

One Health and Zoonotic Disease in Indonesia: The Urgency of Implementation and Challenges

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Abstract

The urgency of implementing the "One Health" approach to overcome zoonotic diseases cannot be overstated. By recognizing the interconnectedness of human health, animal health, and the environment, we can effectively prevent and respond to emerging infectious disease threats. This correspondence provides information on the importance of generating research on zoonotic diseases, especially in Indonesia, where research is still relatively scarce. The urgency and challenges are focused on critical implementation aspects in the community. The urgency of implementing one-health includes that Indonesia has experienced several outbreaks of zoonotic diseases and high environmental degradation, and the antimicrobial resistance (AMR) issue in Indonesia has increased. The challenges faced in implementing one-health include overcoming fragmentation, securing funding, aligning policies, building capacity, addressing socioeconomic factors critical to the successful implementation of the one-health approach, protecting communities, and paying attention to critical aspects of success carried out by all relevant sectors. By prioritizing implementing the One Health approach and addressing existing challenges, Indonesia can build a more resilient and integrated system to protect population health and prevent outbreaks.

Keywords: one health, zoonotic diseases, communicable disease, Indonesia

1. Introduction

Zoonotic diseases are infections caused by pathogens that can be transmitted from animals to humans [1–3]. This disease has long been part of human history, as have rabies, influenza, and Japanese encephalitis originating in animals. However, the emergence of new zoonotic diseases in recent years, such as SARS-CoV-2 (the virus that causes COVID-19), Ebola, Zika, dengue, schistosomiasis, and monkeypox, has highlighted the urgent need for a comprehensive approach to disease prevention and control [4–7]. One critical aspect of this linkage is the emergence and spread of zoonotic diseases, which significantly threaten human health. Understanding health principles and the complexity of zoonotic diseases is critical to maintaining global health and preventing future pandemics [8–10].

The One Health approach recognizes that human, animal, and environmental health are interconnected [11]. It recognizes that the health of each sector is affected by the other and calls for collaborative efforts among human health professionals, veterinarians, ecologists, environmental scientists, and policymakers to address complex health challenges effectively. By integrating knowledge and expertise from different disciplines, One Health seeks to prevent and control zoonotic diseases at their source, mitigating their impact on public health. This review can reflect how vital the application of the current health concept is to reduce the incidence of zoonotic diseases, especially in Indonesia and worldwide. This review seeks to explain the urgency of implementation and challenges of implementing the concept of one health in efforts to prevent, control and control zoonotic diseases in Indonesia.

2. The urgency of applying the one-health concept to zoonotic diseases in Indonesia

Zoonotic diseases are infectious diseases that can be transmitted between animals and humans.

The disease can spread through direct contact with infected animals, ingestion of contaminated food or water, or exposure to vectors such as fleas, mosquitoes, snails, etc [12,13]. Zoonotic

diseases that until now have not been appropriately handled in Indonesia include dengue virus infections, malaria, rabies, chikungunya, leptospirosis, bubonic plague, brucellosis, and others [14–16]. The Indonesian government has taken steps to implement the One Health approach. The country has established the One Health Coordinating Unit and the National Zoonosis Committee, demonstrating the government's commitment to comprehensively addressing zoonotic diseases [17,18]. However, implementation in the field has not been optimal; this can also be seen from the various studies we analyzed using bibliometric analysis, finding that the focus of research related to one health, especially in Indonesia, is minimal (32 articles) from 2016 to 2022 and has shifted, primarily focusing on the latest issues, so that the topic of one health is only associated with not focusing on the use of the research foundation [19,20].

This can be seen in Figure 1, relating to terms that have changed from year to year and the focus on topics that still need further development and research. The concept of one health is not directly a central topic [21]. However, it is only associated with it, so future research is essential to understanding disease dynamics through a one-health approach [22,23]. Our findings are 11 clusters containing "health" in 32 research articles obtained in PubMed and SCOPUS (Figure 1a). This indicates that this topic still needs to be studied more deeply. Co-occurrences that are hotly discussed are "leptospirosis," "malaria primates," "primates," "human infections," "anthrax," "rat," and "village" (Figures 1 a and b). Zoonotic diseases are emerging, but a comprehensive approach has yet to be widely taken. Furthermore, density visualization analysis shows that current research focuses on diseases originating in rural areas, especially "primates," by identifying isolates and prevention and control strategies (Figure 1c). Finally, based on the distribution and network of the authors, one network was obtained, which indicates that only this group of authors contributed to the development of the concept of one health in zoonotic diseases.

The ⁴One Health concept is an interdisciplinary approach that recognizes the interconnectedness of human health, animal health, and the environment [24,25]. It emphasizes collaborative efforts ¹¹from various sectors, including human medicine, veterinary medicine, environmental science, and public health, to comprehensively address health issues [26,27]. ⁸The concept of "One Health" is very relevant to zoonotic diseases in Indonesia due to the country's unique ecological and socioeconomic factors. Indonesia is a diverse country with a large population and rich biodiversity, making it vulnerable to zoonotic disease outbreaks. By adopting the One Health approach, Indonesia can improve its preparedness, surveillance, and response to zoonotic diseases [28,29]. This collaborative and interdisciplinary approach can improve the health and well-being of people and animals, ensuring a safer and healthier future for the country.

There are several reasons why the government, society, and related sectors must implement the concept of one health throughout Indonesia. First, Indonesia has a high burden of zoonotic diseases. Along the way, Indonesia has experienced several outbreaks of zoonotic diseases, such as bird flu, rabies, and especially the COVID-19 pandemic. The outbreak highlights the urgent need to address the interconnectedness of human and animal health. Human health, animal health, and environmental health are intricately linked. Many infectious diseases originate in animals and can spread quickly to humans. By addressing the health of animals and their ecosystems, we can prevent the emergence and spread of zoonotic diseases. Implementing a One Health approach is critical to effectively detecting, preventing, and responding to these emerging threats [30,31].

Second, there has been high environmental degradation, mediated by rapid urbanization, deforestation, and wildlife trafficking, contributing to habitat loss, increased human–wildlife interaction, and an overflow of zoonotic diseases. Consumption of meat contaminated with viruses or pathogens can result in new sources of outbreaks that endanger human health.

Zoonotic disease outbreaks have severe economic consequences impacting various sectors, including agriculture, tourism, and high public health spending. One-Health approaches can help mitigate these economic losses by preventing and controlling zoonotic diseases at their source and considering efficiency and effectiveness in their implementation [32,33].

Third, the antimicrobial resistance (AMR) issue in Indonesia has increased, so efforts are needed to minimize it. Zoonotic diseases contribute significantly to the emergence and spread of antimicrobial resistance [30]. Overusing and abusing antimicrobials in human medicine and animal husbandry contribute to the development of drug-resistant pathogens. The One Health approach promotes responsible antimicrobial use, surveillance, and coordinated action to combat AMR effectively. One Health recognizes these interconnected drivers and emphasizes **5** the importance of a holistic and collaborative approach to disease surveillance, prevention, and response [34,35]. By strengthening surveillance systems at the human-animal-environment interface, potential outbreaks can be detected and contained before escalating into a full-blown pandemic.

3. Challenges of implementing the one-health concept in Indonesia

Despite the high urgency of implementing One Health in Indonesia, several challenges contribute to the slowdown in implementing this approach. First, the approach and communication could be more cohesive. One of the main challenges in implementing the One Health approach is the fragmentation of the various sectors involved, including human health, veterinary medicine, and environmental conservation. These sectors have traditionally operated independently, resulting in a need for coordination and information sharing.

Effective communication and collaboration among these sectors are critical to successful implementation. Second, with limited funding and resources, implementing the One Health approach requires adequate financial investment and resources. However, funding for the One Health initiative still needs to be improved, hampering its implementation and sustainability.

Governments, international organizations, and stakeholders should prioritize funding and resource allocation for research, surveillance, capacity building, and infrastructure development.

Third, there are policy and regulatory barriers: existing policies and regulations often must align with the One Health approach. Harmonizing regulations and developing cross-sector policies encouraging collaboration and data sharing are necessary. Overcoming bureaucratic hurdles and encouraging interdisciplinary cooperation can be challenging but critical for effective implementation. Fourth, capacity building and education ¹Increasing the capacity of professionals in human and animal health is critical to successful implementation. This requires training programs that foster interdisciplinary collaboration and knowledge sharing.

In addition, public awareness and education campaigns are needed to promote understanding and support for One Health approaches among the general public. Fifth, socioeconomic factors: to overcome zoonotic diseases and apply the One Health approach, we must consider socioeconomic factors. Many communities depend on livestock for their livelihoods, and their economic concerns may conflict with disease control measures such as culling or restrictions on movement. Balancing economic considerations with public health priorities is a complex challenge that requires careful navigation [2,21].

4. Key to the Successful Implementation of the One-Health Concept in Indonesia

Based on the urgency and challenges identified, several recommendations have become critical aspects of the ⁹One Health concept in relation to zoonotic diseases, especially in Indonesia, including ⁹the need for multidisciplinary collaboration. The ⁹One Health approach brings together experts from various fields to work collaboratively. These include human and veterinary medicine professionals, epidemiology, ecology, environmental science, and others

[2,17]. They can better understand and respond to zoonotic diseases by sharing knowledge and expertise.

Furthermore, disease surveillance and early warning systems are needed, which is possible by implementing One Health to establish a comprehensive disease surveillance system to monitor animal and human populations [9,16]. By detecting and reporting disease outbreaks early, interventions can be implemented immediately to prevent further spread. Regarding research and data sharing, the One Health approach encourages zoonotic disease research, including their origin, transmission dynamics, and prevention strategies. Sharing data and findings across disciplines and institutions enhances our understanding of the disease and informs evidence-based interventions [23].

Other vital considerations to successfully implement the One Health concept include preventive and control measures. The One Health concept emphasizes preventive actions to reduce the risk of zoonotic diseases [36]. These include promoting animal vaccination programs, improving hygiene practices, improving biosecurity measures in livestock production, and controlling disease vectors. In addition, considering the environment is vital because the health of ecosystems and the environment is significant for preventing zoonotic diseases. One Health recognizes ⁵ the impact of environmental factors, such as deforestation, climate change, and biodiversity loss, on disease emergence. Protecting natural habitats and promoting sustainable practices can help reduce these risks [18,20].

Finally, public awareness and education contribute to applying the "One Health" concept by advocating for public awareness and education campaigns to promote a better understanding of zoonotic diseases and their prevention [13,19]. By increasing knowledge and changing behavior, individuals can adopt practices that reduce the transmission of zoonotic diseases.

5. Conclusion

One Health offers a comprehensive framework to address the complex challenges posed by zoonotic diseases. This approach fosters collaboration, information sharing, and coordinated action across disciplines by recognizing ¹² the interconnectedness of human, animal, and environmental health. Implementing the One Health principle is imperative as we continue to address the impact of the COVID-19 pandemic and prepare for future health threats. Through a holistic and integrated approach, we can protect the well-being of all species, protect ecosystems, and prevent the devastating effects of zoonotic diseases on global health. In the future, it is expected that many studies will generate ⁸ the concept of one-health to eradicate zoonotic diseases and improve the quality of the concept so that it can be used sustainably.

Declarations

Competing interests : The authors declare that there is no conflict of interest.

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Figure

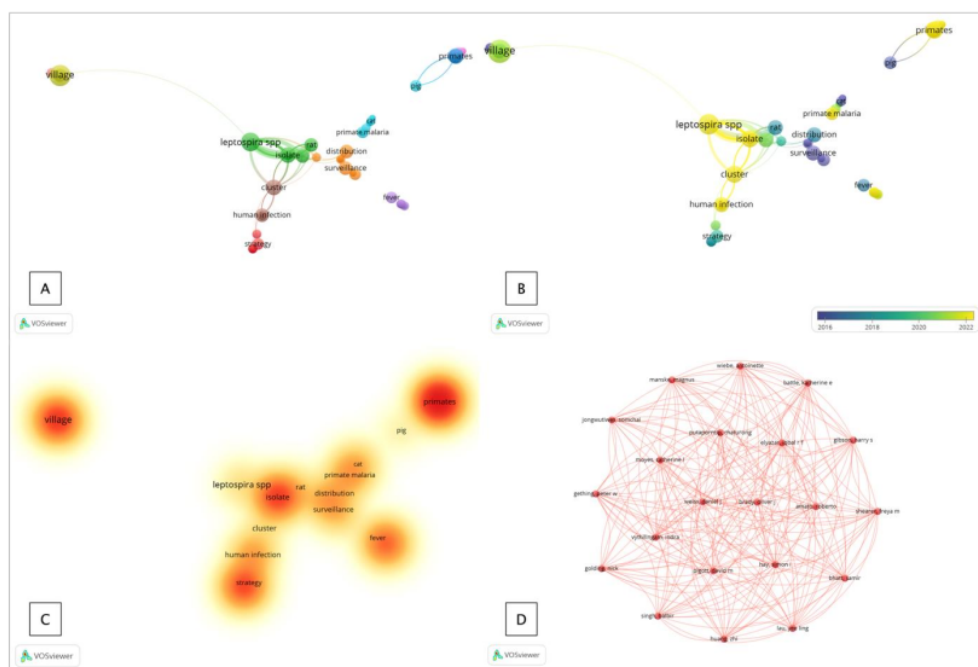


Figure 1. Mapping and visualization of the term "co-occurrence" (one-health) in its application to zoonotic diseases. Description: (a) clusters and terms used as keywords; (b) overlay visualizations related to developments and changes in research topics from 2016–2022; (c) density visualizations related to the depth of the one-health concept in each research topic; and (d) author networks on the topic of one-health and zoonotic diseases.

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