

One health strategy in prevention and control of parasitic zoonosis globally and Indonesia-from theory to practice: a mini-review



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ABSTRACT

Infections caused by parasites infect millions of people worldwide, especially in developing countries. Most parasites have a life cycle that lives in hosts (animals or humans) and the environment; thus, the One Health approach is an advanced strategy to overcome these challenges. Recently, One Health has become important as it considers several factors of the connection between humans, animals and the environment. This study aims to understand the One Health Approach as a strategy to prevent and control parasitic zoonosis globally and in Indonesia. We used a literature review using PubMed and Google Scholar based on PRISMA guidelines. Our review identified 22 recommendations and applications of the One Health strategy to handle zoonotic parasitic diseases globally and in Indonesia. There are theoretical and practical gaps in the implementation of this strategy. Further studies are needed to implement better One Health of combating parasitic zoonosis globally and in Indonesia.

Keywords: One Health application, parasitic zoonotic diseases, globally, Indonesia.

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INTRODUCTION

A parasite is an organism that undergoes part or all of its life cycle in the host's body and obtains nutrients from the host's body.¹ Parasites are the cause of infectious diseases that are mild to severe (death). Infections caused by parasites infect millions of people worldwide, especially in developing countries.² In general, parasitic infectious diseases fall into two categories, ectoparasites (arthropods) and endoparasites, namely diseases caused by protists (single-celled organisms) and diseases caused by helminths (worms). Parasites can infect humans through various intermediaries. One of the intermediaries of parasite infection is the animal (zoonotic). Animals can become infected with parasites through the food or drinks they consume. The feces of animals infected by parasites can indirectly spread to food or drink consumed by humans. This problem can occur when the water source used daily is located close to the cage of an infected animal, eating fruits

or vegetables that have not been washed thoroughly, not washing hands after taking care of livestock or consuming the meat of an immature or undercooked infected animal.¹

Most parasites have a life cycle that lives in hosts (animals or humans) and the environment; thus, the One Health approach is an advanced method to tackle this problem. One Health is a collaborative, multisectoral, and transdisciplinary approach in the local, regional, national, and even global scope that aims to achieve optimal health. This optimal health can be achieved by realizing the interrelationship of relationships between human health, animals, and the surrounding environment. The concept of One Health focuses on the consequences, actions, and responses of things related to humans, animals, and the environment/ecosystem around them, one of which is zoonoses. Zoonoses are diseases that spread from animals to humans. More than half of the infections that occur worldwide are caused

by animal transmission.³

Recently, One Health has become important to pay attention to because several factors can change the connection between humans, animals and the environment. This connection can certainly affect the achievement of the goal of One Health, namely optimal health. The factors in question are significantly increasing changes in human populations, climate change and land use, and an increase in the movement of people, animals, and animal products due to buying and selling and travel activities. These factors can affect the spread of zoonotic diseases.⁴ According to WHO 2017, 'One Health' is an approach designed and program implemented, rules, legislation and research in which various communication sectors work together to achieve better public health. The work areas of the 'one health' system are particularly relevant to food security, zoonotic control (diseases that can spread between animals and humans, such as flu, rabies, and Rift

Valley Fever), and eradicating antibiotic resistance.⁴ The CDC defines 'One Health' as an approach recognizing that human health is closely related to animal health and the environment. This thing is not new, but it is becoming more important in the present concerning various factors that cause changes in the interaction between humans, animals, plants, and the surrounding environment.³ This study's objective is to understand One Health recommendation and implementation of parasitic zoonosis globally and in Indonesia.

RESEARCH DESIGN AND METHODS

This study's ethical clearance register number was 64/UN27.06.11/KEP/EC/2022. This systematic review was conducted based on the outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines 2020 expanded version. Systematic literature searches of electronic databases, including Google Scholar and PubMed, up to 18 July 2022 using the following search terms (Table 1).

The following inclusion criteria were included to select articles for literature review: (i) information was provided related to One Health recommendation to prevent and control parasitic zoonosis globally and in Indonesia, (ii) information was provided related to One Health implementation to prevent and control parasitic zoonosis globally and in Indonesia (iii) provided sufficient data of country/region, pathogen/disease studied, host studied, and One Health recommendation or implementation of parasitic zoonosis globally or in Indonesia. Studies were excluded if: (i) the article was unavailable in English or Indonesian, (ii) the full text could not be retrieved, and (iii) the article was not relevant with the study.

RESULTS

Our review identified 22 zoonotic parasitic diseases globally and in Indonesia, recommending the use of One Health approach and One Health application globally and in Indonesia (Figure 1).

Table 1. Search terms and synonyms used for the study.

Term	Search Terms and Synonyms Used
One Health Application	"one health" OR "one health application" "prevention" OR
Parasitic Zoonosis World and Indonesia	"control" "parasitic zoonosis" OR "zoonosis" OR "parasit" "Indonesia"

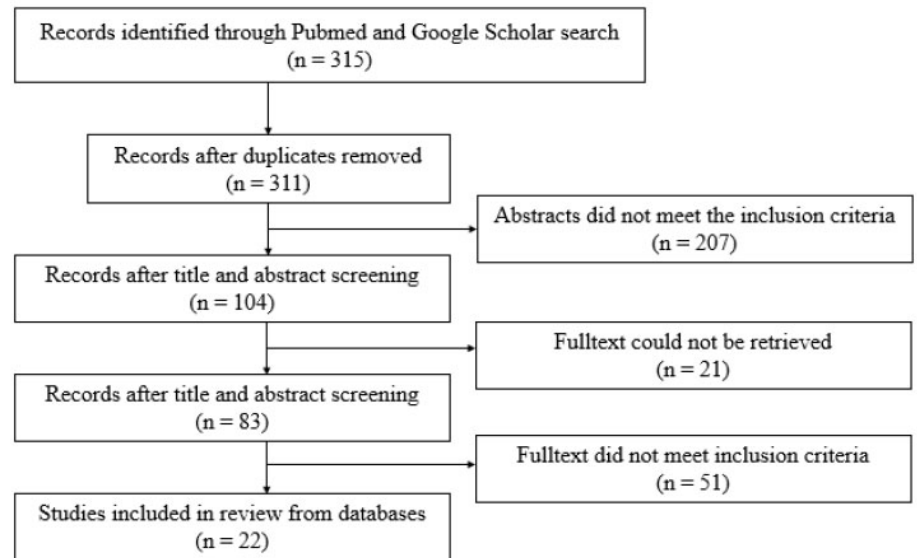


Figure 1. Flow diagram of search strategy of One Health application parasitic zoonosis worldwide and Indonesia.

One Health Suggestion of Parasitic Zoonosis Prevention and Control Globally

Most studies (16) suggested One Health strategy to prevent and/or control parasitic zoonotic diseases worldwide as described below.

The studies were gathered worldwide, including in Asia, Africa, and Latin America. Most studies focused on helminth infections (Taeniasis, Schistosomiasis, Toxocariasis, Thelaziasis, Trichinellosis, and Strongyloidiasis). We identified 5 studies that recommend One Health to prevent and control parasitic zoonosis from domestic animals, 4 studies from wild animals, and 5 studies from pets. These stressed the importance of One Health to prevent and control zoonotic parasitic diseases from livestock, wild animals, and pets, especially helminth infections in developing countries.

One Health Application of Parasitic Zoonosis Prevention and Control Globally

Our study found one study that applies One Health Approach in Spain by identifying

zoonotic intestinal protozoans as the first step in preventing and controlling parasitic zoonosis.

In Spain, *Rattus norvegicus* lived close to humans. These rodents become reservoirs of zoonotic parasites of rodents. Zoonotic Identification of Intestinal Protozoans (ZIP) in the population of *R. norvegicus* in Spain was carried out with a One Health approach. With this approach, it was found that the prevalence was significant due to poor sanitation. The increase in zoonotic cases of Norway rats is due to the increasing urbanization of the whole world, climate change, and the Covid-19 pandemic, which is increasing human interaction with rats at home.²¹

One Health Suggestion of Parasitic Zoonosis Prevention and Control in Indonesia

Several studies in Indonesia suggest One Health to prevent and control zoonotic parasitic diseases, as shown below.

Most of the studies focused on protozoan parasites but with a wide range of hosts including humans, wild animals (non-human primates), livestock, and

pets. Most of the diseases in the studies use vectors (Malaria and Trypanosomiasis) to infect humans. These indicate the importance of vector control as one of Indonesia's One Health strategies to manage infectious parasitic zoonosis.

One Health Application of Parasitic Zoonosis Prevention and Control in Indonesia

A study was carried out using the One Health approach to prevent and control Cryptosporidian parasite by discovering

the factors of infection in Yogyakarta, Indonesia.

In Yogyakarta, a study analyzing the livestock communities of cryptosporidiosis parasitic zoonoses using the One Health method can determine the potential for

Table 2. Studies suggested One Health to prevent and control parasitic zoonosis worldwide.

Country/Region	Pathogen/Disease Studied	Host Studied	One Health recommendation	References
Sub Saharan Africa	Taeniasis	Pig	One Health to control <i>T.solium</i> involves intersectoral collaboration (medical doctors, veterinarians, environmental, and social sectors).	5
Zambia	Taeniasis	Pig	One Health as a tool to control involves not only animal, human, and enviromental health but also agronomy, ecology, and socio-cultural perspectives.	6
Italy	Cat parasites	Cat	Application of the One Health concept for endo- and ectoparasitocides to prevent human infection	7
Brazil	Leishmaniasis	Captive primates	Applying a One Health approach (human-animal-environmental health) to prevent and control disease and protect endangered species.	8
People's Republic of China, the Philippines, and Indonesia	Schistosomiasis	Domestic animals	One Health perspective to control Schistosomiasis following increased flooding.	9
Asia	<i>Blastocystis spp.</i>	Human and animals	One Health is proposed for future study of <i>Blastocystis spp.</i> to achieve optimal health outcomes through the recognition of interconnection between people, animals and their shared environment with a collaborative, multisectoral and transdisciplinary approach	10
Uganda	Schistosomiasis and Giardiasis	Human and snail	One Health approach for intestinal Schistosomiasis and giardiasis for improvements in health and wellbeing.	11
East, South East, and South Asia	Cysticercosis (<i>T. saginata</i>)	Humans and cattle	One Health implementation of human, animal, and environmental health.	12
Worldwide	Helminths and arthropods	Cats and dogs	Better management of these diseases with 'One Health' approach using complex wildlife-domestic animals-humans-parasites relationships	13
Worldwide	Strongyloidiasis	Cats, dogs, non-human primates, humans	A combined medical and veterinary public health (One Health) approach is recommended to support of the WHO 2030 goal for the global elimination of strongyloidiasis.	14
Worldwide	Theileriosis	dogs	From One Health's perspective, the parasite's zoonotic nature should be studied.	15
China	Thelaziasis	humans	The use of a One Health approach to preventing eyeworm infections in humans.	16
Far East Countries	Taenia and Trichinella	Humans and animals	A One Health approach is needed to control foodborne zoonotic taeniasis and trichinellosis.	17
Worldwide	Scabies	Dog, primates, pigs, cats	One Health approach to preventing and control zoonotic scabies by increasing surveillance in high-risk occupations and during outbreaks by improving communication between animal and human health sectors.	18
Worldwide	Nematodes	Wild carnivores	the 'One Health' approach prevents zoonotic nematodes from wild carnivores with conservation consideration and risk management.	19
Worldwide	Toxocariasis	Humans	A One Health strategy to improve the knowledge base and prevent and control toxocariasis.	20

Table 3. Table of a study which applies One Health for prevention and control of parasitic zoonotic diseases worldwide.

Country	Pathogen Studied	Host Studied	One Health Application	References
Spain	Zoonotic Intestinal Protozoans	Norway Rats (<i>R. Norvegicus</i>)	Identification of Zoonotic Intestinal Protozoans of <i>R. Norvegicus</i> using One Health Strategy	²¹

Table 4. Studies suggested One Health prevent and control parasitic zoonosis in Indonesia.

Indonesian Region	Pathogen/ Disease Studied	Host Studied	One Health recommendation	References
Indonesia	Malaria	Primates	One Health approach (environmental, non-human primate conservation, disease management, and vector control) to conduct mitigate malaria.	²²
East Nusa Tenggara.	Anisakiasis, Toxoplasmosis, Cysticercosis	Fish (Anisakiasis), cats and dogs (Toxoplasmosis), pigs (Cysticercosis), humans (Anisakiasis, Toxoplasmosis, Cysticercosis)	One Health importance for control of zoonotic diseases in East Nusa Tenggara.	²³
Indonesia	Malaria	Livestock, pet, poultry, humans	Implementing a “One Health” strategy to control malaria in Indonesia by 2030.	²⁴
Indonesia	Trypanosomiasis	Livestock and humans	One Health to prevent and control Trypanosomiasis by surveillance with collaboration of animal, human, and environmental health sectors.	²⁵

Table 5. Table of a study which apply One Health for prevention and control of parasitic zoonotic diseases in Indonesia.

Indonesian Region	Disease studied	Host studied	One Health Application	References
Yogyakarta	Cryptosporidiosis	Livestock and humans	Cryptosporidiosis parasitic zoonoses using the One Health method to determine the potential for <i>Cryptosporidium</i> sp. transmission, risk factors, and infection control	²⁶

infection transmission, risk factors, and infection control.²⁶

DISCUSSION

One health concept was first used in 2003-2004 because of the spread of severe acute respiratory syndrome (SARS) in early 2003 and the high spread of avian influenza H5N1 virus. Both cases sparked awareness of human-animal-environmental linkages and the importance of collaborative and multidisciplinary approaches to managing various diseases. The conference acknowledged the existence of a link between human and animal health and the threat of disease to the food supply and the economy. These principles are vital steps in understanding the urgency of working together, cross-disciplinary review to respond to emerging and re-emerging diseases, and, more specifically, wildlife health as essential to global disease prevention, surveillance, control, and mitigation.^{3,27}

Globally, One Health is an effective way of dealing with human, animal, and environmental health issues including

zoonotic diseases. Creating effective One Health requires communication, coordination, and collaboration in human health, animal health, environment, and other expertise.³ One Health collaboration across government and non-government stakeholders is needed to optimize monitoring and surveillance, risk management, and emergency response to known and new zoonotic threats.²⁸ The concept of One Health can find out the process of the emergence of the spread of zoonotic diseases so that the picture of the disease can be known more fully and treatment can be done more quickly.²⁹ This collaboration is one of the zoonotic prevention and control strategies that can reduce mortality and morbidity in humans and animals.³⁰

One Health implementation for zoonotic diseases worldwide has been implemented in many countries, including the US (the United States) and China. US (United States) made protocols and procedures to be adhered to in the management of zoonotic diseases using One Health approach in the form of

text-based monitoring to increase the detection of diseases due to influenza A virus.³¹ China regularly monitored under a multisectoral system between humans and domestic and wild animals of 55 known zoonotic diseases (59 pathogens) using One Health approach.²⁸

Indonesia has also implemented One Health, focusing on zoonotic diseases (including parasitic zoonosis) and other One Health problems, such as food borne diseases and antimicrobial resistance. The one health approach implementation in Indonesia involves coordination across public health sectors, animals, and the environment effectively in conducting surveillance and diagnosis of zoonotic diseases. Zoonotic management with One Health is carried out by increasing the capacity of public health and animal health laboratories to diagnose zoonoses, collaborate to respond to outbreaks, and share information on surveillance results.³⁰

Parasites have a life cycle that includes vectors (arthropods) and reservoirs (vertebrate animals), as well as the environment (water and soil). Globally,

parasites are the main cause of zoonosis after bacteria.³² Indonesia has the densest human and farm animal population in Southeast Asia. The climate in Indonesia experiences an increase in temperature of 1-1.5 °C every year, affecting the breeding of parasites zoonotic vectors and reservoirs.²⁵ This needs One Health approach to better manage and control parasitic zoonosis.

Although many references in this study recommend One Health to prevent and control parasitic zoonosis, only a few references show the implementation of One Health in combating parasitic zoonosis in the field both globally and in Indonesia. Some challenges may be due to the lack of institutionalization of One Health and the lack of sustainable advocacy among the sectors. Other challenges may be poor coordination and collaboration among sectors for effectively monitoring and managing parasitic zoonosis. Therefore, it is critical to continue raising awareness of the One Health strategy to prevent and control parasitic zoonosis from animals and encourage leaders to work across disciplines and government and non-government sectors, especially helminth infections in developing countries vector control in Indonesia.

Limitation of review: records that recommend and apply One Health approach but, due to the broad definition and implementation of One Health, not mention "One Health" in abstracts or full paper, were not included in the review, which may bias the results of a literature review.

CONCLUSION

Many studies have called for the wider adoption of "One Health integrated approaches" to prevent and control parasitic zoonotic diseases. However, there are theoretical and practical challenges that have practical gaps in implementing this strategy. Further study is needed to better implement One Health, especially for combating parasitic zoonosis in the field.

DISCLOSURE

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AUTHOR CONTRIBUTION

All authors contributed in conducting the research and publishing the manuscript.

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