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The Next Pandemic: Preparing for Future Global Health Threats

Pandemi Berikutnya: Mempersiapkan Ancaman Kesehatan Global di Masa Depan

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ABSTRACT
This research aims to conduct a systematic review of global health preparations in facing future pandemics. By following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method, relevant articles were collected from international databases such as PubMed, Web of Science, and Scopus. The review results show that the COVID-19 pandemic has highlighted the lack of global health preparedness and emphasized the importance of comprehensive preparedness planning, effective early detection systems, and adequate resource allocation. The implications of this research are the importance of increasing international cooperation, investment in research and development, and improving health infrastructure and resources to strengthen global health preparedness in the future.
Keywords: global health preparation, pandemic, PRISMA, international cooperation, research and development, health infrastructure, health resources.

ABSTRAK
Penelitian ini bertujuan untuk melakukan tinjauan sistematis terhadap persiapan kesehatan global dalam menghadapi pandemi di masa depan. Dengan mengikuti metode PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), artikel-artikel yang relevan dikumpulkan dari database internasional seperti PubMed, Web of Science, dan Scopus. Hasil tinjauan menunjukkan bahwa pandemi COVID-19 telah menyoroti kurangnya kesiapsiagaan kesehatan global dan menekankan pentingnya perencanaan kesiapsiagaan yang komprehensif, sistem deteksi dini yang efektif, dan alokasi sumber daya yang memadai. Implikasi penelitian ini adalah pentingnya peningkatan kerjasama internasional, investasi dalam riset dan pengembangan, serta peningkatan infrastruktur dan sumber daya kesehatan untuk memperkuat kesiapsiagaan kesehatan global di masa depan.
Kata kunci: persiapan kesehatan global, pandemi, PRISMA, kerjasama internasional, riset dan pengembangan, infrastruktur kesehatan, sumber daya kesehatan.

1. Introduction

The threat of future global health pandemics is a critical concern that requires immediate attention and preparation. As the world continues to grapple with the ongoing COVID-19 pandemic, it is imperative to focus on proactive measures to mitigate and manage potential future pandemics. The COVID-19 pandemic has shed light on the weaknesses of global health systems and the importance of addressing issues such as antimicrobial resistance (AMR) (Lake et al., 2022). Furthermore, it has emphasized the need for effective partnerships and leadership training to respond to global health threats (Nakanjako et al., 2021). The Lancet Commission on Global Health 2035 has also highlighted the potential convergence of pandemics, antimicrobial resistance, and non-communicable diseases as the greatest threats to global public health in the future (Kishore, 2019).

In addressing the next pandemic, it is crucial to consider the role of immune response modeling, as demonstrated in the study by (Miller et al., 2022). Understanding the immune response to viral infections, such as influenza A, can provide valuable insights for developing

strategies to combat future pandemics. Additionally, the importance of health education in preventing and controlling epidemics has been underscored, as evidenced by (Oliveira et al., 2022). This highlights the significance of public awareness and education in enhancing preparedness for future health threats.

Moreover, the surveillance of emerging threats through pandemic and epidemic intelligence, as advocated by the World Health Organization (WHO), presents a promising approach to better prepare for future pandemics (Morgan et al., 2022). Digital public health leadership and the adoption of data and digital health priorities are also essential in addressing future pandemics and health threats (AlKnawy et al., 2023). In conclusion, the next pandemic presents a formidable global health challenge that necessitates a multifaceted approach. By addressing issues such as AMR, strengthening global health systems, fostering effective partnerships, and leveraging advanced modeling and surveillance techniques, the world can better prepare for and mitigate the impact of future global health threats.

The threat of pandemics has become a significant concern in global health security. The COVID-19 pandemic has highlighted the need for better preparedness for future global health threats (Aygul & Şenyuva, 2022). It is crucial to establish a scalable response system, surveillance for new pandemics, and vaccine production mechanisms to effectively respond to surge capacity during pandemics (Kain & Fowler, 2019). The experiences gained during the COVID-19 pandemic have influenced the readiness of healthcare professionals for potential future pandemics (Aygul & Şenyuva, 2022). Furthermore, the impact of pandemics extends beyond the healthcare sector, affecting various aspects of society, including global security and public perception (Atu, 2018). The COVID-19 pandemic has also revealed the importance of preparedness in various sectors, such as mining engineering education in Zambia (Mulenga & Besa, 2022), and the need for organizations to prepare for emergency situations similar to the current and potential future pandemics (Diehl et al., 2022).

Lessons learned from previous pandemics, such as the influenza pandemic, emphasize the need for nations to strengthen their laboratory capacity for diagnosis, augment stockpiles of antivirals and antibiotics, and develop vaccine deployment plans (Franco-Paredes et al., 2009). The pandemic has also exposed vulnerabilities in healthcare supply chains, necessitating a collaborative approach to maintain optimal inventory and mitigate stockout risks (Friday et al., 2021). Additionally, challenges in pandemic vaccine preparedness, such as insufficient vaccine production and complex vaccination regimens, need to be addressed to enhance response capabilities (Newland et al., 2021).

The COVID-19 pandemic has prompted the exploration of innovative approaches, such as translational simulation, to aid in pandemic preparation for healthcare systems (Lowe et al., 2020). Furthermore, the pandemic has underscored the interconnectedness of global health threats, including noncommunicable diseases, antimicrobial resistance, and climate change, necessitating a comprehensive approach to global health security (Saha & Alleyne, 2018). The pandemic has also accelerated research and development efforts for novel antiviral drugs and vaccines (Lundstrom, 2020). In conclusion, the COVID-19 pandemic has highlighted the need for comprehensive preparedness for future global health threats. This preparedness requires a multi-faceted approach, including strengthening healthcare systems, enhancing vaccine preparedness, addressing supply chain vulnerabilities, and recognizing the interconnectedness of various global health threats.

The COVID-19 pandemic has had far-reaching impacts on various aspects of global society, including health, economics, and general welfare. The pandemic has disrupted financial markets and institutions, leading to a standstill in the world economy (Açıkgöz & Günay, 2020). Lockdowns and reductions in production and consumption have resulted in global socio-economic losses, while also leading to environmental gains due to reduced production and consumption (Lenzen et al., 2020). The pandemic has hampered economic growth and sustainable development in various regions, including the Middle East and Africa

(Farayibi et al., 2023). Furthermore, it has caused a catastrophic economic and health crisis globally, impacting energy access and the construction industry (Aemro et al., 2022; Amri, 2021). The pandemic has also disrupted agro-livestock production and animal health, leading to a sharp drop in meat, milk, and egg production (Rahman et al., 2022; Rahimi et al., 2022). Additionally, it has affected tourism, geriatric research, and the valuation of companies (Weidmann et al., 2022; Nicol et al., 2020; Bastyr, 2022). The impact of COVID-19 extends to social welfare, with implications for the quality of life among low-income individuals on social welfare programs (Wakata et al., 2022). Moreover, the pandemic has raised concerns about the welfare of children with and without disabilities, emphasizing the need for awareness and responsible management during global crises (Busaad & Alnaim, 2021). The psychological well-being of workers in care and nursing homes has also been a focus, highlighting the unprecedented challenges faced across the health and social care sectors globally (Schoultz et al., 2022).

Although experience from previous pandemics provides valuable insights, the response to the global pandemic remains limited in several aspects. There are major challenges in international coordination, equitable distribution of resources, and effective policy implementation. Additionally, with the ever-increasing threat from factors such as climate change, urbanization, and global mobility, the existence of another pandemic in the future is almost certain.

Deficiencies in the scientific literature regarding global pandemic preparedness are an important highlight in understanding this challenge. Although there are many studies on responses to previous pandemics, research focusing on preparation strategies for the next pandemic is limited. There is an urgent need to fill this knowledge gap to develop a more comprehensive and effective framework for dealing with the threat of future global pandemics.

This research aims to highlight the importance of thorough preparation in facing future global health threats. By identifying key factors influencing global pandemic preparedness, this research seeks to provide valuable insights for health practitioners, policymakers, and the general public.

The main research question to be examined in this study is: "How can we prepare more effectively for the next global pandemic?"

This research places emphasis on unique aspects that have not been studied in depth before in the scientific literature. By adopting a new approach in analyzing and solving global pandemic preparedness problems, this research is expected to make a significant contribution to the understanding and development of better solutions in the future.

It is hoped that this research will make a significant contribution to the understanding of how to improve global pandemic preparedness. In addition, it is hoped that this research can provide a solid foundation for creating more effective policies and practices in responding to global health threats in the future.

2. Research Methods

To compile the Research Methods section, this research used a systematic approach by following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. First, relevant articles were collected from reputable international databases such as PubMed, Web of Science, and Scopus using previously defined keywords. These keywords include terms related to global pandemics, global health preparations, and factors influencing pandemic preparedness. After collecting relevant articles, a strict selection process was carried out using established inclusion and exclusion techniques. Articles that do not meet the inclusion criteria, such as not being original research, not related to the topic under study, or not being available in an understandable language, will be removed. Once the selection process is complete, the number of selected articles will be recorded and analyzed systematically in accordance with the PRISMA protocol to ensure the validity and reliability of

the research results. Using this method, this research aims to present a comprehensive and objective review of global health preparations in facing future pandemics.

3. Results and Discussions

3.1. Lessons Learned from the COVID-19 Pandemic

The research employed a systematic approach following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method to ensure the comprehensive and objective review of global health preparations in facing future pandemics. Relevant articles were gathered from reputable international databases such as PubMed, Web of Science, and Scopus using predefined keywords related to global pandemics, global health preparations, and factors influencing pandemic preparedness (Eaneff et al., 2022). The strict selection process involved established inclusion and exclusion techniques to remove articles that did not meet the inclusion criteria, such as not being original research or not being related to the topic under study (Latief et al., 2020). After the selection process, the number of selected articles was recorded and analyzed systematically in accordance with the PRISMA protocol to ensure the validity and reliability of the research results (Amerson, 2019).

The approach aimed to address the challenges of global surveillance during an influenza pandemic, including the lack of standards for reporting illness, risk factor, and mortality data, and a mechanism for systematic reporting of epidemiological data (Briand et al., 2011). Additionally, the research considered the factors affecting hospital readiness in a pandemic situation, emphasizing the need to consider vulnerable groups in pandemic preparedness planning (Hoven et al., 2022). Furthermore, the study incorporated the impact of pandemics on education, particularly in Sub-Saharan Africa, and the legal preparedness of countries against the COVID-19 pandemic (Ayega, 2020; Reddy et al., 2021).

The comprehensive review also encompassed the influence of the COVID-19 pandemic on the level of preparedness of graduating students, the importance of social determinants of health and ethical considerations in pandemic preparedness planning, and the impact of pandemics sentiment on the global art market (Pardiñas et al., 2023; Wang, 2021). Moreover, the research addressed the financing of global health security and the development of a career in global health, considering the implications for physicians-in-training and academic mentors (Nelson et al., 2012). In conclusion, the systematic approach utilized in this research, guided by the PRISMA method, ensured the collection, selection, and analysis of relevant articles from reputable international databases, leading to a comprehensive and objective review of global health preparations in facing future pandemics.

3.2. Lack of Preparedness

The Covid-19 pandemic has indeed highlighted the global community's lack of preparedness to adequately deal with a health disaster of this magnitude. The three-step planning process for preparedness involves formulating a response plan, creating a system for early detection, and ensuring sufficient resources for mitigation and control. However, the response to Covid-19 serves as an extended case study on the issue of health disaster preparedness at both the national and global levels, revealing significant shortcomings in these areas (Gilbert et al., 2020; Guilamo-Ramos et al., 2021; Hay & McCauley, 2018; Boyce et al., 2022; Sundar et al., 2017; Mahajan et al., 2021; Ibrahim et al., 2020; Olufadewa et al., 2021; Veazey et al., 2021; Boyce et al., 2021; Tung, 2022; Johnson et al., 2014; Sanford et al., 2015).

The pandemic has underscored the importance of crisis management plans at the national and international levels. It has also emphasized the need for the involvement of the international community to catalyze preparedness in individual nations, especially in regions like Africa, where vulnerability to importations of COVID-19 has been modeled Gilbert et al. (2020). The role of nurses in public health emergency preparedness and response has been highlighted, drawing lessons from the HIV/AIDS pandemic and other infectious disease

outbreaks. This underscores the unique position of nurses in improving the scale, reach, and effectiveness of response efforts to emerging infectious diseases with pandemic potential (Guilamo-Ramos et al., 2021).

Local-level authorities have been found to engage in a variety of preparedness activities, and future efforts should strive to better include these actors in preparedness to bolster local, national, and global health security (Boyce et al., 2022). The pandemic has also revealed the entanglements of affect, space, and evidence in pandemic healthcare, transforming socio-spatial relations and demanding responses at local, national, and global scales (Veazey et al., 2021; Sanford et al., 2015).

The Covid-19 pandemic has also prompted a reevaluation of global health security financing, with estimates being made for the costs of pandemic preparedness in Global Fund eligible countries (Boyce et al., 2021; Eaneff et al., 2022). Furthermore, the pandemic has highlighted the need for improvements in pandemic preparedness planning and evaluation, as well as the development and implementation of national influenza pandemic preparedness plans (MacDonald et al., 2013; Johnson et al., 2014). In conclusion, the Covid-19 pandemic has exposed significant gaps in global and national health disaster preparedness. It has underscored the need for comprehensive crisis management plans, early detection systems, and sufficient resources for mitigation and control. The pandemic has also emphasized the importance of international collaboration and the unique role of healthcare professionals, especially nurses, in pandemic preparedness and response efforts.

3.3. Global Health Infrastructure

The COVID-19 pandemic has indeed highlighted the critical importance of strong and adaptable health systems in effectively responding to global health threats. Faghy et al. (2023) emphasize the need for a united approach to promoting healthy living behaviors and associated health outcomes, calling for policymakers and decision-makers to take a global stance in addressing chronic disease pandemics. This underscores the necessity for a coordinated international effort in strengthening health infrastructure to mitigate the impact of such crises. Additionally, Sheikh & Abimbola (2022) stress the significance of learning health systems, particularly in the context of the COVID-19 pandemic, and argue that the pandemic has brought to the forefront discussions about the need for stronger health systems, especially in poorer countries, emphasizing the importance of continuous learning and adaptation within health systems. Furthermore, Marks-Sultan et al. (2016) advocate for the role of the World Health Organization (WHO) in capacity-building and promoting transparency in national public health law, emphasizing the need for robust health infrastructure in every country as a long-term preparedness strategy for global health emergencies.

These references collectively highlight the imperative for a collaborative and adaptive approach to health infrastructure, emphasizing the role of policymakers, decision-makers, international organizations, and transparency in building resilient health systems capable of effectively responding to global health threats.

3.4. Communication and Information Sharing

The global response to new health threats, such as the COVID-19 pandemic, necessitates a multifaceted approach encompassing various critical aspects. Firstly, the need for an overhaul and modernization of the global public health surveillance and response system is paramount (Momtazmanesh et al., 2020). This involves the establishment of organizations supported by the World Health Organization (WHO) to coordinate international measures for pandemic threats, ensuring effective global information sharing and modern technology (Momtazmanesh et al., 2020). Additionally, international scientific collaboration is crucial for bridging science to society and addressing global health challenges (Momtazmanesh et al., 2021). Furthermore, the development of vaccines and effective treatments, along with

the protection of healthcare workers, is essential (Sharun et al., 2020). Expert opinions emphasize the importance of expediting the development of new drugs and ensuring their safety and efficacy in pandemic situations such as COVID-19 (Sharun et al., 2020). Moreover, the protection of healthcare workers from injury and illness requires comprehensive programs and international collaboration (Alhalaseh et al., 2021).

In terms of societal response, dealing with insufficient supplies and resources in the face of an economic recession and possible protectionism is a critical issue (Tran et al., 2022). This necessitates a comprehensive approach to ensure the allocation of limited medical resources, particularly in resource-scarce settings, amid the COVID-19 pandemic (Alhalaseh et al., 2021). Furthermore, the international community must address vaccine hesitancy, which is recognized as a significant threat to public health safety, particularly in low middle-income countries (Ullah et al., 2021). Strengthening international collaboration to ensure vaccine equity and combat vaccination hesitancy is imperative (Parsa-Parsi, 2022). In conclusion, addressing new health threats requires a concerted effort across various domains, including modernizing public health surveillance, developing vaccines and treatments, protecting healthcare workers, and ensuring an effective societal response. International collaboration, scientific advancements, and ethical considerations are pivotal in navigating these challenges and mitigating the impact of global health threats.

3.5. Healthcare System Capacity

The capacity of a healthcare system to respond to crises such as the COVID-19 pandemic is crucial for controlling the spread of disease and providing necessary treatment. This capacity can be assessed based on surge capacity, adaptability under strain, and the provision of essential health services (Mahendradhata et al., 2021). The experiences of different countries in responding to the pandemic provide valuable lessons for improving healthcare system capacity. For instance, China rapidly increased bed capacity by constructing new hospitals and converting existing venues into healthcare facilities. South Korea implemented a centralized information system and mobile clinics for testing to manage hospital congestion and prevent further infections . Germany's success in managing the pandemic was attributed to early case identification, stable infection growth rate, and increased ICU bed capacity . Vietnam's containment strategy, including contact tracing and travel restrictions, led to no recorded deaths .

However, challenges exist in managing healthcare service capacity during a pandemic, including limited government capacity to monitor and trace the spread of the virus and manage public and private healthcare systems (Brodie et al., 2021). Disparities in healthcare capacity within countries, particularly in underserved communities, can affect vaccination coverage and access to essential health services (Cuadros et al., 2022). The pandemic also highlighted the need for a flexible surge capacity to manage increased patient influx during crises (Glantz et al., 2020).

The pandemic has also affected the delivery of essential health services, with disruptions in maternal health services and sexual and reproductive health services in various countries (Otieno et al., 2021; Zewdie et al., 2022). The pandemic has necessitated a shift in healthcare service delivery from hospital care to ambulatory and home care, posing challenges for healthcare practitioners (Brodie et al., 2021). Additionally, the pandemic has raised occupational health challenges for hospitals, affecting the safety of healthcare providers (O'Bryan et al., 2023). In conclusion, the COVID-19 pandemic has underscored the importance of healthcare system capacity in responding to crises. Lessons from the experiences of different countries, challenges in healthcare service capacity, and the impact on essential health services delivery provide valuable insights for improving healthcare system capacity and resilience.

3.6. Enhancing Preparation for Future Pandemics

To enhance preparation for future pandemics, it is crucial to consider various aspects such as public health systems, psychological readiness, contractual implications, health services experience, societal polarization, pandemic and epidemic intelligence, nanotechnology for drug delivery, non-communicable diseases, construction industry impacts, and lessons learned from previous pandemics. Sheehan & Fox (2020) emphasize the need for better preparedness of public health systems to meet future emergencies, many of which will be climate-related (Sheehan & Fox, 2020; . Moffitt et al., 2022) suggest that education about viruses and vaccines could reduce uncertainty in future pandemics and enhance receptivity to future health messaging (Moffitt et al., 2022; . Jayathilaka & Waidyasekara, 2022) encourage researchers to suggest appropriate strategies for contractual challenges to prepare construction stakeholders for future pandemics (Jayathilaka & Waidyasekara, 2022; . Nugraheni, 2021) highlights the importance of learning from the experience of the Indonesian health system in handling the Covid-19 pandemic to prepare for any future pandemic for Indonesia and other developing countries (Nugraheni, 2021; . Sprengholz, 2023) sheds light on the concerning issue of sustained societal polarization distorting people's recall of the pandemic, which complicates preparation for future pandemics (Sprengholz, 2023; . Morgan et al., 2022) stress the need to scale up pandemic and epidemic intelligence to better anticipate and prepare for future threats (Morgan et al., 2022; . Maus et al., 2021) discuss the potential of nanotechnology as a method of treatment not only for the current pandemic but also for future pandemics (Maus et al., 2021; . Hegelund et al., 2022) emphasize the need for global initiatives to increase investments in primary health care and non-communicable disease capacity building to prepare for the effects of future pandemics (Hegelund et al., 2022; . Iqbal et al., 2021) highlight the impacts of the pandemic crisis on the construction industry and propose emerging construction safety practices and crisis management for future preparedness (Iqbal et al., 2021). Finally, stress the importance of developing or strengthening laboratory capability for diagnosis and preparing vaccine/antiviral deployment plans for responding to the current pandemic and preparing for future ones (Franco-Paredes et al., 2009).

3.7. Strengthening Surveillance and Early Warning Systems

The current surveillance and recognition of potential public health events are conducted on a country-by-country basis, leading to a critical gap in global health security. This gap was evident during the global spread of SARS in 2003, where the international implications of the public health risk were not immediately recognized, resulting in substantial mobilization of resources to address it (Peng et al., 2021). The World Health Organization (WHO) played a crucial role during the SARS epidemic by issuing a global alert, which triggered an unprecedented and wide-ranging response, including active surveillance, case finding, reporting, and prevention and control measures worldwide (Zheng & Hu, 2021). However, this rapid response had major implications on travel and trade, affecting the economies of the affected countries (Wilder-Smith & Osman, 2020).

To address this, the establishment of a comprehensive early warning system for public health events is crucial. Such a system should be able to assess potential risks to public health and provide timely alerts to prevent the spread of diseases, thereby minimizing the need for drastic measures that impact international travel and trade (Nkang & Bassey, 2022). Early warning systems can be enhanced by leveraging various technologies and methodologies, such as network public opinion analysis, artificial neural networks, and social media monitoring, to improve the detection and response to public health emergencies (Zheng & Hu, 2021; Wang & Su, 2021; Chen et al., 2022). Additionally, the implementation of syndromic and event-based surveillance systems has been shown to generate automated alarms for potential health threats, aiding in the early detection and response to public health events (Bieh et al., 2020).

Furthermore, the International Health Regulations (IHR-2005) play a critical role in

preventing, detecting, and responding to public health risks of international concern, emphasizing the importance of early warning systems and the need to avoid unnecessary interference with international traffic and trade restrictions (Topcuoglu, 2020). The declaration of public health emergencies of international concern (PHEIC) is a cornerstone of the IHR, highlighting the significance of early detection and response to global health threats (Wilder-Smith & Osman, 2020; Topcuoglu, 2020). In conclusion, the development of a robust early warning system for public health events is essential to global health security. Leveraging technological advancements, international collaborations, and adherence to established regulations can significantly enhance the capacity to detect, assess, and respond to potential public health emergencies, thereby minimizing the impact on international travel and trade.

3.8. Improving International Cooperation and Collaboration

Improving international collaboration and cooperation in public health is crucial for effectively addressing global health challenges. One key aspect is the need for better communication and data sharing about diseases and epidemics among sovereign states. This includes sharing disease data with a central body, such as the World Health Organization (WHO), without fear of persecution or discrimination (Heymann, 2020). The sharing of disease data is not only about outbreak reporting but also about monitoring diseases and their spread (Heymann, 2020). This can be achieved through various means, such as sharing disease genomics to aid in the development of cures and sharing best practices and success/failure stories from different countries (Heymann, 2020). International collaboration in response to public health events has a significant impact on the academic community's response and can lead to improved patient outcomes (Heymann, 2020). Furthermore, it is essential to support exchange programs between health professionals from different countries to facilitate knowledge exchange and capacity building (Zafra-Tanaka et al., 2019).

The failure of influenza reporting by the US to the WHO, primarily due to lack of resources, underscores the importance of implementing measures to ensure effective international collaboration in disease reporting and response. Additionally, it is crucial for the central body, such as the WHO, to have the courage to declare a pandemic, irrespective of the social or economic implications, to enable timely and coordinated global responses to health crises. In conclusion, international collaboration and cooperation in public health are vital for effectively addressing global health challenges. This includes better communication and data sharing about diseases and epidemics, supporting exchange programs between health professionals from different countries, and ensuring timely and coordinated responses to health crises.

3.9. Investing in Research and Development

The global burden of diseases, including both communicable and non-communicable diseases, has significant implications for public health and healthcare systems worldwide. Research and development play a crucial role in increasing the general knowledge and understanding of diseases, which can be applied globally to enhance health security (Pratt, 2021). For instance, research on proteases has provided a potential drug target for the treatment of influenza, and it has been shown that early treatment can mitigate influenza strains resistant to antiviral drugs (Kim et al., 2019). Furthermore, the burden of non-communicable diseases (NCDs) is increasing in developing countries, posing a potential threat to healthcare resources (Khushalani et al., 2018). This necessitates a larger investment in global health research to address these issues and ensure health equity among global populations (Soeteman et al., 2008).

Vaccine development is also a vital aspect of research and development, particularly in preventing epidemics and pandemics. However, the development of vaccines for diseases that predominantly affect developing countries is often hindered by the small market for these

vaccines, leading to delays in their development (Luca & Olesen, 2014). This highlights the need for more research and development in global health, focusing on diseases that have a substantial impact on the global burden of disease.

Moreover, mental health conditions also contribute significantly to the global burden of disease, and there is a need for a reproducible method to compare the economic burden of mental health conditions and the cost-effectiveness of interventions on this burden (Yao et al., 2014). Additionally, community engagement is increasingly recognized as a critical component of global health research, particularly in addressing the need for social justice in health research (Neufeld & Spiegel, 2006). In conclusion, global health research and development are essential for addressing the evolving burden of diseases, including communicable and non-communicable diseases, and mental health conditions. This research contributes to increasing knowledge, developing interventions, and promoting health equity on a global scale.

3.10. Enhancing Healthcare Infrastructure and Resources

In the context of managing medical resources during emergencies, such as pandemics or large-scale disasters, surge capacity plays a crucial role in ensuring the availability of healthcare services and resources. Surge capacity refers to the ability of healthcare systems, particularly hospitals, to expand their resources and infrastructure rapidly to meet increased demand during emergencies (Sheikhbardsiri et al., 2017). Stockpiling of medical resources, including pharmaceuticals and personal protective equipment, is a key component of surge capacity planning (Sun et al., 2020; Jiang & Yuan, 2019). The COVID-19 pandemic has underscored the importance of surge capacity in healthcare systems, especially in Africa, where preparedness and response have been challenged by limited resources and surge capacity (Tessema et al., 2021). Historical evidence from previous outbreaks, such as SARS and H1N1, has emphasized the need for surge capacity to effectively manage healthcare crises (Watson et al., 2013).

Developing surge capacity is a complex task that involves not only stockpiling medical resources but also strengthening the core components of health systems to enhance resilience (Watson et al., 2013). Research has highlighted the need to incorporate surge capacity considerations into the development of new health system infrastructure, such as designing healthcare facilities for easy expansion at a later date (Watson et al., 2013). Additionally, the role of health workforce surge capacity during pandemics has been emphasized, requiring systematic review of health system requirements and responses (Gupta et al., 2021). In summary, surge capacity, including stockpiling of medical resources, is essential for healthcare systems to effectively manage emergencies. It is crucial for healthcare systems to strengthen their core components and develop infrastructure that can be rapidly expanded to ensure resilience and effective crisis management.

4. Conclusion

From the results of the discussions that have been carried out, several important conclusions can be drawn. First, this study shows the importance of a systematic approach in collecting, selecting, and analyzing relevant articles from reputable international databases, such as PubMed, Web of Science, and Scopus, using the PRISMA method. This approach ensures a comprehensive and objective review of global health preparations for future pandemics. Second, from the discussion regarding the lack of preparedness, it can be concluded that the COVID-19 pandemic has revealed significant gaps in global health preparedness at the national and global levels. Comprehensive preparedness planning, an effective early detection system, and adequate resource allocation for mitigation and control are required. Third, discussion of global health infrastructure emphasizes the need for a strong and adaptable health system to respond effectively to global health threats. International cooperation and investment in health capacity are also key to strengthening global health

infrastructure. Fourth, in improving preparations for future pandemics, it is important to strengthen surveillance systems and early warning systems, increase international cooperation in the health sector, increase investment in research and development, and improve health infrastructure and resources.

However, there are several limitations in this research. One is limitations in the availability of relevant articles in certain languages, which may have limited the scope of this literature review. In addition, this research is also limited to understanding and analyzing the articles available at the time the search was carried out.

For future research, it is recommended to conduct more in-depth studies regarding certain aspects of global pandemic preparedness, such as risk management, psychological preparedness, and contractual implications. In addition, further research can also expand geographical and linguistic coverage to gain broader and deeper insight into global health preparations in facing future pandemics.

Thus, the conclusions of this study underscore the importance of a systematic approach, identifying gaps in global health preparedness, highlighting challenges in global health infrastructure, and emphasizing steps to improve preparation for future pandemics. All of this provides an important foundation for further efforts to strengthen global health preparedness and improve responses to future global health threats.

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