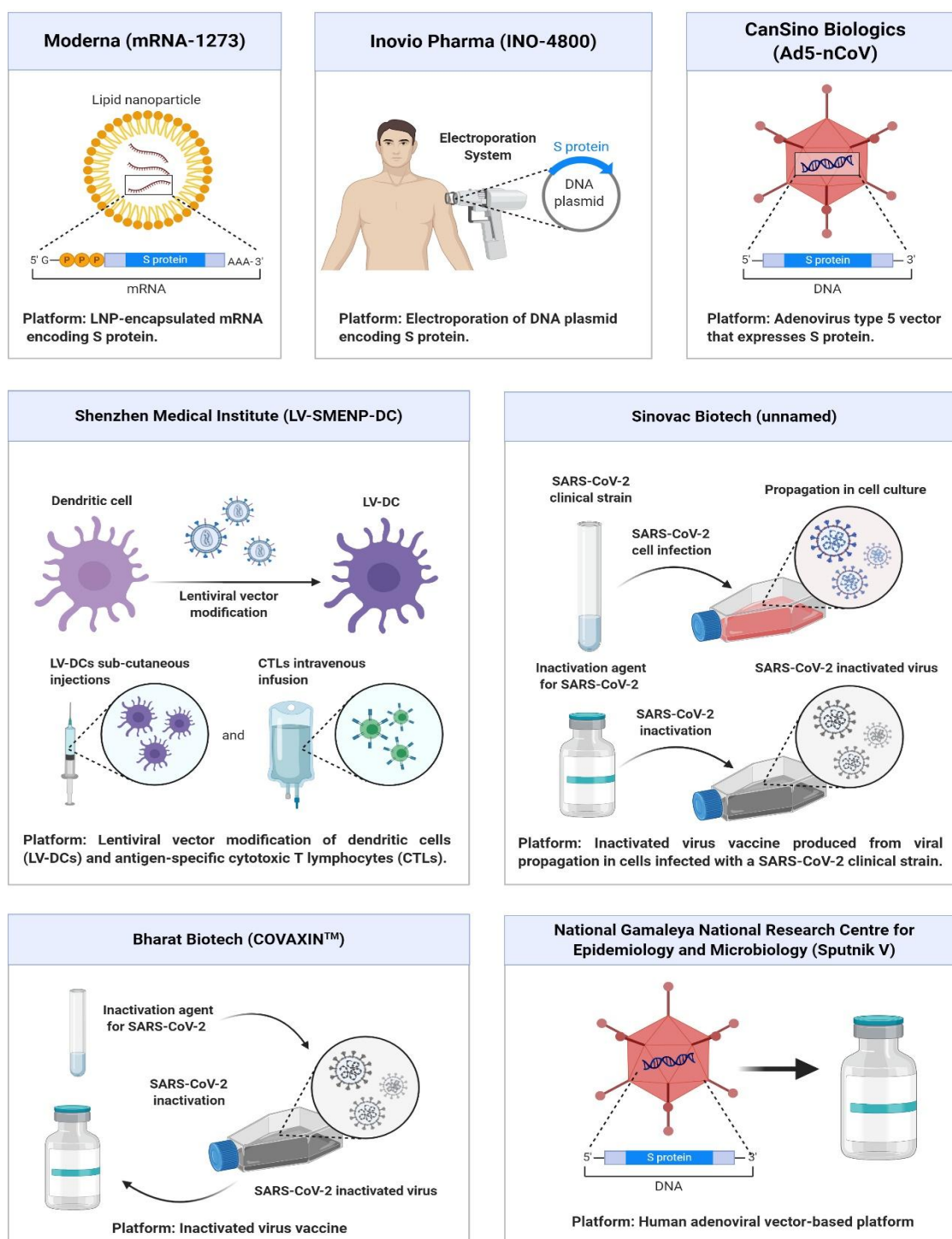


Figure 8 Few of the major vaccine candidates that are currently under clinical trials around the world. Adapted from “Clinical Phase Vaccine Candidates for COVID-19”, by BioRender.com (2020). Retrieved from <https://app.biorender.com/biorender-templates/figures/5e99f5395fd61e0028682c01/t-5ea83be2d3420200adea0b6a-clinical-phase-vaccine-candidates-for-covid-19>

Disclosure statement

All authors declare that there exist no commercial or financial relationships that could, in any way, lead to a potential conflict of interest.

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