

Review Article

A Narrative Review of the Strategy for COVID-19 Vaccination

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Abstract

Background: COVID-19 vaccination is a health intervention to halt the escalation of the pandemic. Several countries have succeeded in rolling out vaccination policy for the population. **Objective:** This paper aims to provide strategies for implementing COVID-19 vaccination. **Methods:** A narrative review was proposed to gather published papers about strategies for vaccination rollout from the PubMed search engine using the Boolean method. All types of paper, including experiment, cohort study, mathematical model, and other observational studies, were included in the analysis. Comments, perspectives, letters to the editor, and opinions were included as long as they provided accurate descriptions of the implementation of COVID-19 vaccination. The papers were extracted, synthesised, and analysed, and 461 were found eligible. After extraction, the synthesis found 24 eligible papers for further analysis. **Results:** From the analysis of these papers, several categories were found and classified as the role of local and regional governments, partnership, inter-governmental networking, role of public figures, role of pharmacists, role of religious leaders, developing vaccine manufacture, developing digital infrastructure, developing vaccine centres, public preferences, priority groups, free of charge, strengthening family physician, communication, and reward and punishment. Hence, the four major components of vaccination strategy are system, networking, stakeholders, and infrastructure. **Conclusion:** The COVID-19 pandemic requires a comprehensive system to terminate the spread of infection by vaccination. However, a successful vaccination program needs a strategy consisting of a system, networking, stakeholders, and infrastructure.

Keywords: COVID-19 pandemic, vaccination, strategy implementation

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Introduction

The current coronavirus disease-19 (COVID-19) is the seventh member of the reported human coronaviruses triggered by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Compared to previously identified respiratory corona viruses such as Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2003 and 2012, respectively.^{1,2} The current COVID-19 produces a

further extreme pandemic due to its rapid spread and the population affected. Although countries around the world have taken various mitigation efforts since the first instance of new coronavirus infections was discovered in December 2019 in Wuhan, China, countries are still fighting the waves of COVID-19 infections, which have been devastating. By the end of 2021, over 300 million cases and over 5 million deaths because of COVID-19 were recorded. Yet, understanding and forecasting the wave pattern of COVID-19

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remains difficult. Although many trials and efforts were undertaken to control this pandemic, including social distancing, stay-at-home orders, and lockdown measures, COVID-19 vaccination is still the most effective way to bring the pandemic under control.³

Vaccination is the primary tool and considered an essential public health measure to reduce infectious disease burden in populations where most people are vaccinated. The COVID-19 vaccines are supposed to offer similar health benefits worldwide. The World Health Organization (WHO) has identified 333 vaccine candidates, 139 of which are currently in the clinical development stage. Among those diverse vaccine platforms, many techniques have been used and developed, including traditional live attenuated and inactivated pathogens as well as modern alternatives using viral vectors, mRNA, DNA, single proteins, and virus-like particles as carriers.^{4,5} To reduce the impact of COVID-19 on daily life, some analysis results suggest that around 80-90 per cent of the population should acquire SARS-CoV-2 protection through either vaccination or prior infection.⁶ Furthermore, the vaccination coverage around the world is expected to reach 60% by January 2022. Therefore, regulations will be required to achieve 90 per cent vaccination coverage in the population.

Several countries run to reach herd immunity by vaccination with various strategies. India, for example, has a policy to vaccinate 300 million people by the end of August 2021. The government has launched some indigenous vaccines, such as COVAXIN and COVISHIELD, to support the program. In addition, vaccination policy and networking have undergone modification and amendment since the earlier vaccination policy.⁷ Currently, 49.4% or 581 million of the population of India have been fully vaccinated, the second highest vaccination rate in the world.⁸

Another country is China. Since the beginning of the pandemic, China has positioned five home vaccines in a completely full clinical trial to support the policy. The government inoculated 100 million doses to 200 million doses in 25 days, and this was continued by 200 million doses to more than 300 million doses in 16 days. It took 9 days for 300 million doses to 400 million doses and 5 days for 600 million doses to 700 million doses. Hence, the total population fully vaccinated was more than 900 million, while the first inoculation reached over 1 billion people or approximately 77.6% of the total population as reported in September 2021.⁹ The current situation in China shows that 1.22 billion people have been fully vaccinated and 2.96 doses have been distributed across the country.⁸ In addition to the two aforementioned countries, the big five countries with vaccination rollout also include Brazil, United States of America (USA), and Indonesia,⁸ each having different strategies to increase the uptake of vaccination.

Learning from those countries that successfully roll out vaccination in home countries has left a question behind. What is the successful strategy to implement vaccination in developed countries? Hence, this paper aims to examine some strategies for the implementation of vaccination rollout policy as a lesson to learn by other governments.

Methods

Data sources: This study aims to analyse the strategies for COVID-19 vaccination. These strategies are fundamental to the provision of information about a country's implementation of vaccination rollout in the population as well as assessment of the challenges and constraints. The data were taken from the Pubmed database through a Boolean method without any restrictions on the language and date of publication. In addition, the references in the published papers were reviewed. Finally, the search terms and strategies are

Table 1: Criteria of eligible papers

Criterion	Description
Problem	COVID-19 vaccination
Concept	The strategies for COVID-19 vaccination to reduce cases, improve intention of vaccination, remove refusal or hesitancy about vaccination, and others; the data were based on not only statistical findings but also statements or reports in the papers
Context	<ul style="list-style-type: none"> • Implementation of vaccination strategies in any developed or developing countries. • The vaccination target was not only general population but also healthcare workers, essential workers, elderly, and vulnerable population.
Search strategy	((vaccination [Title/Abstract]) AND (strategy [Title/Abstract])) AND (COVID 19 [Title/Abstract]) AND (policy [Title/Abstract])

presented in Table 1.

Eligibility criteria: Original papers about strategies for COVID-19 vaccination in any countries were eligible in this study, including several research designs such as observational study, experiment, quasi-experiment, and mathematical model. In addition, editorial letters, opinions, and perspectives were also eligible as long as they provided an accurate explanation of vaccination strategies and vaccination impact. The impact of vaccination includes decreasing case number and increasing vaccination intention, removing vaccination hesitancy or refusal in the population, and others. The detailed criteria of eligibility are presented in Table 1.

Management of literature: The published paper results were imported to Microsoft Excel for extraction and synthesis, and the Mendeley software was used as the reference management. Both authors (SRS and AMR) screened the eligible papers based on the title and abstract. If the title and abstract screening results were agreed, the process would continue to a full-text screening.

Coding: The coding was performed according to authors' information, year of publication, country's name, characteristics of population, summary of results, strategies for COVID-19 vaccination, category of strategy, component of strategy, and outcome of vaccination.

Summary: The conclusion of the strategies for COVID-19 vaccination was drawn narratively based on the various implementations in each country, and a diagram was prepared for the final summary.

Results

Literature screening: There were 23 studies included in this review and presented in Figure 1. Four studies were descriptive (10–13), six studies were modelling (14–19), three studies were editorial letters (7,20,21), and two studies were experiments, commentaries, and perspectives (9,22–26). Meanwhile, the remaining studies were RCT (27), cross-sectional (28), case-control (29), and correspondences (30). There were ten countries in those papers, including USA (eight), China (five), India (three), and Serbia, Thailand,

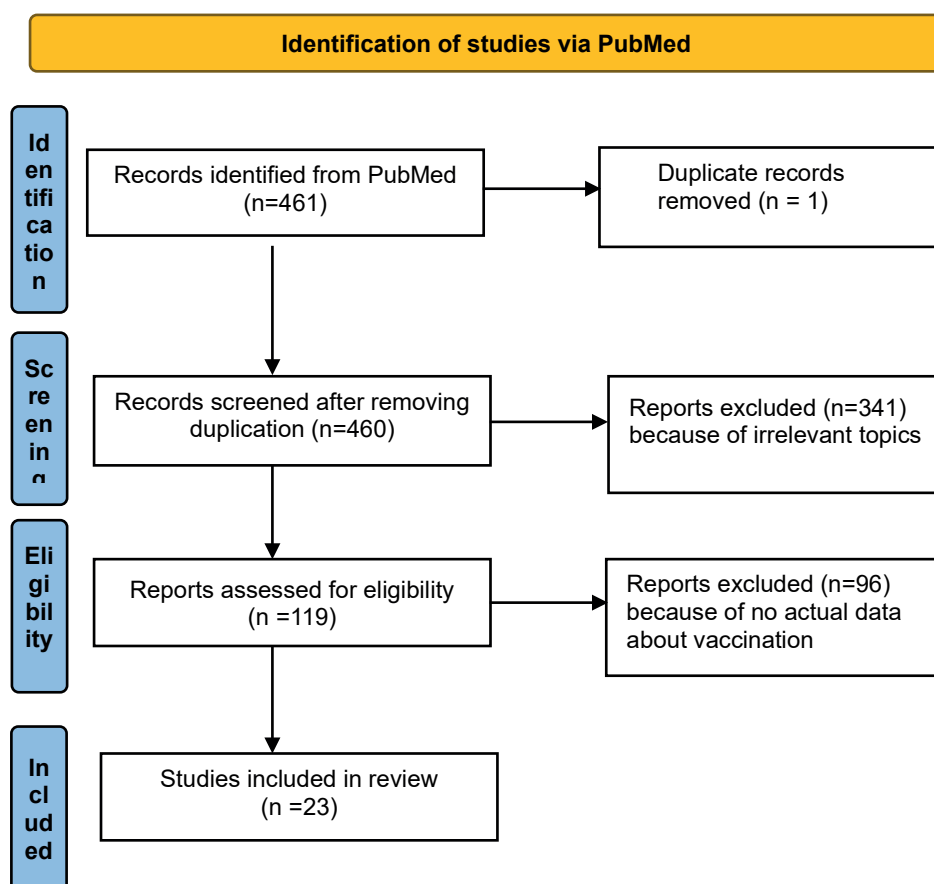


Figure 1. Flowchart for selection of the literature

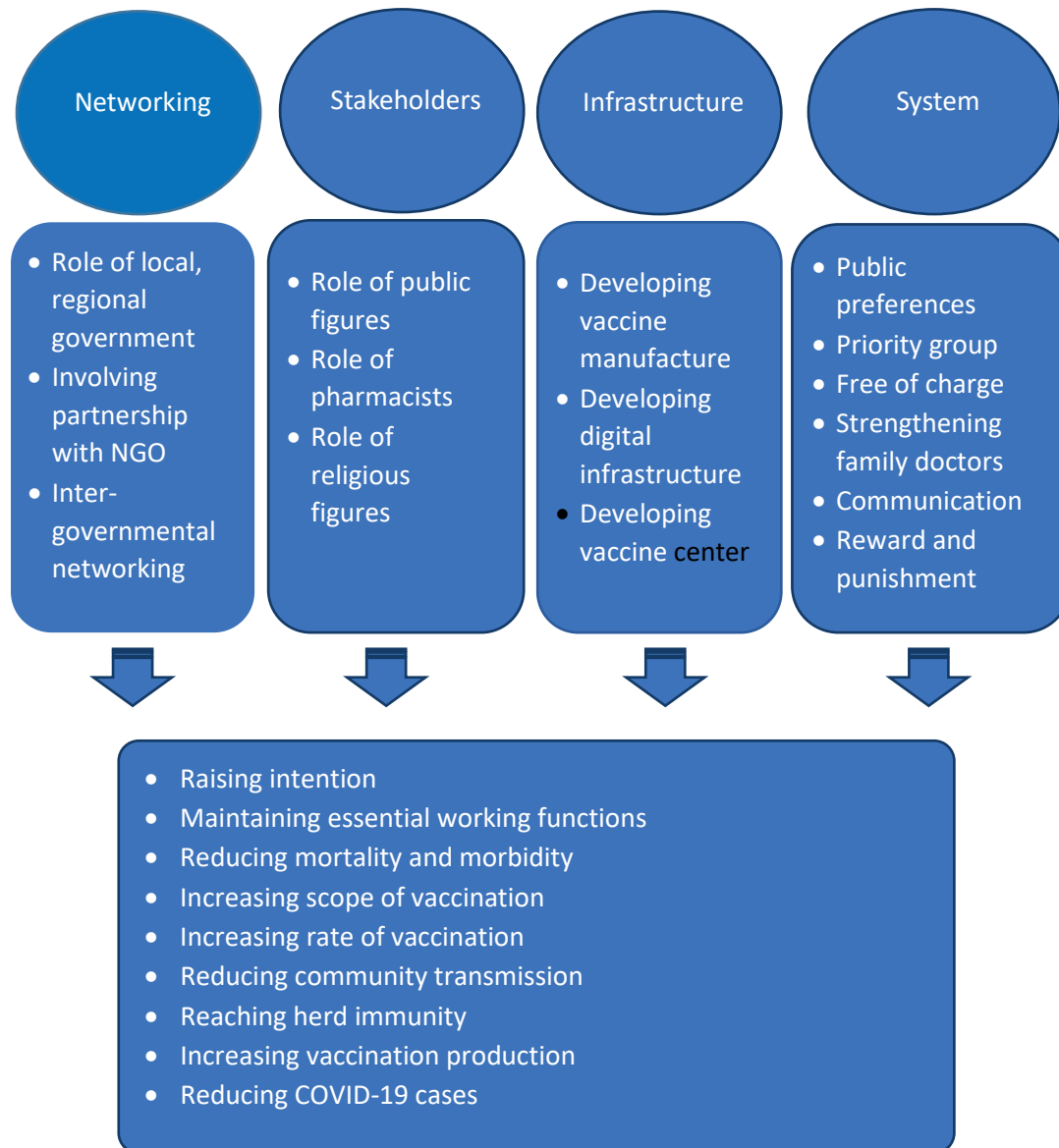


Figure 2. Summary of the vaccination strategy

South Korea, Canada, and the United Kingdom (UK), European Union (EU) as well as United Emirates Arab (UEA) each with one published paper. The populations in the included papers were adults, elderly, healthcare workers, comorbidities, pharmacists, and nursing homes.

Components of the vaccination strategy

Networking: The component of networking was categorised into the role of governments, either local, regional, or national (9,26,30), and partnership involvement (7,21,24).

Stakeholders: The element of stakeholders was grouped into the role of public figures (27), the role of religious leaders (24), and the role of pharmacists and other healthcare workers (HCWs)

(25,26).

Infrastructure: The section of infrastructure was assembled into developing vaccine manufacturers (7,9,26), developing vaccine centres (21), and developing digital infrastructure (24,26).

System: The part of system was gathered into priority groups (7,10,21,12–19), public preferences (11,22,23), strengthening family physician (21), giving reward and punishment (9,29), and communication (28).

Outcome of vaccination strategy: The outcome of vaccination strategy consisted of some aspects, such as increasing intention (27), reducing mortality and morbidity (10,12–18), reducing community transmission (13), raising the scope

of vaccination (7,21–23,25,28–30), increasing the rate of vaccination (9,11,20,26), increasing vaccination production (24), and reaching herd immunity (19).

Summary of the components of vaccination strategy and outcome: A summary of the vaccination strategy entailing the components, categories, and outcomes of the policy is presented in Figure 2.

Discussion

Networking: Networking highlights how vaccination is under government control by coordinating national to district levels or national to national government levels. Inter-collaboration among departments and ministries is employed to reach the initial vaccination scope (26), and all resources and methods are mobilised and concentrated to carry out vaccination works (9). The government has set up a national board to provide vaccination guidance administration called the National Expert Group on Vaccine Administration for COVID-19 (NEGVAC) (9). In addition, application suitability and emergency use of vaccination are conducted by the Central Drugs Standard Control Organization (CDSCO) in India (7,26), the National Health Commission (NHC) in China (9), and the Joint Committee on Vaccination and Immunization (JCVI) and UK Medicine and Healthcare Products Regulatory Agency (MHRA) in UK (21). These boards comprise various experts who determine some conditions and requirements for vaccination priority. In addition, an inter-governmental partnership by the Serbian government employs a thousand vaccines for the neighbouring countries to strengthen diplomacy in the Balkan regions (30). The government has a role not only to establish national boards but also to ensure that public communication works well by providing accurate message services in printed, online, or social media platforms (24).

Dealing with a pandemic is challenging. Since the escalation of the pandemic is getting wider, networking is a significant action to face it. The government plays a critical role to mobilise financial resources and human power; however, coordination among governments and the lower-level governments is more crucial to deploy vaccination policy. The national government establishes many different bodies to review, assess, monitor, and evaluate vaccination requirements, emergency use, and scope. Lastly, the role of the

government is not only to focus on those aspects but also to guarantee accurate information and avoid untrusted news to encourage the community in the vaccination program.

Stakeholders: Stakeholders focus on the community and the role of public figures to escalate the scope of vaccination. Healthcare workers (HCW) are the primary stakeholder of vaccination; however, they require the skills to inoculate and manage adverse effects by training and workshop. The training concerns the capacity building of HCW such as medical doctors, nurses, midwives, and pharmacists as vaccinators. After completing vaccination training, all HCW are deployed across the country in remote, rural, and even mountainous areas (26). As a secondary frontline HCW, pharmacists can maintain the cold chain, keep vaccines intact, and be deployed as vaccinators after training, accreditation, certification, and amendment of regulation to cover the role of pharmacists in vaccination strategy (25,26).

On the other hand, a religious leader's role includes delivering a message that vaccination is permissible in Islam (24). An Islamic *fatwa* has declared that COVID-19 vaccine is *halal* and allowable to inoculate in the community (31). A study about stakeholders' roles reported that political figures also have a role in raising the scope of vaccination (27). The presidential election in the United States of America (USA) has increased the uptake of vaccination and belief in the safety of vaccination. In this regard, human resources such as religious or political figures have an essential role in vaccination rollout programs because they can influence constituents. Therefore, the increasing scope of vaccination nowadays concerns HCW, and public figures can encourage more public intention to COVID-19 vaccination.

Infrastructure: Infrastructure highlights physical and digital systems. Vaccine manufacture is established to produce an indigenous vaccine to cover the entire population in home countries. Since the demand for vaccination is high, making own vaccines can be a solution to cover millions of people in the countries. Building manufacture requires a large number of funding resources and supporting clinical research phases. In addition, physical infrastructure alone is less effective without digital resources which provide applications for registering, detecting, monitoring, and evaluating inoculation in the population. Thus,

digital infrastructure can become a useful strategy to deliver message and information as well as to track vaccinated or unvaccinated individuals.

Manufacturing indigenous vaccines is one crucial step to fulfil vaccine allocation in home countries. Some countries have launched and registered vaccines that work 24 hours to accomplish domestic necessities (7,9,24,26). Developing a mass vaccination centre has also been implemented, supervised by trained vaccinators, armed forces, and HCW, and vaccination centres have been deployed in local pharmacies, local communities, private hospitals, and religious buildings (21). Digital infrastructure has been developed in UEA (24) and India (26) since the first time of vaccination launch. Al Hosn app is used for contact tracing, national registration of vaccination, and tracking vaccination history, while Malaffi platform is used to collect and share information with many healthcare facilities connected to electronic medical records (24). Meanwhile, COVID Vaccine Intelligence Network (Co-WIN) is a digital platform to register people in the vaccination program and monitor immunised individuals for any adverse effects. The Co-WIN system sends appropriate schedule, place, and vaccination supervisor data (26).

System: Studies about priority groups have found that healthcare workers and frontline workers are the most critical priority since they essentially function in daily activities, deploy vaccination, and guarantee daily life during the pandemic. Protecting HCW and essential workers can mean handling the transmission of infection in the community. Meanwhile, older people are the most vulnerable; however, several studies are arguable regarding the cut-off age of elderly, whether it is more than 50 y.o. (16), more than 65 y.o. (19), or more than 80 y.o. (12). One consensus about comorbidities agreed in most studies is that underlying diseases in age-stratified groups are included in the priority. Older people and underlying diseases are prioritised because they have morbidity and mortality in the population. In addition, after prioritizing HCW, essential workers, elderly, and comorbidity, the last priority is young adults and children, and one priority that might be overlooked is pregnancy. However, the published papers have limited data on the precedence given to pregnant women for vaccination.

Regarding public preferences for COVID-19 vaccination, studies have reported that one

vaccination episode with low adverse effects is preferred in health facilities. Immediate service performed voluntarily is intended, and people prefer vaccines if the community in their place is already vaccinated. The general preference is challenging to implement since every vaccine has side effects that depend on individual responses. Immediate vaccination depends on each government's capability to manage the people, including human resources in inoculation. Public preferences are essential, but to entirely rely on them is problematic. A fruitful action is a communication about the procedure, side effects, and pre- and post-vaccination occasion that must be delivered comprehensively. Communication plays an important role in delivering information about the side effects and symptoms, which is preferable to respondents who do not obtain such information (28).

Free vaccination increases willingness rate (11). Even though vaccination is free of charge, the government should provide paid vaccination, particularly for low-income residents. Since vaccination must be delivered equally in low-, middle-, and high-income residents, vaccine stocking in paid or free schemes is obligatory. In addition, medical insurance also offers a protection scheme to vaccination policy; however, there is minimal data regarding the medical insurance scheme in relation to the rate of vaccination. The role of medical insurance funds to cover vaccination is limited (9). Further study is warranted to observe the role of medical insurance in the willingness of vaccination policy.

The primary care strengthening establishes vaccination centre programs beside hospital-based ones by employing human resources such as medical doctors, laboratory staff, and nurses. The UK deployed a million doses of influenza vaccine years ago, a success story from previous experience for implementing COVID-19 vaccination based on primary care resources (21). Finally, another strategy to escalate vaccination is by providing reward and punishment. A reward, either monetary or non-monetary, can stimulate people's response to come for vaccination (9). As the pandemic is unprecedented, massive vaccination ensures protection of the community from the infection. For people who refuse vaccination, such punishment as being banned in public office may encourage willingness and remove hesitancy.

This study has several limitations. First, a narrative

review is the author's subjective intuition that potentially show a bias; second, the narrative review does not have any protocols to employ the methodology. Further study is warranted by employing a qualitative method to collect more accurate and in-depth data regarding health policy of COVID-19 vaccination.

Conclusion

Vaccination is one of the most effective measures during the pandemic. All countries have launched several policies to roll out vaccination. Our findings suggest strengthening networking, empowering stakeholders, implementing an appropriate system, and building infrastructure

in every country to succeed in COVID-19 vaccination strategy. The strategy of vaccination can strengthen the resilience of the health system during the pandemic.

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