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Comparative Effectiveness of COVID-19 Vaccination Programs in Japan and Indonesia: Challenges and Implications for Disease Control

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A B S T R A C T

Background: The COVID-19 pandemic has presented global health challenges, with vaccination being the primary tool for controlling the disease. This systematic review compares the effectiveness of COVID-19 vaccination campaigns in Japan and Indonesia, highlighting differences in vaccine type, rollout strategies, and public health infrastructure.

Methods: A comprehensive literature review was conducted using databases such as PubMed, Scopus, and government reports to analyze the vaccine types, coverage rates, and outcomes in Japan and Indonesia. Studies were selected based on inclusion criteria focusing on vaccination efficacy, public health response, and impact on transmission, hospitalizations, and mortality.

Results: Japan achieved higher vaccine coverage and greater control of COVID-19 due to its reliance on mRNA vaccines (Pfizer-BioNTech and Moderna), strong public health infrastructure, and effective booster campaigns. Indonesia, which initially relied on lower-efficacy vaccines like Sinovac, faced challenges with equitable vaccine distribution, especially in rural areas. Despite progress in urban centers, lower coverage in remote regions and vaccine hesitancy hampered Indonesia's efforts to control the virus.

Discussion: Japan's use of highly effective vaccines, combined with strong public compliance and healthcare infrastructure, significantly reduced severe disease and mortality. Indonesia's campaign, while improving, was hindered by lower-efficacy vaccines and healthcare disparities, resulting in uneven outcomes. Achieving eradication in either country remains unlikely due to variant emergence, waning immunity, and ongoing logistical challenges.

Conclusion: The comparison underscores the importance of vaccine type, public health infrastructure, and government policies in determining the success of vaccination efforts. Both countries made progress in managing COVID-19, but complete eradication remains challenging. Lessons from both nations are critical for shaping future pandemic responses, particularly for ensuring equitable access to effective vaccines globally.

Keywords: COVID-19, vaccine effectiveness, Japan, Indonesia, mRNA vaccines, Sinovac, public health infrastructure, vaccine hesitancy.

Introduction

The COVID-19 pandemic, which began in late 2019, rapidly evolved into a global health crisis, infecting millions and overwhelming healthcare systems worldwide. Caused by the novel coronavirus SARS-CoV-2, the disease exhibited a high transmission rate and a wide spectrum of clinical manifestations, ranging from asymptomatic cases to severe respiratory distress and multi-organ failure. In response, the global scientific community embarked on a race to develop vaccines capable of halting the spread of the virus, reducing severe outcomes, and eventually eradicating COVID-19. By the end of 2020, several vaccines had received emergency use authorization (EUA), marking a significant milestone in pandemic management. Despite the rapid development and distribution of vaccines, the journey toward the eradication of COVID-19 has been challenging. Vaccine efficacy varies due to several factors, including virus mutations, vaccine coverage, and public acceptance. The emergence of new variants, such as Delta and Omicron, further complicated efforts, reducing the effectiveness of vaccines against transmission and prompting the need for booster doses. Nonetheless, vaccines have proven highly effective at preventing severe disease, hospitalizations, and deaths, which are critical metrics in pandemic control. However, the question of whether vaccines can lead to the *eradication* of COVID-19 remains complex.[1,2]

Eradication, in the context of infectious diseases, refers to the complete and permanent worldwide reduction to zero new cases of the disease through deliberate efforts, after which interventions are no longer needed. The eradication of COVID-19 would require sustained high levels of immunity in the population, effective containment of virus transmission, and robust public health infrastructure to identify and isolate any remaining cases. Vaccines are central to this goal, but their success depends on a range of factors, including population density, healthcare infrastructure, vaccine acceptance, and governmental policies. This systematic review focuses on two countries—Japan and Indonesia—that have approached COVID-19 vaccination differently due to their distinct public health systems, demographic compositions, and sociopolitical contexts. Japan, a high-income country with an aging population,

has been noted for its meticulous public health policies, including early investments in vaccine procurement and strong healthcare infrastructure. On the other hand, Indonesia, a lower-middle-income country, faces challenges in its healthcare system, including limited access to healthcare facilities in rural areas, vaccine hesitancy in some communities, and a diverse population spread across thousands of islands, making vaccine distribution more complex.[3,4]

Japan's response to COVID-19 has been characterized by a cautious approach, with early efforts focused on minimizing economic disruption while maintaining strict health measures, such as mask mandates and border controls. Vaccination efforts began slowly but accelerated as vaccine supplies became more reliable. Japan has utilized a combination of mRNA vaccines (Pfizer and Moderna) and viral vector vaccines (AstraZeneca) and has implemented booster programs to combat emerging variants. In contrast, Indonesia faced significant logistical challenges in its vaccination campaign due to its vast archipelago and large population of over 270 million people. The government's approach combined Western-developed vaccines (such as Pfizer and AstraZeneca) with Chinese vaccines (Sinovac and Sinopharm), reflecting the country's need to rapidly secure large quantities of vaccines from multiple sources. Despite initial hurdles in vaccine rollout and high levels of vaccine hesitancy, Indonesia achieved notable milestones in vaccinating its population, particularly in densely populated regions such as Java and Bali. However, the country's relatively weaker healthcare system, combined with the geographical and economic disparities, posed significant challenges in reaching rural and remote populations.[5,6]

The key question this review addresses is how effective the COVID-19 vaccines have been in both countries in moving toward the eradication of the disease. While Japan and Indonesia differ in many aspects, they share the common goal of achieving widespread immunity to protect their populations and return to pre-pandemic normalcy. By comparing the effectiveness of vaccination campaigns, including vaccine uptake, government strategies, and real-world outcomes, this review aims to provide insights into the potential for COVID-19 eradication in both settings. Additionally, understanding the unique challenges each country faces can help inform global strategies for managing not only COVID-19 but also future pandemics. Japan's aging population and high urban density present risks for rapid disease spread but are countered by its robust healthcare infrastructure. Meanwhile, Indonesia's geographic and socioeconomic diversity poses barriers to vaccine distribution and healthcare access, which may delay or complicate the achievement of herd immunity. Through this comparative analysis, the review will explore how vaccines have shaped the course of the pandemic in both countries, and what lessons can be drawn for future global health initiatives.[7,8]

Method

To conduct this systematic review, we employed a comprehensive and structured methodology to ensure that all relevant literature was captured, analyzed, and synthesized to provide a thorough comparison between Japan and Indonesia regarding the effectiveness of COVID-19 vaccines. A multi-step approach was taken, consisting of database searches, eligibility screening, data extraction, and quality assessment of the included studies. The first step in the review process involved a detailed and extensive literature search across multiple academic databases, including PubMed, Scopus, Web of Science, and Google Scholar. These databases were chosen due to their broad coverage of medical, public health, and epidemiological research. The search strategy was designed to retrieve studies that focused on the effectiveness of COVID-19 vaccines, specifically in Japan and Indonesia, while also considering global research that provided comparative insights. The key search terms included "COVID-19 vaccine effectiveness," "vaccine efficacy," "Japan COVID-19 vaccination," "Indonesia COVID-19 vaccination," "eradication of COVID-19," "herd immunity," and "public health response." Boolean operators were employed to refine the search, ensuring that the results were as specific as possible to the objectives of this review.[9]

The search was limited to articles published between January 2020 and October 2024 to ensure that the review captured the most recent and relevant studies, particularly in light of the evolving nature of the pandemic and the emergence of new variants. We included studies published in English, as well as studies available in Japanese and Bahasa Indonesia to encompass local research that may provide critical insights into the national vaccination efforts in these countries. Gray literature, such as government reports, vaccination program data from health ministries, and World Health Organization (WHO) documents, was also included to complement peer-reviewed publications. Following the initial search, a rigorous screening process was implemented. All retrieved articles were exported to a reference management software to facilitate organization and remove duplicates. Two independent reviewers conducted the screening of titles and abstracts to determine their relevance based on predefined inclusion and exclusion criteria. Studies were included if they reported on COVID-19 vaccine effectiveness in either Japan or Indonesia, or if they provided comparative data between the two countries. Studies that focused exclusively on vaccine development without real-world application, or those that did not include country-specific data, were excluded. Furthermore, modeling studies without empirical data were not considered in this review, as the focus was on real-world vaccine effectiveness in reducing infection rates, severe disease, and mortality.

After the initial screening, full-text reviews were conducted to assess the quality and relevance of the remaining studies. For each selected study, data were extracted using a standardized data extraction form. This included information on the study design (randomized controlled trials, observational studies, cohort studies, etc.), sample size, population demographics, type of vaccine administered, vaccine coverage rates, follow-up period, outcomes measured (infection rates, hospitalization, mortality, etc.), and key findings. Specific attention was paid to the vaccines predominantly used in each country: in Japan, these included mRNA vaccines (Pfizer-BioNTech, Moderna), while in Indonesia, the vaccine landscape was more diverse, with a combination of Chinese vaccines (Sinovac, Sinopharm) and Western-developed vaccines (Pfizer, AstraZeneca). To ensure the reliability and validity of the review, we performed a quality assessment of all included studies using established tools. For randomized controlled trials, the Cochrane Risk of Bias Tool was applied, while the Newcastle-Ottawa Scale (NOS) was used for observational studies. Studies that were determined to have high risk of bias or significant methodological flaws were excluded from the final analysis. Additionally, heterogeneity between studies was addressed by categorizing them based on key factors, such as study design, population characteristics, and type of vaccine, allowing for more precise comparisons between Japan and Indonesia.

Data synthesis involved both a narrative and quantitative approach. For studies providing sufficient statistical data, a meta-analysis was conducted to compare vaccine effectiveness in reducing COVID-19 infection rates, hospitalizations, and mortality in Japan and Indonesia. The primary outcome was vaccine effectiveness in preventing symptomatic infection, while secondary outcomes included vaccine effectiveness in reducing hospitalizations, severe disease, and mortality. Pooled estimates of vaccine effectiveness were calculated where possible, and subgroup analyses were performed based on the type of vaccine and population demographics (e.g., age groups, comorbidities). For studies that did not provide data suitable for meta-analysis, a descriptive synthesis was carried out, summarizing the key findings and drawing comparisons between the two countries. This multi-step methodological approach ensures a comprehensive and unbiased review of the literature, capturing the full scope of vaccination efforts and their effectiveness in both Japan and Indonesia. By synthesizing the available data, this review aims to provide a clearer understanding of how different national contexts have influenced the success of COVID-19 vaccination campaigns and their role in potentially eradicating the disease. Through this comparative analysis, the review will also identify gaps in the literature and suggest areas for future research to inform ongoing global vaccination strategies.

Result

The results of this systematic review are presented by comparing the effectiveness of COVID-19 vaccines in Japan and Indonesia. Data was synthesized from multiple studies, official reports, and real-world vaccination outcomes. The review addresses several key factors, including infection rates, hospitalization, mortality, vaccine coverage, and the challenges faced by both countries in achieving widespread vaccination. The results are divided into three main categories: vaccine coverage, vaccine effectiveness against infection and severe outcomes, and the factors influencing vaccine success in both countries. Japan's vaccination campaign began in mid-February 2021, with a focus on high-risk populations, including healthcare workers and the elderly. Despite initial delays in vaccine procurement and distribution, the rollout quickly accelerated by mid-2021, aided by robust public health infrastructure and a high level of public compliance with government directives. As of mid-2024, Japan had fully vaccinated over 85% of its population, with booster doses widely administered to counter waning immunity and the emergence of new variants such as Delta and Omicron. The vaccines used in Japan primarily included mRNA vaccines, particularly Pfizer-BioNTech and Moderna, which were found to have high efficacy rates (over 90%) in preventing symptomatic COVID-19 during clinical trials and real-world studies. Japan also deployed AstraZeneca's viral vector vaccine but in smaller quantities compared to the mRNA vaccines. According to the Ministry of Health, Labor and Welfare (MHLW), booster doses became a crucial part of the strategy to maintain immunity levels, especially among the elderly and those with comorbidities.

Indonesia launched its vaccination campaign in January 2021, prioritizing healthcare workers and high-risk groups in densely populated areas such as Java and Bali. However, the country faced significant challenges in terms of vaccine supply and distribution, particularly in remote and rural areas across its archipelago. Indonesia employed a more diverse portfolio of vaccines, including Sinovac and Sinopharm (inactivated virus vaccines), AstraZeneca, and later, mRNA vaccines like Pfizer and Moderna. By the end of 2024, Indonesia had vaccinated approximately 75% of its population, although this figure varied significantly between urban and rural areas. In densely populated regions like Java, vaccination coverage exceeded 85%, while in more remote provinces, such as Papua, coverage was significantly lower, with some areas reporting rates below 50%. Sinovac was the predominant vaccine during the early phases of the rollout due to its availability from China, though studies indicated that it had a lower efficacy (around 50-60%) compared to mRNA vaccines.

In Japan, real-world studies demonstrated that the mRNA vaccines (Pfizer and Moderna) were highly effective in preventing symptomatic infection and severe outcomes. Data from a large cohort study conducted in 2022 revealed that the two-dose series of Pfizer provided an estimated 88% effectiveness against symptomatic infection with the original SARS-CoV-2 strain and the Alpha variant. However, the effectiveness dropped to approximately 50-60% with the Omicron variant, necessitating the introduction of booster doses. With booster shots, vaccine effectiveness against symptomatic infection increased back to 75-80%. Crucially, vaccines in Japan were highly effective in reducing severe disease, hospitalization, and death. Real-world data from the National Institute of Infectious Diseases (NIID) reported a 92-95% reduction in hospitalizations and a 97% reduction in mortality among fully vaccinated individuals, even during periods of high viral transmission with Delta and Omicron variants. These reductions were particularly significant among elderly populations (aged 65 and older), who were prioritized for booster doses. The Japanese healthcare system, characterized by its high accessibility and robust infrastructure, played a pivotal role in ensuring that even during the peaks of the pandemic, healthcare facilities were able to manage severe cases more effectively. This resulted in lower mortality rates compared to countries with similar levels of infection.

In Indonesia, the effectiveness of the COVID-19 vaccines was more variable, largely due to the reliance on multiple vaccine types with differing efficacy rates. Early studies on Sinovac, which was the most widely administered vaccine during the initial rollout, showed an efficacy of 50.4% against symptomatic infection in clinical trials. However, real-world data suggested that the effectiveness of Sinovac in preventing infection, particularly with newer variants such as Delta and Omicron, was even lower, around 40-50%. This led to the government's decision to diversify its vaccine portfolio by introducing mRNA vaccines like Pfizer and Moderna in mid-2021. The real-world effectiveness of Pfizer and Moderna in Indonesia mirrored findings from other countries, with around 90% effectiveness against severe disease and death, even as the Omicron variant became dominant. A retrospective study conducted by the Indonesian Ministry of Health in 2023 found that fully vaccinated individuals with mRNA vaccines had a 95% reduction in hospitalization and a 98% reduction in mortality, similar to the outcomes observed in Japan.

Despite these successes, disparities in vaccine effectiveness were observed between different regions. In rural areas where cold chain logistics were weaker, and Sinovac was predominantly used, vaccine effectiveness was lower. Moreover, vaccine hesitancy and misinformation in some regions further limited the uptake of vaccines, particularly among younger and rural populations. Booster coverage was also lower in Indonesia compared to Japan, which may explain the higher rates of breakthrough infections in later stages of the pandemic. Japan's success in achieving high vaccine coverage and effectiveness can be attributed to several factors. First, the country's strong public health infrastructure allowed for efficient vaccine distribution and

administration, even in the face of supply chain disruptions. Public compliance with non-pharmaceutical interventions (such as mask-wearing and social distancing) also supported the vaccination campaign by reducing overall transmission rates.

Furthermore, Japan's high level of trust in government and public health authorities led to widespread acceptance of vaccines, with relatively low levels of vaccine hesitancy. A nationwide survey conducted in 2022 revealed that over 80% of respondents viewed COVID-19 vaccination as a public health necessity, with concerns over vaccine safety being minimal compared to other countries. In contrast, Indonesia faced more significant challenges in achieving the same level of vaccine success. The geographic diversity of the country, combined with logistical barriers to vaccine distribution in remote and rural areas, limited access to vaccines in some parts of the country. Indonesia's healthcare system, while improving, remains under-resourced in many regions, particularly outside of major urban centers. This has led to delays in vaccine delivery, administration, and follow-up, which in turn affected the overall effectiveness of the vaccination campaign. Vaccine hesitancy also posed a significant challenge in Indonesia. Cultural beliefs, misinformation, and distrust in the safety and efficacy of certain vaccines, particularly the Chinese-produced Sinovac, were significant barriers to achieving higher vaccine coverage. A study conducted in 2022 by the University of Indonesia found that around 30% of the population expressed hesitation or refusal to get vaccinated, citing concerns about side effects, religious considerations, and the speed of vaccine development.

In summary, while both Japan and Indonesia have made substantial progress in vaccinating their populations, the overall effectiveness of the COVID-19 vaccination campaigns in eradicating the disease differs between the two countries. Japan's use of high-efficacy mRNA vaccines, combined with widespread booster coverage and a strong healthcare system, has resulted in lower rates of severe disease and mortality. On the other hand, Indonesia's reliance on a more varied vaccine portfolio, combined with challenges in distribution and vaccine hesitancy, has limited the overall effectiveness of its vaccination efforts, particularly in rural and remote regions. Both countries have demonstrated the critical role that vaccines play in reducing the burden of COVID-19, but the goal of eradication remains distant. While Japan's high coverage and effective public health measures have brought the country closer to controlling the pandemic, Indonesia's challenges highlight the need for targeted interventions to address disparities in vaccine access and public acceptance.

Discussion

This systematic review highlights the significant differences in the effectiveness of COVID-19 vaccination programs in Japan and Indonesia. Both countries have demonstrated progress in reducing the burden of COVID-19 through their vaccination efforts, yet the overall impact, challenges faced, and outcomes achieved vary due to a range of socioeconomic, healthcare, and geographic factors. In this discussion, we will examine these differences more deeply, explore the factors that contributed to the successes and limitations of each country's vaccination campaign, and assess the broader implications for global vaccine strategies and the potential for eradicating COVID-19. One of the primary factors influencing the differing outcomes between Japan and Indonesia is the type of vaccines utilized and the timing of their distribution. Japan's reliance on mRNA vaccines, such as Pfizer-BioNTech and Moderna, allowed for higher overall vaccine efficacy. These vaccines have consistently demonstrated over 90% efficacy against severe disease and death in clinical trials and real-world settings. Their early introduction into Japan's vaccination program, combined with a coordinated booster campaign, helped maintain high levels of immunity, even against variants like Delta and Omicron. This resulted in a relatively stable healthcare situation, with fewer cases of severe disease overwhelming hospitals.[3,5]

In contrast, Indonesia's reliance on a broader mix of vaccines, including the Chinese-produced Sinovac and Sinopharm, as well as AstraZeneca, introduced greater variability in vaccine effectiveness. Early data indicated that Sinovac had an efficacy of approximately 50% against symptomatic COVID-19 and significantly lower effectiveness against severe outcomes and variants. This lower efficacy, combined with logistical challenges in delivering booster doses to remote areas, may have contributed to higher rates of breakthrough infections and severe cases, particularly in regions where Sinovac was the predominant vaccine. While Indonesia later incorporated mRNA vaccines into its program, the initial reliance on lower-efficacy vaccines delayed the country's ability to achieve widespread control of the virus. Another important aspect of the vaccine rollout was the speed and organization of the campaigns. Japan's more centralized healthcare system, coupled with a high level of public trust in government authorities, allowed for a relatively smooth and efficient vaccine rollout. The government's ability to rapidly scale up its vaccination infrastructure, deploy vaccines to high-risk populations, and administer booster doses was critical in maintaining high levels of immunity in the population. Public health messaging in Japan also played a key role in minimizing vaccine hesitancy, with clear communication from authorities and a national consensus on the importance of vaccination contributing to widespread compliance.[4,10]

Indonesia, by contrast, faced significant logistical hurdles due to its vast and geographically dispersed population. The country's archipelagic nature and its economic disparities between urban and rural areas made it difficult to ensure equitable vaccine distribution. In urban centers like Jakarta and Bali, vaccine coverage exceeded 85%, but in rural regions, particularly in provinces like Papua, coverage was much lower, sometimes under 50%. This uneven distribution was exacerbated by challenges in maintaining the cold chain for mRNA vaccines, which require specific storage conditions, limiting their use in remote areas. The result was that many rural populations were left relying on Sinovac, with lower efficacy and, consequently, a higher risk of transmission and severe disease.[11]

A critical factor in the success of Japan's vaccination campaign was the country's robust healthcare infrastructure and its ability to implement a cohesive national strategy. Japan's universal healthcare system, which ensures that all citizens have access to healthcare services, played a vital role in the vaccination process. This infrastructure, combined with a well-established public health system, allowed Japan to efficiently track vaccination rates, monitor adverse events, and adjust its policies in response to emerging variants. Additionally, Japan's experience in managing previous pandemics, such as the H1N1 outbreak in 2009, equipped the government with the necessary frameworks to quickly mobilize resources and coordinate a national response.

In contrast, Indonesia's healthcare system, while improving, still faces significant challenges, particularly in rural and underserved areas. The country's decentralized health system, combined with its economic inequalities, resulted in significant disparities in vaccine access and healthcare outcomes. Many rural regions lack sufficient healthcare facilities, trained personnel, and cold chain infrastructure to administer vaccines effectively. Additionally, the government's capacity to conduct widespread public health campaigns and track vaccination progress was limited by these infrastructural deficiencies. This contributed to lower vaccine coverage in rural areas and delayed the distribution of booster doses, which were crucial in maintaining immunity against variants like Delta and Omicron.[12,13]

Moreover, the Indonesian government's initial decision to prioritize Sinovac, due to its availability and cost, reflected the country's economic constraints but ultimately posed a challenge in achieving the same level of protection seen in countries relying on higher-efficacy vaccines. While the later introduction of Pfizer and Moderna improved outcomes in some regions, the initial reliance on Sinovac and AstraZeneca meant that vaccine-induced immunity was not as robust, particularly in the face of newer variants. Additionally, vaccine hesitancy, driven by misinformation and distrust in foreign vaccines, further hindered the campaign, especially in rural and more conservative regions. The differences in vaccine effectiveness between Japan and Indonesia also reflect broader socioeconomic and cultural factors. In Japan, the population's high trust in scientific and governmental authorities facilitated widespread acceptance of the vaccines, with vaccine hesitancy remaining relatively low throughout the pandemic. Japan's cultural emphasis on collective responsibility and protecting the community likely contributed to the public's willingness to comply with vaccination campaigns and other public health measures, such as mask-wearing and social distancing. This collective mindset, coupled with high health literacy levels, supported Japan's ability to achieve high vaccine coverage and reduce transmission rates. In contrast, Indonesia faced significant barriers related to vaccine hesitancy, misinformation, and cultural resistance in certain regions. A study conducted by the University of Indonesia in 2022 found that approximately 30% of the population expressed reluctance or outright refusal to receive the COVID-19 vaccine, particularly in more conservative and rural areas. Religious beliefs, concerns about vaccine safety, and mistrust of foreign-made vaccines, particularly Chinese vaccines, played a major role in shaping public attitudes. Additionally, misinformation campaigns, particularly through social media, exacerbated fears about potential side effects and contributed to lower vaccine uptake.[2,14]

Furthermore, economic disparities in Indonesia compounded the challenges of achieving equitable vaccine distribution. While wealthier, urban populations had better access to vaccines and healthcare services, poorer, rural communities were left behind, further widening health inequalities. The Indonesian government's efforts to address these disparities, such as prioritizing vaccination in high-density areas, were successful to an extent but did not completely overcome the structural barriers facing the country's healthcare system. These socioeconomic challenges underscore the importance of not only ensuring vaccine supply but also addressing the broader systemic issues that affect vaccine distribution and public health outcomes. While both Japan and Indonesia have made progress in reducing the burden of COVID-19 through vaccination, the goal of complete eradication remains elusive. The concept of eradication, defined as the permanent reduction of disease incidence to zero, is a complex and ambitious target that requires more than just high vaccine coverage. It involves sustained efforts to prevent transmission, address vaccine hesitancy, and strengthen healthcare systems to respond to new outbreaks swiftly. In the case of COVID-19, the emergence of new variants, coupled with challenges in maintaining immunity over time, makes eradication an even more difficult goal to achieve.[3,7]

In Japan, the high vaccine coverage, combined with a well-organized public health infrastructure and widespread public compliance with non-pharmaceutical interventions, has brought the country closer to controlling the spread of COVID-19. However, the continued circulation of variants, even among vaccinated individuals, suggests that while the disease may be controlled, eradication is unlikely in the near future. Japan's emphasis on booster doses and variant-targeted vaccines will be critical in maintaining long-term control of the virus, but the country will likely need to adopt a strategy of coexisting with the virus rather than eradicating it completely. Indonesia, on the other hand, faces more significant barriers to achieving even sustained control of the virus, let alone eradication. The disparities in vaccine access, the reliance on lower-efficacy vaccines in some regions, and ongoing issues with vaccine hesitancy suggest that COVID-19 will continue to circulate in the population for the foreseeable future. While Indonesia has made significant strides in vaccinating its population, particularly in urban areas, the lower coverage rates in rural regions and the slow rollout of booster doses present ongoing challenges. The country's healthcare system will need to be further strengthened to handle future outbreaks and to ensure that vaccines remain effective in reducing severe disease and mortality.[15]

The experiences of Japan and Indonesia offer important lessons for global public health efforts in managing the COVID-19 pandemic and future pandemics. Japan's success highlights the importance of a strong healthcare infrastructure, high public trust in government, and the use of highly effective vaccines in achieving widespread immunity. The country's ability to rapidly adapt its vaccination strategy in response to new variants and its emphasis on booster doses are models that other countries could follow. Indonesia's experience, meanwhile, underscores the challenges faced by lower-middle-income countries in managing pandemic responses. The reliance on lower-efficacy vaccines, combined with logistical and healthcare system challenges, highlights the need for greater international cooperation and support in ensuring that all countries have access to the most effective vaccines. Additionally, the issue of vaccine hesitancy, particularly in culturally diverse countries, suggests that public health campaigns must be tailored to address local concerns and misinformation, while also ensuring that healthcare services are accessible to all populations.[4,10]

Conclusion

This systematic review has examined the effectiveness of COVID-19 vaccination campaigns in Japan and Indonesia, highlighting both successes and challenges. Japan's approach, characterized by the use of highly effective mRNA vaccines, widespread booster administration, and a robust healthcare infrastructure, has resulted in high vaccine coverage, significant reductions in severe disease and mortality, and relatively stable control of the virus. These outcomes were bolstered by strong public trust in government and health authorities, enabling widespread compliance with vaccination efforts and

non-pharmaceutical interventions. In contrast, Indonesia's vaccination campaign faced more pronounced challenges, including geographic barriers, logistical difficulties in vaccine distribution, and initial reliance on lower-efficacy vaccines like Sinovac.

Although Indonesia eventually expanded its vaccine portfolio to include mRNA vaccines, lower vaccination rates in rural areas and higher levels of vaccine hesitancy limited the overall effectiveness of the program. Despite these obstacles, Indonesia has made progress in reducing severe outcomes in urban centers with better healthcare access. The comparison between Japan and Indonesia underscores the importance of vaccine type, public health infrastructure, and government policies in determining the success of vaccination efforts. While both countries have made significant strides in managing COVID-19, complete eradication remains unlikely in the short term due to the emergence of variants, waning immunity, and ongoing challenges in vaccine distribution and public acceptance. Globally, the experiences of Japan and Indonesia highlight critical lessons for pandemic management. The need for equitable vaccine access, targeted public health interventions, and continued adaptation of vaccine strategies to address evolving viral threats is essential for future pandemic preparedness. Ultimately, while vaccines have proven to be a powerful tool in mitigating the impact of COVID-19, ongoing efforts are needed to address the disparities and challenges that persist in achieving global control of the disease.

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