One Health, multiple impacts: a review of 10 years of One Health work in Bangladesh and the region with a focus on the poultry industry in Bangladesh

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Registration No: 966
Session: 2021-2022

A thesis submitted in the complete fulfilment of the requirements for the degree of Master of Science in Epidemiology

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August 2023

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This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all aspects and all revisions required by the thesis examination have been made

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Acknowledgments

First and foremost, praise and appreciation to **Almighty Allah** for His showers of blessings throughout my research work to successfully accomplish this for the degree of Master of Science (MS) in Epidemiology.

I would like to express my gratitude to my supervisor, **Dr Md. Ahasanul Hoque**, Professor, Department of Medicine and Surgery, Chattogram Veterinary and Animal Sciences University (CVASU), for providing me with this learning opportunity as well as invaluable intellectual guidance and encouragement throughout this research. His dynamism, vision, genuineness, and motivation have all left an indelible impression on me.

I can't thank my co-supervisor **Robyn Alders**, Honorary Professor, Development Policy Centre, Australian National University, Australia, enough for her unwavering support and patiently teaching me about this work. I am grateful for her enthusiasm, determination, and vast knowledge, as well as her friendly direction and expert advice during the research and preparation of this thesis.

I would like to express my heartfelt gratitude to the key informants from Bangladesh and other countries for their valuable time and cooperation. At the same time, particular gratitude to those who assisted us in obtaining the interviewee's personal communication and the study documents, which were quite challenging to obtain.

I am really grateful to Professor **Dr Pankaj Chakraborty**, Head of the Department of Medicine and Surgery, and all of the faculty members for their assistance. Many thanks also to the MS examination committee.

This MS research study was supported by the **UKRI GCRF One Health Poultry Hub** [Grant No. BB/S011269/1], one of twelve interdisciplinary research hubs funded under the UK government's Grand Challenge Research Fund Interdisciplinary Research Hub initiative. It gave me a fantastic opportunity to be a part of the collaborative platform among CVASU (Bangladesh), the Department of Livestock Services, the Institute of Epidemiology, Disease Control and Research, the Bangladesh Livestock Research Institute, the Royal Veterinary College, and Chatham House (UK) for their assistance in this significant research work. At the same time, I'd like to thank One Health Bangladesh platform icon Professor **Dr Nitish Chandra Debnath** sir for his tremendous encouragement of my research.

A million thanks to my wonderful little sister and brother for their mental support and tolerance of my cranky behaviour during this thesis journey. I want to thank my friends, colleagues, and well-wishers, especially **Dr Rashed**, **Dr Meherjan**, **Dr Munira**, **Dr Keya**, and **Dr Logno**, for providing moral assistance throughout my thesis work.

Last but not least, I express my deepest sense of gratitude to my beloved parents for their sacrifice, blessings and encouragement.

Contents

List of Figures

List of Tables

List of Abbreviations

Abbreviation	Elaboration
AMR	Antimicrobial Resistance
AMU	Antimicrobial Usage
ASEAN	Association of Southeast Asian Nations
BAHIS	Bangladesh Animal Health Intelligence System
BARA	Bangladesh Antimicrobial Resistance Response Alliance
BAU	Bangladesh Agriculture University
BLRI	Bangladesh Livestock Research Institute
BSE	Bovine Spongiform Encephalopathy
BSL	Biosafety Level
CCHF	Crimean Congo Haemorrhagic Fever
CDC	Centers for Disease Control and Prevention
COVID-19	Coronavirus Disease-2019
CUOH	Coordinating Unit of One Health
CVASU	Chattogram Veterinary and Animal Sciences University
DLS	Department of Livestock Services
EBS	Event-based Surveillance
EID	Emerging Infectious Diseases
EPT	Emerging Pandemic Threats
EU	European Union
FAO	Food and Agricultural Organization
FDIL	Field Disease Investigation Laboratory
FETP,B	Field Epidemiology Training Programme Bangladesh
FGD	Focus Group Discussion
GHD	Global Health Development
GHSA	Global Health Security Agenda
HPAI	Highly Pathogenic Avian Influenza

icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
IEDCR	Institute of Epidemiology, Disease Control and Research
IMSC	Inter-Ministerial Steering Committee
KII	Key Informant Interviews
LBM	Live Bird Market
LMICs	Low- and Middle-Income Countries
LSHTM	London School of Hygiene and Tropical Medicine
MERS-CoV	Middle East Respiratory Syndrome Coronavirus
MoHFW	Ministry of Health and Family Welfare
MoLF	Ministry of Livestock and Fisheries
MOU	Memorandum of Understanding
NCDs	Non-Communicable Diseases
NGO	Non-Government Organization
NOHSP	National One Health Strategic Plan
NTD	Neglected Tropical Diseases
OH	One Health
OHB	One Health Bangladesh
OHC	One Health Commission
OHCC	One Health Coordination Committee
OHHLEP	One Health High-Level Expert Group
OH-JPA	One Health Joint Plan of Action
OHP	One Health Partnership
OHPH	One Health Poultry Hub
OHS	One Health Secretariat
OHSP	One Health Strategic Plan
OIE	World Organisation for Animal Health
OP	Operational Plan
RVC	Royal Veterinary College
SA	South Asian

SAARC	South Asian Association for Regional Cooperation
SAU, Dhaka	Sher-e-Bangla Agricultural University
SAU, Sylhet	Sylhet Agricultural University
SEA	South-East Asian
SEAUHUN	Southeast Asia One Health University Network
SOP	Standard Operating Procedure
TAG	Technical Advisory Group
TOR	Terms of Reference
UK	United Kingdom
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNEP	United Nations Environment Programme
USA	United States of America
USAID	United States Agency for International Development
USCDC	United States Centers for Disease Control
WEBE	Wildlife Environment, Biodiversity, and Ecological Health Training
WHO	World Health Organization
WOAH	World Organisation for Animal Health
ZDRIC	Zoonotic Diseases Research and Information Centre
ZELS	Zoonoses and Emerging Livestock Systems

Summary

Bangladesh has been promoting “One Health” with an emphasis on zoonotic diseases. Bangladesh has a significant poultry industry that plays a crucial role in the country's economy and food security. This study analyses the results and lessons learned from implementing One Health strategy in Bangladesh and its neighbouring region over ten years. It also suggests One Health approaches to improve health security more efficiently especially focusing the poultry industry. Scoping reviews were used to determine Bangladesh's inclusion and exclusion criteria and those of selected documents from the Association of Southeast Asian Nations, South Asian Association for Regional Cooperation, United States of America, United Kingdom and Australia. A customised and semi-structured interview with 32 key One Health informants from 10 countries assessed the approach's effectiveness for addressing emerging diseases and antimicrobial resistance. Bangladesh has achieved significant progress in institutionalising One Health compared to the other countries studied. Bangladesh has a dedicated One Health coordinating framework with assigned responsibilities. Bangladesh has advanced One Health networking nationally and internationally also. But the development of these One Health working bodies has not yet led to extensive community-level initiatives. Identifying additional working areas at different levels was addressed through the key informant interviews. In relation to One Health, there is a lack of communication with the general public as well as between the various sectors. Typical challenges that emerged included inadequate collaboration among stakeholders, funding incompatibility, and limited availability of evidence-based research and One Health practices. Poultry zoonotic disease monitoring and early detection, as well as integrated outbreak investigation and surveillance, are all now occurring and should be expanded. The current state and our desired state of the integrated data management system differ significantly. Thus, Bangladesh needs to establish local One Health teams and improve inter-sectoral communication and public awareness like other countries. To maximise the success of One Health initiatives in poultry sector, we require cohesive coordination systems to promote timely knowledge management about preventive practices among farmers.

Keywords: One Health; Coordination; Zoonotic; Antimicrobial Resistance

Chapter-1: Introduction

One Health (OH) is an integrated, unified strategy that seeks to optimally and sustainably balance the health of people, animals, and ecosystems. The recognition is made that there exists a close and interdependent relationship between the well-being of humans, domestic and wild animals, plants, and the broader environment, encompassing ecosystems. The approach aims to engage diverse sectors, disciplines, and communities across different societal levels in collaborative efforts to promote well-being and address challenges to both human health and ecosystems. This includes addressing collective necessities of clean water, energy, and air, as well as safe and nutritious food. Additionally, it involves taking proactive measures to mitigate climate change and contribute to sustainable development (Adisasmito et al., 2022). Although the terminology "OH" is of recent origin, the underlying concept has been acknowledged nationally as well as globally for a considerable period of time (CDC, 2022). A gathering was convened in New Delhi, wherein delegates from 111 nations and 29 international organisations gathered to deliberate upon strategies for managing the H5N1 pandemic, a highly pathogenic strain of avian influenza. During the meeting, participants put up the suggestion of broadening the scope of the "OH" concept by integrating human and animal health systems in order to enhance pandemic preparedness and ensure health security (Samad, 2016). Consequently, the "OH" approach was endorsed as a viable framework for effectively addressing pandemic preparedness. Furthermore, it serves as a catalyst for the implementation of the OH concept on a larger scale within the South/Southeast Asian region. The avian influenza outbreak in Bangladesh prompted stakeholders to recognise the significance of engaging in multi-sectoral collaboration. Consequently, in March 2008, following extensive consultations with the Bangladesh Government, United Nations entities, universities, researchers, non-governmental organisations, and civil societies, a formal framework for the One Health Bangladesh (OHB) platform was established (Anonymous, 2019). From its inception to the present, there is a need to assess the application of OH approaches in Bangladesh and other South/Southeast Asian countries across various sectors (human, animal, and environment). This evaluation should focus on communication, coordination, and collaboration to identify potential areas for future implementation of the OH approach,

in addition to the existing working domain.

In the context of OH collaboration, zoonotic diseases continue to be a key priority due to their global prevalence and substantial impact on human health, particularly in low- and middle-income countries (LMICs) such as Bangladesh. There are recorded total of approximately 1415 pathogens that have been identified as having an impact on the human population. Among these pathogens, zoonotic pathogens make up a significant proportion, accounting for approximately 61% (Samad, 2011). Furthermore, zoonotic pathogens are responsible for nearly 75% of emerging infectious diseases. As a result, zoonoses are estimated to cause around 2.4 billion cases of illness and 2.7 million deaths in humans annually, in addition to various other detrimental effects on human health (Grace et al., 2012). According to Allen et al. (2017), Bangladesh is widely recognised as a significant global hotspot for the transmission of zoonotic diseases to humans. Simultaneously, within the environmental framework, the phenomena of habitat degradation and disintegration, climate change, and pollution exhibit interconnections with the emergence of infectious diseases. This association arises from the fact that nearly all infectious diseases have been found to be correlated with biodiversity in various manners (Guégan et al., 2020). Despite the abundance of evidence provided by environmental health practitioners highlighting the crucial role of OH disease reporting concepts in the timely identification and management of epidemic disease events, the focus of OH initiatives have predominantly been on veterinarians, medical doctors, and public health professionals thus far. According to Lebelo (2018), the environmental and wildlife sectors have not yet made a substantial impact on ensuring food safety and preventing illnesses. The Institute of Epidemiology, Disease Control and Research (IEDCR) conducted a workshop on prioritising zoonotic diseases within the framework of OH. As a result, six diseases were identified as priority zoonotic diseases: Anthrax, Brucellosis, Nipah, Rabies, zoonotic Influenza, and zoonotic Tuberculosis (CDC, 2017). This selection highlights the significance of promoting sustainable health solutions through collaborative endeavours aimed at preventing and controlling the emergence of infectious diseases.

The expansion of small and medium-sized poultry enterprises in Bangladesh has exceeded

the initial expectations over the past two decades. Currently, Bangladesh has the capacity to fulfill more than two-thirds of its population's meat and egg requirements, thereby establishing the meat and egg industry as a substantial contributor to employment in our country. According to the Department of Livestock Services (DLS) (DLS, 2023), the livestock sector in Bangladesh yielded a total of 442.8 million of livestock production during the period from 2022 to 2023. Within this context, the poultry subsector accounted for a significant portion, specifically generating 385.7 million. Nevertheless, the proliferation of this highly intensive farming system is presenting a growing threat to the environment and accelerating the propagation of infectious diseases. Simultaneously, there exists an additional significant issue pertaining to antimicrobial resistance (AMR) in animal-derived food, particularly within the intensive poultry industry, as the poultry supply chain expands (Adeyi et al., 2017; Chereau et al., 2017). Once again, the inadequate implementation of biosecurity measures, including waste management and carcass disposal, within the poultry farming sector and live bird markets (LBM) in Bangladesh has resulted in the transmission of antibiotic-resistant bacteria or genes from animals to humans, the environment, and potentially the food supply chain. This transmission occurs through direct or indirect pathways, such as soil or water sources. According to Alam et al. (2019), the implementation of a OH approach is likely to yield the greatest efficacy in tackling the factors that contribute to the transmission of antibiotic-resistant infections from animal and environmental sources to the human food chain.

To address these rising issues, OH initiatives are expected to promote health care and speed biomedical research, improve public health efficacy, widen scientific knowledge, and improve the quality of the veterinary, medical treatments, and environmental workforces. So, effective execution is all that is required to safeguard and save countless millions of lives in the present and future, particularly in LMICs such as Bangladesh (Burkle, 2020). This concept must be incorporated into all relevant sectors because it will aid in the development of an integrated holistic set of science-based policy and management measures, similar to those used in the COVID-19 pandemic and other epidemics, that reasonably reduce zoonotic disease risk by mitigating the ecological conditions that lead to zoonotic pathogen spillover (Plowright et al., 2021). We must remember that the human

race is constantly evolving, and with it, some unanticipated challenges in human, animal, and environmental health are emerging, necessitating a revolution in the sphere of cooperation. So, through our research, we hope to analyse the current operational system of OH in Bangladesh to identify areas that are yet unknown and require a structured coordinating mechanism. At the same time, we want to learn about the possible obstacles of addressing developing health issues.

The specific research questions of the study were:

i. What is the provenance of One Health and its scope in Bangladesh and selected south and south-east Asian countries;
ii. How One Health approaches are best pursued in Bangladesh, with an emphasis on the poultry industry

The next section provides a comprehensive overview of the development of OH in Bangladesh and the neighbouring regions, as well as a review of OH related secondary documentation. Then, chapter three will detail the materials and methods of the study following study design, participants, and data analysis of the study. The fourth and fifth chapters will cover the results and discussion, limitation of the study, respectively. The list of references and appendices are placed afterwards under Chapter 6.

Chapter-2: Literature Review

This chapter presents a coherent synthesis of the history of OH and how it is evolving in Bangladesh and the region which includes the analysis of OH related secondary documentation.

2.1. What is One Health?

One Health is an approach that emphasizes collaboration and multidisciplinary study in order to produce the best possible health outcomes for humans, animals, and the ecosystem as a whole (Mackenzie et al., 2013). Since the conception of OH in the early 2000s, this has evolved over the years, with various organizations and institutions seeing its significance and promoting its adoption (Smith et al., 2019).

The OH initiative was established in 2004 with the goal of promoting a unified approach to health care by combining the animal, human, and environmental health which stated that "The health of humans, animals, and the environment is inextricably linked, and that a collaborative and interdisciplinary approach is necessary to address the complex challenges facing global health" (Anonymous, 2008).

Over time, the definition of OH has expanded to include a wider range of health concerns, such as food safety, environmental pollution, and climate change. The World Health Organisation (WHO), Food and Agricultural Organisation (FAO), and US Centers for Disease Control (USCDC) defined OH in their ways too. In 2018 the WHO, FAO, and World Organisation for Animal Health (WOAH, formerly OIE) defined OH as “an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes. The areas of work in OH include zoonotic diseases, food safety, and the control of AMR, among other issues" (OHC, 2023). This definition highlights the significance of cross-sector collaboration in addressing health issues that affect both humans and animals, such as zoonotic diseases and food safety. It also acknowledges the importance of

addressing issues such as AMR, which can have devastating effects on public health. The Centers for Disease Control and Prevention (CDC) and One Health Commission (OHC) definition is similar to this definition, they defined OH as "OH is a collaborative, multi-sectoral, and transdisciplinary approach, working at the local, regional, national, and global levels to achieve optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment" (CDC, 2022). During the course of the past several years, the notion of "OH" has gained traction, and it has been recognized as a crucial instrument in the prevention and management of zoonotic illnesses such as the very recent Coronavirus Disease 2019 (COVID-19) and the previous outbreak like severe acute respiratory syndrome, Ebola, and avian influenza (WHO, 2020). The United Nations also adopted a OH approach in their 2030 agenda for sustainable development, recognizing the need for a multidisciplinary approach to address global health issue that could be the potential risks (UN, 2015).

The COVID-19 pandemic brought to light the significance of taking a "OH" strategy to solve the issues that are posed to world health. In addition to this, the OHC has emphasized the significance of collaboration and communication between public health specialists, environmental scientists, animal health professionals, and human health professionals in order to avoid the occurrence of future pandemics (OHC, 2020).

The latest definition was produced in the year 2021 by the One Health High-Level Expert group (OHHLEP), which serves as an advisory group to the OH (now) Quadripartite, which is comprised of the United Nations Environment Programme (UNEP), FAO, WHO, and WOAH. According to them, “OH is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) is closely linked and interdependent”. According to the new definition, “OH approach mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems while addressing the collective need for clean water, energy, and air, safe and nutritious food, taking action on climate changes and contributing to sustainable

development" (Adisasmito et al., 2022).

Another key document is the One Health joint plan of action (OH JPA) (2022–2026), which was issued in 2022 and is directed by the areas of OH collaboration reflected in the strategic documents of the Tripartite (FAO, OIE, and WHO, 2010; 2017). It provides a broad framework for longer-term actions and incorporates the priority areas that were identified in the tripartite work plan. The OH JPA is being established for a period of five years (2022–2026) through a participative approach, and it will represent the inputs of the FAO, UNEP, WHO, WOAH, and OHHLEP. One of the most noteworthy aspects of this strategy was three possible pathways to change, which were together referred to as the theory of change. These pathways indicate the areas in which the four organisations have the greatest potential to bring about a change that is both substantial and sustainable in terms of the outcomes that are anticipated in the medium and long term. One Health joint plan of action expressed their vision as the desired impact over a longer period of time, and that is why they emphasised the four words which are prevent, predict, detect, and respond to tackle the health threats and improve the health of humans, animals, plants, and the environment while also contributing to sustainable development (FAO, UNEP WHO, and WOAH, 2022).

The Global Plan of Action on OH recognizes the importance of shared responsibility and cooperation among governments, organizations, and stakeholders in order to successfully address health concerns at the connection between human beings, animals, and their surroundings. The importance of interdisciplinary collaboration and cross-sectoral action is emphasised throughout the strategy in order to accomplish the goals of the comprehensive OH initiative. In addition to this, it places an emphasis on gender equity, inclusion, and equity in the process of formulating OH policies, regulations, and practices. The strategy acknowledges the important role that local communities and organisations play in identifying and developing locally relevant OH solutions, and it promotes their active engagement as well as communication. In conclusion, the plan emphasises the significance of recognising and mobilising both local and traditional knowledge in addition to scientific understanding and the findings of research in order to realise its goals

successfully.

2.2. Emergence of the One Health Concept

Despite the fact that the phrase “OH” has only been around for a short while, the idea behind it has been recognized for a very long time both domestically and internationally for example in indigenous territories, a prevailing perspective on health and survival is characterised by a collective and individual's cross-generational perspective. This viewpoint encompasses a holistic framework that encompasses four fundamental dimensions of life: spiritual, intellectual, physical, and emotional (Cediel-Becerra et al., 2022). According to their perspective, health is conceptualised as the harmonious cohabitation of individuals with the natural environment, as well as with themselves and others, in the pursuit of well-being (Del Popolo, 2014). Even though medical professionals treating their patients in distinct silos until the beginning of the 20th century, researchers have known since the 1800s that animal and human disease processes share many commonalities. Dr Schwabe is the one who came up with the concept of “One Medicine”, which highlights the parallels that can be found between human and veterinary medicine as well as the necessity of working together to successfully treat, prevent, and manage diseases that can affect both humans and animals. As a result of the contributions made by influential people and important events in recent years, the “OH” paradigm has received a greater degree of acceptance among the public health and animal health communities (CDC, 2022). The Wildlife Conservation Society hosted a symposium on the topic of human and animal health on September 29, 2004, at Rockefeller University in New York City. The event was attended by a group of professionals from both fields. The attendees of this symposium, which was given the title “Building Interdisciplinary Bridges to Health in a ‘Globalized World’,” talked on the transmission of diseases between humans, domestic animals, and wild animals. At the conference, a list of twelve objectives to resolve potential threats to human and animal health was established. These priorities, also known as the “Manhattan Principles”, called for a global and multidisciplinary approach to disease prevention and served as the foundation for the concept " One Health, One World” (Anonymous, 2004).

At the International Ministerial Conference on avian and pandemic influenza, which took place from December 4-6, 2007, in New Delhi, India. The conference was focused on avian and pandemic influenza. During this summit, governments were encouraged to enhance the OH concept by integrating human and animal health systems for the purpose of pandemic preparedness and human security (Anonymous, 2008). Food and Agriculture Organization, WOAH, WHO, United Nations Children's Fund (UNICEF), the World Bank, and the United Nations system influenza coordination developed a document titled "Contributing to One World, One Health-A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystem Interface" in response to the 2007 International Ministerial Conference on avian and pandemic influenza in New Delhi. At the 2008 International Ministerial Conference on avian and pandemic influenza, which took place on October 25-26, 2008 in Sharm el-Sheikh, Egypt, representatives from over 120 countries and 26 international and regional organizations participated. During the conference, this strategic framework was formally released (WHO, 2008). It provided a plan for applying the OH concept to emerging infectious illnesses at the common interface between the animal-human-ecosystem and was based on the lessons learned from the response to highly pathogenic H5N1 avian influenza in the early 2000s.

Since 2005, U.S. Agency for International Development (USAID) has helped more than 50 countries improve their abilities to monitor the spread of highly pathogenic avian influenza (HPAI) H5N1 among wild birds, domestic poultry, and humans; to implement a rapid and effective containment strategy for the virus when it is discovered; and to assist countries through capacity building. In 2009, the pandemic influenza and other emerging threats unit created the Emerging Pandemic Threats (EPT) initiative in order to tackle other potential viruses that have the potential to pose the threat to future pandemics. This was done as a complement to the work that USAID was doing in tackling H5N1. It was made up of four initiatives that worked together to complement one another and was carried out in a total of 20 nations. These programmes were Predict, Prevent, Identify, and Respond with the technical help of USCDC. The goal of the EPT global programme is to build regional, national, and local OH capacities for early disease detection, laboratory-based

disease diagnosis, rapid response, and risk reduction (USAID, 2017). To accomplish this goal, the EPT global programme draws on the expertise of professionals working in both the animal and human health sectors. As professionals began to recognize the significance of the OH concept in 2009, the director of the CDC, Lonnie King, National Center for Emerging and Zoonotic Infectious Diseases proposed the establishment of a OH office with the vision to support public health research that advances the OH concept, facilitate the exchange of data and information between researchers working in a variety of fields and sectors, and also obtain findings from outside sources (CDC, 2022).

In April of 2010, WOAH, FAO, and WHO partnered to issue a document known as the "Tripartite Concept Note". This document established a long-term strategy to foster global collaboration, with the goals of sharing responsibility and coordinating worldwide initiatives to address the health hazards that occur as a result of interactions between humans, animals, and the natural environment (FAO, OIE and WHO, 2010). On May 4-6, 2010, the CDC, in partnership with the WOAH, FAO, and WHO, organized the “Stone Mountain Meeting”, which was intended to establish definitive and practical actions to move the concept of OH from concept to execution (Rubin et al., 2011).

Tripartite was in charge of organizing a top-level technical meeting that was held in Mexico City from November 15 to 17, 2011, and it took place between those two dates. The purpose of this meeting was to address health hazards that occur in various geographic locations by spotlighting three key OH subjects: rabies, influenza, and AMR. These subjects provided a starting point for a conversation on what steps need to be taken to strengthen political will and more actively involve lawmakers of health in the OH movement (CDC, 2022). In Melbourne, Australia, on February 14-16, 2011, the very first International OH Congress took place. More than 650 individuals representing 60 nations and a wide variety of academic fields got together to discuss the many advantages of collaborating on efforts to advance a "OH" perspective. The participants reached a unanimous agreement that, in addition to gaining an awareness of the interrelationship of human, animal, and environmental health, it is essential to incorporate other academic fields such as economics, social behaviour, and food security and safety (Mackenzie et al.,

2011).

In response to the HPAI (H5N1) outbreaks, the European Union (EU) funded Asia Pacific Strategy for Emerging Diseases established a tripartite relationship between South Asian Association for Regional Cooperation (SAARC) and Association of Southeast Asian Nations (ASEAN) countries (WHO, 2008). Later that, Massey University established a regional health capacity-building initiative to improve epidemiology and health risk management abilities through an integrated master's education and applied training facility. This programme was supported by the avian and human influenza facility and managed by the World Bank from 2010 to 2013 (World Bank, 2010). Under this programme, a OH Hub was established in the seven countries, which were Bangladesh, India, Pakistan, Afghanistan, Bhutan, Nepal and Sri Lanka that participated in it. These OH Hub serves as a platform for individuals working in OH-related fields to engage in communication and networking opportunities, and they are led by the two government institutions in each country that are responsible for the health of both humans and animals (Kakkar et al., 2013). The One Health alliance of South Asia was founded in order to combat zoonotic diseases and establish a regional network. This association brought together scientists and legislators from throughout South Asia's ministries of health, the agricultural sector, and environment, in addition to non-governmental organizations (NGOs) and universities. Together, they discussed and developed best practices, based on the most up-to-date scientific knowledge, for detecting and managing infectious diseases that may propagate beyond national limits. From September 2014 to October 2016, an EU-funded second Massey University capacity-building programme comprising 24 human health, animal, and wildlife health specialists from Afghanistan, Bangladesh, Bhutan, and Nepal was implemented (McKenzie et al., 2016).

In recent years, in the South Asian region, OH has acquired greater attention and adoption as a framework for tackling the complex health concerns affecting humans, animals, and the environment. This has occurred as a result of the fact that this approach takes all three aspects of health into account. For instance, in India, the OH idea has been adopted as a means of addressing concerns such as newly emerging infectious illnesses, AMR, and food

safety by the country's government, academic institutions, and civil society organizations. This is done to improve overall public health (Chatterjee and De, 2018). The OH Platform of Bhutan was established in 2014, making it a notable example of OH adoption in South Asia. This platform brings together government agencies, academic institutions, and civil society organizations to promote collaborative approaches to addressing health challenges at the interface of humans, animals, and the environment (Elbers and Raj, 2016).

The government of Pakistan has started a number of initiatives in an effort to promote OH. These initiatives include the construction of a national One Health secretariat (OHS) as well as the drafting of a OH Strategic plan. In addition, the nation has worked along with several international organizations, like the WHO and the FAO, to improve the capabilities of OH and to encourage research that draws on multiple disciplines (Mushtaq and Hameed, 2018).

The Ministry of Health in Sri Lanka has included the concept of "OH" into the country's overall health strategy, and it has also formed a "OH unit" to coordinate and facilitate collaboration between varieties of different sectors. Additionally, the government has cooperated with foreign organizations such as the United Nations Development Programme to improve the capacity of OH and to foster research and innovation (Premaratna et al., 2018).

Nepal has identified OH as a priority subject for research and policy development, and the government has formed a OH coordination body to enhance collaboration among various sectors. In addition, the country has collaborated with international organizations such as the USAID to advance OH research and capacity building (Khanal and Sah, 2018).

The OH concept has been included into Afghanistan's national health policy, and the country's Ministry of Public Health has established a OH coordination unit in order to make it easier for various sectors to work together. In addition, the country has worked together with other nations' governments and international organizations, including as the OIE, to improve research and capacity building in the area of OH (Ahmad et al., 2018).

Over the course of the past two decades, a wide range of Bangladeshi stakeholders in the human health and animal sectors, as well as academic and research organizations, have come around to the OH concept. The first known case of avian influenza (H5N1) in chickens was discovered in Bangladesh in the year 2007 (Osmani et al., 2014). Not only did the virus has an impact on the poultry business, but it also posed a considerable risk to the general population's health. The epidemic prompted the government and several partners to implement a OH strategy in order to stop the further spread of the virus. As a direct consequence of this, Bangladesh created the National Avian Influenza Control and Prevention Committee in order to coordinate and carry out the implementation of a OH response to the outbreak (Rimi et al., 2017). The OHB network is the most important professional OH network in Bangladesh. It was established in 2008 and has members representing 12 different national and international organizations. To improve inter-sectoral collaboration and coordination, the country has also formed a One Health Coordination Committee (OHCC), which includes officials from numerous ministries and organizations (GoB, 2018). The government of Bangladesh founded the IEDCR in 2013. In the same year, the Ministry of Health and Family Welfare (MoHFW) collaborated with the US CDC to develop the Field Epidemiology Training Programme Bangladesh (FETP, B) and OHB convened a high-level policy consultation meeting in 2014 to develop the OHS, which acts as a formal structure of collaboration and ownership across institutions. It was agreed that the control body would be based at IEDCR, with Global Health Security Agenda and FAO providing financial assistance and resources for the Secretariat (Personal communication, Dr. M. Salimuzzaman, IEDCR, 2023).

Additionally, OH is being integrated into graduate-level curricula in Bangladesh, and in May of 2015, the University Grants Commission of Bangladesh gave its approval for the establishment of a One Health Institute (OHI) at Chattogram Veterinary and Animal Sciences University (CVASU). At the same time, other academic and scientific institutes in Bangladesh have been active participants in the promotion and furtherance of the OH idea. For example, since 2015, the OHB conference has been held to bring together researchers, practitioners, and policymakers from a wide range of fields in order for them

to discuss and share their experiences and results on OH-related issues (Chowdhury et al., 2019). One Health Bangladesh has co-hosted nine conferences since its inception and presently has a good number of members, including medical professionals, veterinarians, agriculturalists, environmentalists, wildlife experts, ecologists, sociologists, financial analysts, practitioners, and activists.

Simultaneously, Bangladesh harbors several other zoonotic viruses with potential for transmission to humans, such as middle east respiratory syndrome coronavirus (MERS-CoV), Ebola, West Nile virus, zoonotic hepatitis E virus, and zoonotic pox virus. Bangladeshi individuals reside in close proximity to domestic and peri-domestic animals, including rodents, crows, and bats. In addition, the importation of animals, the presence of traveling healthcare workers, and the influx of immigrants from regions with a higher likelihood of infectious diseases such as MERS-CoV and ebola, among others, may all constitute potential risk factors for the transmission of zoonotic diseases (Joseph, 2015). Upon the identification of the initial case of MERS-CoV in Bangladesh in 2015, the nation experienced a heightened sense of apprehension due to the inadequacy of existing preventive measures (Chowdhury et al., 2021). Although the initial MERS-CoV case was subsequently perceived to be a false alarm, a study conducted by Islam et al. (2018) revealed the presence of MERS-CoV antibodies in camels bred in Bangladesh. This finding illustrates the significance of adopting a OH approach in the management and prevention of cross-species transfer of infectious diseases between humans and animals.

So, it is clear that the OH concept has gained significant recognition and adoption in Bangladesh over the past few years. The government and stakeholders have recognized the importance of a OH approach to manage and control the spread of infectious diseases that can transmit between humans, animals, and the environment. So far, several initiatives have been launched to strengthen the country's capacity to respond to emerging and re-emerging infectious diseases through a OH approach. However, the implementation of OH in Bangladesh over the past twenty years has been limited and there are a number of scientific gaps that need to be addressed in order to improve the effectiveness of the strategy. There is a lack of cooperation between the human health sector and the animal

health sector in this country, which contributes to the ineffectiveness of the country's zoonotic disease surveillance system. There is a need for additional study to establish effective zoonotic disease surveillance systems, to identify the challenges to multidisciplinary collaboration, and to develop ways for increasing collaboration between human and animal health professionals. As of right now, the environmental health impacts of human and animal activities are often overlooked in Bangladesh; therefore, research should focus on the impacts of agricultural practices, urbanisation, and other human activities on environmental health, as well as how these factors are linked to the health outcomes of humans and animals. It may be possible to improve the efficiency of the implementation of the OH approach in Bangladesh by focusing on filling in these gaps through expanded scientific study and collaboration.

2.3. One Health issues and infectious diseases

In the early 2000s, OH was primarily focused on the prevention and control of zoonotic diseases. There were some disease outbreaks that made scientists and experts all around the world think about an integrated approach rather than an individualistic approach. The very devastating one was definitely avian influenza and also behind the initiation of the OH concept this disease played a significant role. Avian influenza, informally known as bird flu, is a highly contagious viral disease that primarily affects birds but can also infect humans and other animals. The first recorded outbreak of avian influenza in the Asian subcontinent was in Hong Kong in 1997, where it resulted in six human deaths (Shortridge et al., 1998). In this subcontinent, avian influenza outbreaks have been linked to close contact between humans and live poultry, which is common in many Asian countries (Wang et al., 2014). The high population density, poor biosecurity measures, and LBMs facilitated the spread of the virus in the region which has had a significant impact on human and animal health, as well as the economy. In contrast, developed countries implemented strict biosecurity measures to control the spread of the virus and prevent outbreaks (Capua et al., 2008). The impact may seem less severe in developed countries but it has still had a significant impact on the poultry industry and public health. In the US, for example, the outbreak of highly pathogenic avian influenza in 2014-2015 resulted in the culling of over

48 million birds and an estimated economic loss of 3.3 billion (Swayne et al., 2016).

In the early years, the focus was on containing the disease outbreak by culling infected birds and restricting the movement of birds and bird products. However, this approach was not effective in controlling the spread of the disease, and it continued to have a devastating impact on the poultry industry in the affected countries. As a result, there was a shift towards a OH approach that recognized the interdependence of human, animal and environmental health in managing the disease. Over the years, the impact of avian influenza on the OH initiative has evolved. The development of vaccines for poultry and antiviral drugs for humans has improved disease control measures (Criado et al., 2020). In addition, there has been increased research on the ecology and transmission of avian influenza, which has led to a better understanding of the disease and its potential for human-to-human transmission (Van Kerkhove et al., 2012). Furthermore, the emergence of new strains of avian influenza, such as H7N9, highlights the need for ongoing research and vigilance (Zhou et al., 2018).

Alongside avian influenza, bovine spongiform encephalopathy (BSE), also known as "mad cow disease" and West Nile virus were other OH issues that gained prominence in the early 2000s. The outbreak of BSE in the United Kingdom (UK) in the 1980s and 1990s led to significant changes in food safety regulations and the adoption of a OH approach to disease surveillance (Collinge, 2001). And the West Nile virus spurred increased collaboration between public health and veterinary professionals, as well as research into the ecology of the virus and its potential impacts on human and animal health (Petersen and Roehrig, 2001).

Another emerging problem that becomes a headache around the world is AMR which has a close connection with OH because AMR is not just a problem in humans but also in animals and the environment. Antibiotic-resistant bacteria can be transmitted between animals and humans through direct contact or through the food chain, even environment is also a significant reservoir for AMR bacteria, with wastewater treatment plants and agricultural fields being hotspots for the spread of resistant strains leading to infections that

are difficult to treat. A study by Yin et al. (2021) found that urban rivers in China were heavily contaminated with antibiotic-resistant genes, highlighting the role of the environment in the spread of AMR. So, the OH approach is crucial to addressing the problem of AMR. Several recent studies have highlighted the significance of the OH approach in tackling the problem of AMR. In a review article, Murray et al. (2022) emphasized the importance of collaboration among human and animal health sectors, as well as environmental scientists, to control and prevent the spread of resistant microorganisms. The authors noted that many AMR infections in humans have their origin in animal reservoirs, making it essential to address the issue in animal populations. Similarly, a study conducted in Nigeria (Olowo-Okereet al., 2021) emphasized the need for a OH approach to address the issue, given the high levels of resistance observed in both human and animal isolates. Also, a study conducted by the review on AMR estimated that by 2050, the global cost of AMR could reach 100 trillion, more than the current global gross domestic product (Bloom and Cadarette, 2019). The economic burden of AMR is not limited to healthcare costs but also affects agriculture, food production, and trade.

As the OH concept was getting embraced by the multi-sectoral people with more importance day by day OH definition got revised multiple times with the advanced issues and working areas. It is getting more inclusive nowadays. So, the OH concept is beyond zoonotic diseases now. Non-communicable diseases (NCDs) like cardiovascular disease, diabetes, and cancer, are very closely linked to various environmental and social factors, including air pollution, climate change, and unhealthy diets (WHO, 2022) which are a major public health challenge globally and it is acknowledged recently that OH approaches can help identify and address the root causes of these factors by involving a range of stakeholders across sectors, including health, environment, agriculture, and food systems (FAO , 2020). Climate change, deforestation, toxic waste, and environmental pollution can lead to far-reaching effects that alter the distribution of vector-borne diseases, and cause food and water scarcity, among other impacts on human and animal health (Haines et al., 2006; UNEP, 2021). Also, we can’t ignore vector-borne diseases, such as malaria, dengue fever, and Lyme disease, as they are also a concern in many parts of the world (Chala and Hamde, 2021). Additionally, foodborne illnesses caused by contaminated food or water,

including Salmonella, *E. coli*, and cholera, pose a significant threat to public health (Havelaar et al., 2015).

These OH issues require global collaboration and concerted efforts to mitigate their impact and prevent future outbreaks. Also, if we want to mitigate these effects, we need collaboration and communication across different sectors, including health, agriculture, and the environment, to develop integrated sustainable solutions (Bhatia, 2021) by incorporating OH principles, policies, and interventions to promote sustainable and healthy ecosystems for all.

2.4. One Health activities in the region

India has recognized the importance of a OH approach in addressing emerging health threats for a while. Several articles recognize the potential for the OH approach to address emerging health threats in India, such as zoonotic diseases and environmental threats. The articles also acknowledge the increasing recognition of the importance of inter-sectoral collaboration and coordination in achieving OH goals. Furthermore, some articles highlight the need for institutionalizing the OH approach in national health policies, creating committees to oversee its implementation, and establishing surveillance systems to monitor health threats. For sustainable efforts toward the institutionalization and implementation of OH initiatives Nambiar (2020) proposes a roadmap for institutionalizing the OH approach in India, including establishing a National OH Secretariat, creating a OH Advisory Group, and implementing pilot projects to showcase the benefits of OH. Similarly, Dasgupta et al. (2021) advocate for the creation of OH committees at national and state levels to oversee inter-sectoral collaboration and coordination. Yasobant et al. (2019) suggest developing a resilient health system in India through OH collaboration, based on global initiatives (Chatterjee et al., 2016) also highlight the need for developing countries to learn from experiences in other countries like Bangladesh, and Bhutan in integrating OH into national health policies. They suggest that creating awareness among policymakers, researchers, and stakeholders is essential for incorporating OH into the health system in India.

The OH approach has gained significant attention in Nepal in recent years, with various studies exploring its scope, opportunities, and potential drawbacks (Acharya et al., 2019) highlight the potential of OH in Nepal, emphasizing the need for inter-sectoral coordination, capacity building, and awareness-raising to address the country's public health challenges. Paudel (2020) emphasizes the need for political commitment and stakeholder engagement to implement OH in Nepal effectively. Veterinary medicine is identified as the core of OH in Nepal and strengthening veterinary education and training programmes is recommended to enhance the OH approach. Furthermore, a nationwide survey among veterinary students in Nepal found that their knowledge and perception of OH were low, Subedi et al. (2022) indicating the need for more awareness and education on OH principles. Kaphle (2020) highlights the importance of veterinary medicine in the country's preparedness for pandemics like COVID-19 too. The Nepal-WHO Country Cooperation Strategy (CCS) for 2018-2022 emphasizes the integration of OH into the national health system (WHO, 2018) and incorporating OH approaches for preparedness and response to disease outbreaks. Overall, the OH status of Nepal is improving, but there is still room for improvement in terms of awareness, coordination, and infrastructure.

2.5. Summary

The chapter analysed the concept of OH and its evolution over time in South and South-east Asian countries as well as certain high-income countries, with a focus on Bangladesh. The above discussion demonstrates that Bangladesh has done reasonably good work in terms of institutionalising OH, but many other nations are still striving to do so. At the same time, some South Asian countries have begun initiatives to promote OH, a concept that emphasises the interconnection of collaboration among diverse sectors and increases their OH capacities. Bangladesh is still struggling to bring multi-sectoral people under one roof and another fact that very few scientific studies in the light of the OH approach have done so far. It shows the importance of applied research, networks, partnerships, capacity building, strategic communication, and advocacy from the top to the bottom. Though the OH concept arose from the need to control zoonotic diseases such as avian influenza, this review reveals other significant OH issues that must be taken into account, such as AMR,

non-communicable diseases, climate change, and pollution, as these could be the potential emerging health issues in near future. The review also highlights the unique challenges faced by each country, with similar challenges faced by many countries, including Bangladesh, and indicates that solutions will necessitate long-term commitments from policymakers and other stakeholders, as well as investments in research, training, and infrastructure. As a result, the current study on **"One Health, multiple impacts: A review of 10 years of One Health work in Bangladesh and the region with a focus on the poultry industry in Bangladesh"** will broaden the understanding of the OH approach in Bangladesh, and the findings are likely to serve as impactful highlights that can be incorporated into future OH endeavours.

Chapter-3: Materials and Methods

This research was conducted through scoping review and key informant interview (KII) along with data validation through roundtable meeting.

3.1. Scoping literature review

A scoping review of existing literature was undertaken to determine the current state of knowledge regarding OH and to identify any areas that have not been adequately addressed. This was done in order to create an interview guide that is relevant and appropriate for our specific research questions. The research questions closely aligned with our study's aims. In addition to Bangladesh, our analysis encompassed other countries that are part of the SAARC, as well as selected countries belonging to the ASEAN such as Thailand, Vietnam, and Myanmar. Furthermore, we included higher-income countries such as the USA, UK, and Australia in our study. In order to limit the quantity of outcomes and identify pertinent and suitable literature, solely documents written in the English language and published within the timeframe of 1 November 2007 to 31 December 2021, were incorporated in the search. The process of documentation retrieval commenced in June 2022 and concluded with the review of the relevant data in September 2022. The research databases selected for this study were PubMed and Google Scholar. Google Chrome was utilised as the web browser for accessing online resources. Additionally, personal communication was employed to engage with multi-sectoral stakeholders involved in OH and zoonotic diseases research in the selected countries. This was done to gather grey literature and unpublished reports and documents.

There were 404 articles retrieved from PubMed and Google Scholar searches prior to title and abstract screening. Concurrently, we examined a number of websites, such as OHC, WHO, FAO etc., for OH-related strategic documents and reports. After removing duplicates and screening titles, we identified 13 articles, 6 strategic documents related to OH, 5 reports, and 1 legislative document that were either directly relevant to the topic or specific in a particular area relevant to our research questions.

3.2. Key Informants interview

Semi-structured interviews were selected as the preferred research method due to their ability to offer guidance in exploring various research areas and allowing both the researcher and participant to inquire into specific topics or ideas in order to achieve the desired research objectives (Gill et al., 2008). The development of the interview guide was prompted by the identification of gaps in the scoping literature review. The questions included in the guide, as outlined in Appendix (I), were designed to elicit comprehensive responses from the interviewees through an open-ended format.

The interviews were conducted during the period comprising from November 2022 to January 2023. A total of 32 interviews were carried out using the online Zoom platform. The identification of KIIs was accomplished by employing purposeful sampling techniques. The study identified potential participants as OH champions from the selected countries. These champions possessed expertise in the Human Health (n=9), Animal Health (n=19), Forestry (n=1), and Environment (n=3) sectors. Regarding the gender composition of the participants in the KII, it is worth noting that there were seven female respondents and twenty-five male respondents. The ten countries included in the study were Bangladesh, India, Nepal, Bhutan, Pakistan, Myanmar, Thailand, Vietnam, UK, and United States of America (USA). Given the inclusion of participants from both national and international backgrounds, the interviews were conducted in both the Bengali and English languages.

The majority of inquiries were accompanied by supplementary queries, referred to as "sub-questions," which served as additional prompts in cases where the initial response provided lacked sufficient information. The duration of the interviews showed slight variation, with the minimum length recorded at 35 minutes and the maximum length at 120 minutes. The process of transcribing the recordings commenced promptly following the conclusion of each interview.

3.3. Round table meeting

The findings of our study were presented in a high-level roundtable discussion titled “What more is needed to operationalize One Health in Bangladesh?” organised by the CVASU and One Health Poultry Hub on March 4, 2023, and supported by the United Kingdom Research and Innovation Programme through the Global Challenges Research Fund. The roundtable discussion comprised of multi-sectoral stakeholders representing from Bangladesh, Thailand, and Vietnam, who hold significant positions in the field of OH or express a keen interest in potential collaborations in this domain. The stakeholders involved in this context encompass a diverse range of professionals, including veterinarians, human health practitioners, experts in environmental and wildlife fields, government officials, representatives from international organisations, as well as those affiliated with Thailand and Vietnam's OH working groups. The results of the discussion were gathered and documented in a report. This report was then used in a framework analysis to assess the current challenges faced by One Health initiatives in Bangladesh, as well as to propose relevant solutions. The conclusions drawn from the roundtable meeting were evident in the relevant aspects raised in the discussion chapter.

3.4. Data analysis

3.4.1. Scoping literature review

The necessary information from every article, strategic document, and report that could be considered relevant to the research questions was retrieved. After a thorough extraction, the final summarized data were compiled in a single Microsoft Excel 2013 spreadsheet for further validation.

3.4.2. Qualitative data analysis

Following the framework proposed by Braun and Clarke (2006) for thematic analysis, the interviews were transcribed in verbatim method and subsequently reviewed extensively by the researcher through multiple readings. This process aimed to establish a sense of familiarity with the data and facilitate exploration of its content (Green et al., 2007). We used MAXQDA software for the thematic analysis purpose which allows us to generate codes and record them systematically. This software was developed specifically for use in

academic, scientific, and business institutions for the purpose of conducting computer-assisted analyses of qualitative and mixed methods data, text, and multimedia. It is a professional piece of software that can analyse data using qualitative approaches as well as mixed methodologies. It is able to conduct analysis on a wide variety of data sources, including interviews, papers, surveys, media, twitter, and more. It has been available since 1989, and it features dependable, cutting-edge, and user-friendly analytical tools that contribute to the effective completion of a research project (Marjaei et al., 2019). Before utilising electronic coding with MAXQDA the process of identifying and recording initial codes involved detailed reading of transcripts and the use of an MS Excel 2013 spreadsheet. The codes were systematically arranged using broad words to classify phrases or sentences. The codes underwent a subsequent review process, during which codes that exhibited similarities were consolidated into more specific codes. This was done with the aim of identifying any emerging themes within the MAXQDA software. Furthermore, by means of an expert consultation conducted during a policy-level stakeholder meeting, several recurring themes were identified. These themes were subsequently incorporated into our discussions and formed the basis for our recommendations.

To reduce the risk of personal bias, all reviewed data and coding related to thematic analysis were validated by other members of the research team to ensure that the researcher interpreted and represented the data in accordance with how the participants intended.

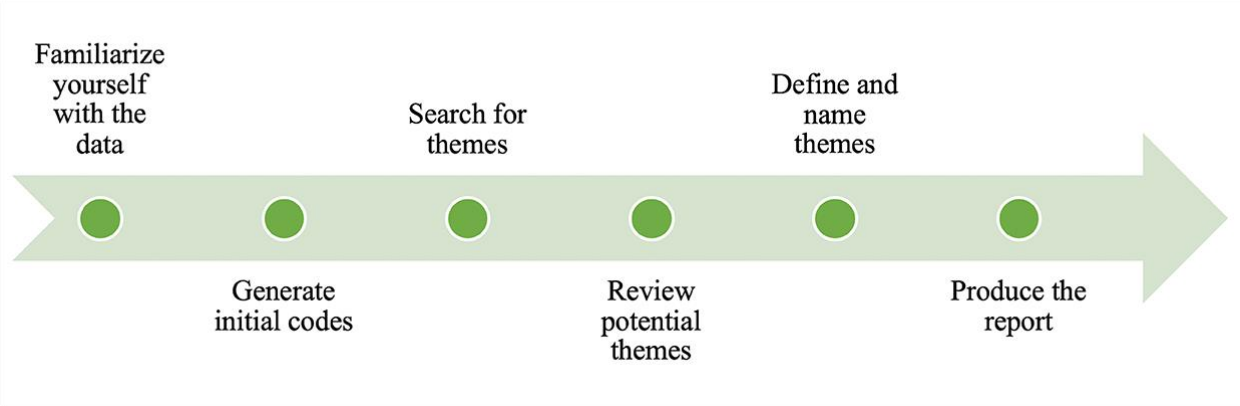

Figure 3.1. Six-phase Thematic Analytic process (adapted from Braun and Clarke, 2006, 2012)

3.5. Ethical consideration

The participants' convenience was taken into consideration when conducting any interview. Prior to the commencement of the interview, it was required for all participants to provide a consent form (Appendix II) in either electronic or oral format. At the beginning of each interview, the participants were provided with a duplicate of the interview guide, encompassing the questions that would be offered to them (see Appendix I), alongside the research's objective and the student researcher's background. Furthermore, prior to the starting of the session, the participant was requested to validate their consent regarding the audio recording of the interview. The study was approved by the CVASU Ethics Committee [permit ref. no. CVASU/Dir(R&E)EC/2022/405/2 Date: 07/09/2022] Bangladesh.

Chapter- 4: Results

To get an overview of the OH initiatives across the South and Southeast Asian countries, and selected high-income countries alongside Bangladesh were viewed OH, Strategic documents from SAARC and ASEAN region, and also relevant reports and legislation from the high-income countries. The review findings are presented sequentially as follows.

Of the 32 stakeholders who participated in the study, 19 were from Bangladesh, five were from the SAARC region (one India, one Pakistan, one Bhutan and two Nepal), five were from the ASEAN (one Vietnam, two Myanmar and two Thailand) countries, two were from the USA, and one was from the UK.

The interviewee consisted of veterinarians, where seven of them were government-level officers and faculty members (three), and eight were from different international organizations and research organization (one USAID, two FAO Bangladesh, one Global Health Development, Eastern Mediterranean Public Health Network (GHD EMPHNET), one United Nations Industrial Development Organization (UNIDO), one Fleming Fund, one Eco Health Alliance, one International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b)). Seven of the participants were part of the OH working bodies for their respective countries. Eight of the participants were public health practitioners who also had expertise in OH. Four were from the environment and forestry sector. All participants had variable level of experience with zoonoses and understood the concept of OH.

The thematic analysis of data resulted in a number of important themes relevant to the past and present situation of OH and its impacts on Bangladesh and the region, and also highlighted a few areas where differences in professional opinion or understanding resulted in inconsistent perspectives relating to the implementation of an integrated OH approach in Bangladesh. With some clear feedback from the participants regarding the OH initiatives and it’s temporal changes in their countries all participants provided recommendations on how to proceed best with a more structural way to implement OH in every level of their respective countries from their perspective.

4.1. Scoping review findings

4.1.1. Bangladesh

Among the SAARC and ASEAN regions, Bangladesh was the first country to build a strategic document for OH in 2012 which was then updated in 2016. The first framework had nine components: i) institutional governance and programme management, ii) coordinated surveillance, iii) coordinated outbreak preparedness, prevention and response, iv) applied research, v) networks and partnerships, vi) strategic communication and advocacy, vii) capacity building, viii) behavioural, social and economic aspects of disease, ix) wildlife and ecology. Although the nine components specified in the document are interrelated, it was stated that the initial five interconnected components will be executed independently, while the subsequent four components are considered cross-cutting and should be incorporated into all OH initiatives. In the first document, stakeholders proposed a core advisory group to advise the Inter-Ministerial Steering Committee (IMSC) for OH, the key governing body for OH in Bangladesh because at that time Bangladesh needs institutional arrangements for facilitating the OH approach. In terms of the central surveillance unit to build a long-term goal for Bangladesh, the document focused on risk-based strategies to target emerging infectious diseases (EID) surveillance. In outbreak preparedness and response, only rabies and endemic diseases like anthrax were mentioned. The first document placed a strong emphasis on identifying the top research priorities and evaluating the nation's potential to carry out the required research. By employing evidence-based research and fostering collaboration among stakeholders at all levels, including subnational, national, regional, and global, the major partners have placed strategic communication and advocacy for the prevention of infectious diseases as a top priority. Simultaneously, it was recommended to distribute the research findings to the major stakeholders and utilise the results as tools for advocacy and communication. Behavioural, social, and economic factors influence disease incidence and impact, so the framework mentioned the socioeconomic effect to do a future risk analysis and also to study the livestock-wildlife interface, specific studies were proposed, such as mapping the environments where the Nipah virus crosses to humans and studying influenza virus movement from wild birds to domestic poultry. To continue the process, an Ad Hoc One

Health Steering Committee was established with representatives from the MoHFW (Department of Health), Ministry of Fisheries and Livestock (MoFL) (Department of Livestock Services), Ministry of Environment, Forest and Climate Change, WHO, FAO, UNICEF, icddr,b, and CVASU. The framework was also in line with the National Livestock Development Policy and several health-related Millennium Development Goals to which the government is committed, and it can be used as a model for other OH programmes, such as avian and human pandemic influenza preparedness.

The second strategic document was more dedicated to the establishment of OH in Bangladesh which had seven components; i) institutional governance and programme management, ii) coordinated surveillance, iii) coordinated outbreak investigation and response, iv) transdisciplinary research, v) networking and partnership, vi) strategic communication and advocacy, and vii) capacity building. The last two components of the first strategic document were compromised in the latest document applied research was renamed as transdisciplinary research. A full IMSC and the OHS proposed in the first strategic documents were formalized in June 2016 and included in the second strategic document. In order to address the potential threats posed by newly emerging and re-emerging diseases, this document highlights the significance of enhanced regional collaboration among countries belonging to SAARC and ASEAN. This collaboration has facilitated the establishment of various inter-agency and inter-governmental mechanisms, including the tripartite partnership between FAO, OIE, and WHO, the Global Health Security Agenda, and the towards a safer world initiative. It was proposed that in Bangladesh, there should be a focus on improving existing institutional arrangements and policy frameworks to effectively facilitate a OH strategy. This approach aims to address the prevention, detection, and response to high impact diseases and conditions that occur at the interface of human, animal, and ecosystem domains. In the second document, concerning concepts such as AMR and NCDs were also presented for the first time. In spite of the fact that the first document emphasized the significance of active surveillance, the vast majority of surveillance data was obtained in a passive manner by individual sectors and is not routinely shared, which left a hole in terms of strategic communication.

The second framework prioritises the need of implementing a coordinated outbreak readiness and strategy to mitigate the level of stress induced by the outbreak situation. Consequently, a suggestion was put up to designate a hot spot for the diseases of utmost importance, and to establish connections between this hot spot and other sites specialising in managing emergencies. Nevertheless, this coordinated mechanism also presents certain potential obstacles, including the inconsistent availability of funding as a result of reliance on donors, the need to establish priorities among the partners, the coordination of budget allocation among the partners, and the frequent turnover of trained staff members.

The second strategic document emphasised the significance of OH Bangladesh's contribution in formulating a proficient communication strategy at both the national and regional levels. The document presented several noteworthy achievements in capacity-building, such as the creation of a specialised Institute for OH at CVASU and the establishment of the Zoonotic Diseases Research and Information Centre (ZDRIC) at Sher-e-Bangla Agricultural University (SAU), Dhaka. Additionally, the document highlighted the Zoonoses and Emerging Livestock Systems (ZELS) project, the implementation of Masters in Epidemiology programmes at CVASU and Sylhet Agricultural University (SAU), Sylhet and the provision of various interdisciplinary training initiatives at the national level. A number of joint research initiatives focusing on the intersections between humans, animals, and ecosystems were also showcased such as the Royal Veterinary College (RVC), CVASU, London School of Hygiene and Tropical Medicine (LSHTM), Chatham House, DLS, Bangladesh Livestock Research Institute (BLRI), FAO, and IEDCR. Additionally, the research contributions from key stakeholders including IEDCR, DLS, BLRI, Forest Department, and FAO were mentioned in the second strategic document with importance.

Both documents have a shared objective of enhancing animal and human health in Bangladesh, although through distinct approaches and objectives. The first document focused mostly on regulatory measures and the management of infectious diseases, while the second document illustrated a collaborative and comprehensive approach with a OH perspective. The initial strategic framework for the OH approach to infectious diseases in Bangladesh acknowledged the necessity of implementing a methodical and synchronised

approach to OH. Throughout the development of this framework, it was acknowledged that issues pertaining to human health, as well as related areas such as sustainable agriculture and food safety, may also be effectively tackled by adopting a OH approach. Consequently, the subsequent document presented an exploration of the potential of OH beyond the context of infectious diseases. It highlighted the accomplishments, opportunities obstacles, and strategic considerations linked to the implementation of OH in Bangladesh.

4.1.2. Bhutan

Another SAARC country that pulled off a OH strategic document is Bhutan which was published in 2018. Bhutan OH strategic plan (OHSP) is a comprehensive plan that aims to promote the OH approach in Bhutan which is quite similar with the strategic document of Bangladesh. The plan outlines seven strategic objectives to address the complex health challenges faced by Bhutan. It includes i) establishing institutional setup and networking amongst relevant stakeholders, ii) strengthening disease surveillance systems and information sharing mechanism on prioritized zoonotic, foodborne diseases and AMR, iii) strengthening joint disease outbreak preparedness, iv) building institutional capacity including human resource in relevant stakeholders, v) conducting collaborative research, vi) strengthening communication and advocacy on OH initiative to prevent and control zoonotic and foodborne diseases, and vii) establishing surveillance on wildlife and environment and information sharing mechanism among relevant stakeholders.

The OHSP for Bhutan places a strong emphasis on understanding cultural differences and community engagement, which is one of the plan's distinguishing characteristics. They outlined their district and thromde (second-level administrative division in Bhutan), which is a second-level administrative division OH committees. These committees are designed to be the fundamental functioning bodies at the local level, and they are supposed to provide directions and advice to the diverse individuals who are part of the community. According to the plan, it was discovered that 78 percent of the respondents from Bhutan's health and livestock sectors were not familiar with the OH concept. This finding suggests that even the most important stakeholders are not familiar with OH concepts. This made it clear that there is an urgent requirement across all of Bhutan's societies to educate people and raise awareness about the OH approach and efforts, in addition to examining the socioeconomic

effects of these changes. The plan acknowledges the significance of incorporating traditional knowledge and beliefs into OH practices and of collaborating with local communities to encourage behavioural shifts that lead to better health outcomes. As part of the strategy, the National Institute of Traditional Medicine has to be involved in the various OH set ups in Bhutan. The goal of this was to establish a connection between the traditional medical practices of the region and modern medical technologies. The plan also emphasizes the importance of collaboration between different sectors and stakeholders, including government agencies, civil society organizations, and private sector partners. Alongside institutional setup and networking among the relevant stakeholders, their document included the priority diseases-based plan. Bhutan has a specific plan for tackling HPAI, anthrax, rabies, and also other common zoonotic diseases like trichinellosis, echinococcosis, and foodborne pathogens. It recognizes the critical role of coordinated outbreak and surveillance in promoting the OH approach for the early detection, rapid response, and effective management of disease outbreaks through cross-sectoral collaboration.

Like Bangladesh Bhutan highlights the importance of strengthening surveillance systems, enhancing laboratory capacity, and developing a workforce skilled in outbreak and surveillance management with an emphasis on wildlife and information-sharing mechanism. The Bhutan OHSP outlines a number of strategic objectives aimed at enhancing the competencies and expertise of OH practitioners within the country, with a specific focus on capacity building. The objective of the initiative is to cultivate a proficient OH workforce with expertise in disease surveillance, outbreak investigation, and risk assessment. The plan additionally underscores the significance of ongoing learning and development of new skills and knowledge in order to remain updated of developing health threats. Simultaneously, the plan outlined a strategy for achieving sustainable financial resources to build a OHS and execute OH initiatives in Bhutan. Overall, the strategy is comprehensive, evidence-based, and includes all the necessary components to operationalize OH programmes in Bhutan.

4.1.3. Pakistan

One Health Zoonotic Disease Prioritization and OH Systems Mapping and Analysis Resource Toolkit for Multi-sectoral Engagement is available in Pakistan. This resource toolkit offers a comprehensive overview of the current state of OH in the country, highlighting key challenges and opportunities for collaboration between human, animal, and environmental health sectors. The authors emphasize the critical role of surveillance systems and early detection of emerging infectious diseases such as HPAI, rabies, Crimean Congo haemorrhagic fever (CCHF), anthrax, and zoonotic diseases like brucellosis. Furthermore, the authors emphasized the significance of proficient communication and collaboration throughout healthcare sectors, encompassing both the national and local levels. The document proposes that it is imperative for every relevant stakeholder, such as policymakers, healthcare practitioners, and the wider population, to enhance their knowledge and understanding of the OH paradigm.

4.1.4. Thailand

Thailand has yet to develop a formal strategic document specifically focused on OH. However, the country does possess two national strategic plans for EIDs that emphasise the significance of the OH approach. The initial document, which comprised five strategies, was approved for the time period of 2013–2016, i) development of systems for disease surveillance, prevention, treatment and control under "One Health" concept, ii) management of systems to enhance disease-free animal husbandry, animal health and health of wild animals, iii) development of knowledge management systems and promotion of research and development, iv) development of integrated management systems with preparedness for emergency response and v) risk communication and public relations on EID. In order to optimise the effectiveness of each strategy, the experts implemented certain tactics and intervention measures. Notably, each strategy was characterised by an established set of tactics and measurements. In total, these five strategies encompassed a total of 25 distinct tactics and 140 measures. The first document was developed by a comprehensive examination of the epidemiological situations related to EIDs in Thailand spanning a period of two decades. This process encompassed the analysis of both domestic and international contexts, as well as insights gained through the execution of prior national strategic plans targeting specific diseases. In order to ascertain the possible emergence of

EIDs, a risk assessment exercise was conducted by public health authorities in 2010. This exercise relied on the analysis of pre-existing epidemiological, community, environmental, and livestock information and data. The exercise highlighted several significant health concerns, namely seasonal influenza, foot and mouth disease, avian influenza, chikungunya fever, meningococcal meningitis, *Streptococcus suis* infection, and botulism. Additionally, the significant worry was raised regarding legionnaires' disease, melioidosis, Nipah, West Nile fever, and other emerging diseases. The first plan placed significant emphasis on the necessity of developing capacities, systems, and technologies to effectively prevent and manage EID. This encompassed the collaboration among various sectors, coordinated initiatives on surveillance systems, implementation of effective livestock husbandry practices, and mitigation of economic consequences resulting from the exportation of livestock or animal products. Additionally, a management system is established to ensure efficient preparedness and response to EIDs. Furthermore, it encompassed the possibility of disseminating knowledge among the general people in order to provide sufficient readiness for effectively addressing EIDs, hence mitigating the socio-economic consequences associated with EID epidemics.

The National Executive Committee on Preparedness, Prevention, and Response to Emerging Infectious Diseases, chaired by Thailand's Deputy Prime Minister, approved the second national strategy plan for EIDS, 2017-2021. The second plan aimed to provide a cohesive framework for continued effective implementation efforts that had been implemented under previous strategic plans. In the second document there were six strategies, i) preparedness system development for public health emergencies, ii) surveillance, prevention, treatment and control system development for emerging infectious diseases using OH approach, iii) risk communication and public relations system development for emerging infectious diseases, iv) strengthening of international cooperation, v) promotion of civil society and private sector participation in emerging infectious disease prevention and control, vi) promotion of knowledge management and research and development. The six strategies exhibit interconnectedness. Every strategy is characterised by specified objectives and targets, key performance indicators, techniques, measures, and operational directions. The plan demonstrated that effective management of EIDs necessitates collaborative efforts across all sectors and agencies involved in

preparedness, prevention, and response. The plan's most significant aspect is its clear defining of roles and responsibilities for all relevant agencies and stakeholders, encompassing the government, state enterprise, private sector, and civil society. The implementation procedures established by the organisation consisted of three key aspects: i) Management of the strategic plan, ii) Coordination of involvement and activities, and iii) Monitoring, evaluation, and performance reporting. In addition to the previously developed integrated approach, the second plan has identified several crucial sectors to prioritise. These sectors include addressing the issue of AMR, implementing event-based surveillance, establishing OH disease surveillance in wildlife, ensuring the safety of the food value chain, promoting risk communication, and disseminating knowledge on the prevention and control of EIDs. Furthermore, the plan intends to integrate training, teaching curricula, and communication strategies across all sectors, including educational and healthcare settings. Setting up collaborative working groups or committees at various levels to involve the commercial sector and civil society, as well as selecting focal points at the provincial level to coordinate the activities, were additional crucial aspects of networking. The strategy placed significant emphasis on the promotion of capacity building as a means of fostering the development of new researchers within the next generation.

4.1.5. Vietnam

The development of the first Vietnam OHSP for the period from 2016 to 2020 involved close collaboration between the Ministry of Agriculture and Rural Development, the Ministry of Health, and other relevant ministries and agencies. This collaboration extended to both national and international members of the Vietnam OH Partnership for Zoonoses. The signing of the second framework for the One Health Partnership (OHP) for zoonoses, encompassing the years 2021 to 2025, took place on March 23, 2021. The new document was developed as a basis for cooperation for any international development partner, whether national or private, that shares a common interest and is willing to engage with the Government of Vietnam. Both of these documents had the objective of combating zoonotic diseases and enhancing the general state of public health as their primary focus. The first statement presented a comprehensive outline of the objectives and undertakings intended

to tackle the importance of “OH” in Vietnam. It employed broad terminology such as “general health plans”, “emergencies”, “zoonoses”, “AMR”, “food safety”, and “environment” to describe the scope of the initiatives. The second OHP Master Plan adopts a holistic strategy in managing zoonotic diseases, food safety, and places particular focus on the importance of addressing foodborne pathogens and environmental health. Furthermore, it covered issues like the institutional application of OH, the control of emergence risk factors, the eradication of traditional zoonoses like H5N1, rabies, swine streptococcal disease, anthrax, and leptospirosis, and the effectiveness of responses to outbreaks of emerging zoonotic diseases. The second document also included an analysis, which stands for strengths, weaknesses, opportunities, and threats of the OHSP document. This analysis provides insight into the existing deficiencies in Vietnam's endeavours to address zoonotic illnesses, AMR, and growing issues related to infrastructure, capacity, and the implementation of the OH policy. Both of the documents highlighted the view of zoonotic illnesses as a significant threat to public health and their potential to cause severe economic consequences, especially in countries with extensive animal industry, such as Vietnam. The significance of this matter is particularly pertinent to Vietnam due to the widespread presence of animal industry within the nation. The primary goal of the OHP Master Plan is to promptly detect and effectively address occurrences of zoonotic diseases, with the aim of minimizing the adverse consequences they impose on both human and animal health. The recent statement emphasized the importance of expanding disease surveillance and improving laboratory capacities. Hence, the initial strategic plan played a crucial role in establishing a framework for addressing zoonotic diseases in Vietnam. However, the OHP Master Plan possesses the capacity to create a broader impact on health outcomes in Vietnam.

4.1.6. United State of America, United Kingdom and Australia

High-income countries (USA, UK, and Australia) do not have dedicated OH strategic documentation and institutionalisation like many of the Asian and ASEAN nations. However, they have nonetheless incorporated the concept of OH through multi-sectoral coordination with various organisations, at the policy level, and in all of their health practices.

Aforementioned countries have formulated specific guidelines for prevention of prioritised diseases such as Salmonellosis, Campylobacteriosis, hepatitis E, Mycobacterium bovis, Avian Influenza, rabies, tuberculosis, anthrax, brucellosis, Q fever, toxoplasmosis, and cryptosporidiosis. They have a powerful integrated OH surveillance and outbreak investigation system, which makes the communication within their health system more structural. A joint report on antibiotic use and AMR in the UK, for instance, is a noteworthy piece of work in terms of the OH approach that plays a significant role in the UK's good position in the fight against AMR across the world. To address newly developing infectious diseases and other relevant challenges, Australia plans to establish a National Biosecurity Commission in addition to having a legislative framework on biosecurity already in place (Durant and Faunce, 2018). And just recently, the USA began working on their OH capacity building by including this concept in the academic courses taught at the university level. For instance, the OH Master's Programme offered by the University of Alaska Fairbanks (UAF, 2023) provides students with extensive instruction in the OH principles. A Master's degree programme with a specialization in OH is available to students at the University of Arizona (UA, 2023). This programme focuses on the intersection of human, animal, and environmental health. Auburn University College of Veterinary Medicine offers programmes (AU, 2023) in Public and OH, focusing on the intersection of animal and human health. The University of Washington offers a Graduate Certificate in OH, which emphasizes the interconnectedness of human, animal, and environmental health (UW, 2023). Concurrently, these educational institutions offer cooperative field training in order to cultivate a OH workforce that is capable of successfully competing with other workforces.

Table 4.1. Comparative summary of the One Health approaches in Bangladesh and the region (*Food borne pathogens- *E. coli*/*Salmonella* spp/*Campylobacter* spp, NTD-Neglected tropical diseases)

Components		Bangladesh	Pakistan	Bhutan	Nepal	Vietnam	Myanmar	Thailand
Timeline		2017-21	2017	2013-18	2016-21	2021-25	2017-21	2017-21
Institutional Governance	OH Secretariat/OH partnership secretariat							
	OH steering committee							
	Technical working group							
	Technical advisory committee							
	Coordination committee							
Coordinated surveillance	Avian influenza							
	Anthrax							
	Wildlife (e.g., Nipah)							
	AMR							
	Food borne pathogens *							
	Tuberculosis							
	Rabies							
	Brucellosis							
	Leptospirosis							
	Swine Streptococcus							

	NTD*							
	BSE							
	Monkey pox							
	Nipah							
Coordinated outbreak investigation and response	**Avian influenza**							
	Anthrax							
	Nipah							
	Leptospirosis							
	Rabies							
	Salmonellosis							
	CCHF							
	Brucellosis							
	Wildlife							
	Swine Streptococcus							
Multidisciplinary research								
Networking and partnership	**Community**							
	National							
	Regional							
	Global							
Stakeholder communication and policy advocacy								
Capacity Building	**Institutional involvement**							
	Joint training							
	Collaborative project (national & international)							

4.1.7. Challenges

When it comes to implementing OH, each country faces its own unique set of obstacles, even though the majority of those challenges appears to be relatively similar to each other and was highlighted in the documentations which were reviewed.

Bangladesh has already released two OH strategy documents, but the OH motto of cross-sector collaboration was unable to be reflected perfectly through the framework since environmental science and wildlife were overlooked once again. The fact that the vast majority of surveillance data were gathered in a passive manner by specific sectors and was not routinely shared created a gap in terms of strategic communication, despite the fact that the first document emphasised the relevance of active surveillance. Even if there has been significant development in the field of research, there is still an inadequate amount of funds to conduct sustainable research. There is still certain defiance among stakeholders with the various existing networks to make a commitment and to offer a sustained response, despite the fact that OHB has achieved major strides in the field of networking and cooperation. A lack of synchronised and sustainable funding of national and international source, insufficient resources and logistical support for research and surveillance work, weak coordination among various stakeholders, and a lack of emphasis on evidence generation, resulting in limited evidence, are some of the other challenges that were outlined in the documents.

The absence of institutionalisation is one of the most significant obstacles that must be overcome in order to implement the OH approach. A significant number of the studied countries do not have a specialized organisation or department that is in charge of putting OH initiatives into action and supervising their progresses. To continue efforts to institutionalise and integrate OH into national health policies and programmes, as were indicated in the papers of India, Nepal that were reviewed in our study are very necessary if they are going to construct a OH system that is capable of withstanding emergencies. Another difficulty stems from a lack of available resources. The implementation of the OH approach frequently calls for large financial resources; yet, like Bangladesh the majority of the countries struggle to allot stable funding for these initiatives, which restricts the scope of programmes and prevents them from being as effective as they may be.

One additional issue that frequently arises is inadequate coordination and communication between the various sectors. It is necessary to have collaboration between the health, agriculture (including animal health), and environment sectors in order to implement the OH approach; nevertheless, these three sectors frequently have different goals and ways of approaching problem-solving which is a common headache for several countries. The inability of stakeholders to recognise and comprehend the concept of OH is a barrier to the integration of many industries and reduces the efficiency of OH approaches. A few nations, such as Pakistan and Myanmar, are dealing with political instability in addition to having inadequate infrastructure. Even nations like Vietnam and Thailand, which are making excellent strides in OH efforts, are having trouble dealing with limited resources and the development of evidence. This is due to the fact that it is extremely challenging to convince politicians and other stakeholders to invest in a shared area of focus.

Lastly, insufficient capacity building presents still another significant obstacle. Continuous education and training are required for professionals working in a variety of fields in order to cultivate the knowledge and abilities essential to putting the "OH" concept into practice. Even though this problem is being prioritised in every region of the world right now, the training to address it is inadequate or not a top priority, which limits the OH outcomes that can be achieved.

It was found that high-income countries such as USA, UK and Australia along with low-income countries face similar obstacles when attempting to incorporate the "OH" framework into their respective healthcare systems. These problems cannot be fixed in a single day, but finding solutions to them will require a long-term commitment from policymakers and other relevant stakeholders, in addition to investments in research, training, and infrastructure.

Table 4.2. Common challenges across the South Asian Association for Regional Cooperation and selected Association of Southeast Asian Nations countries

4.2. Main thematic findings

Components	Bangladesh	Pakistan	Bhutan	Nepal	Vietnam	Myanmar	Thailand
Limited institutionalization							
Poultry/animal disease burden							
Insufficient funding							
Weak coordination and communication							
Limited evidence generation							
Limited resource							
Not adequate capacity building							

4.2.1. Existing One Health operational system

4.2.1.1. One Health Governance

In interview each participant was first asked to explain their point of view about the OH governance system in their respective country and how it takes place. In response to this initial question, most of our participants mentioned that OH governance denotes the overall process of how it works with a collaborative effort from the government and civil society levels. On that note their replies were-

"A governance system actually denotes how a system is governed. So, in terms of the governance system of OH in our country, we have two major reflections like we have government and civil society platforms"- 032B26/01

"One Health movement in our country is maintained by three movements, the first one is the society movement, the second one is the government movement and the last one is the global movement" - 24B11/01

And regarding the civil society movement two of our participants mentioned the efforts that the OHB platform played in terms of initiating the OH concept in Bangladesh and how it helps to generate the secretariat afterward though it is formalized yet like the OH secretariat and other relevant committees.

"You can say to support the OH governance system OHB which consists of the civil society and professionals was there. And that is how all the governance mechanism was created and now we are working on the specific roles of this secretariat more extensively"- 008B10/12

"I think most of the OH activities are led by OH Bangladesh platform! Because it was there before the initiation of the secretariat. It is important to make it a formal government entity. But still now, any registration procedure for the OHB platform is not taken yet"- 019B03.01

It is very important to recognize the initiatives that were taken by the civil society because it shows how the OH concept get changed over time in Bangladesh.

"Civil society movement was first initiated at CVASU by the Chittagong declaration, that time this movement was named One World, One Health which is now known as OH only. [00.06.00] Civil society is basically a think tank platform"-24B11/01

One of our Bangladeshi participants shared that government-level OH governance in our country is still present at the national level through the involvement of different ministries and some specific public health institutions.

"One Health governance consists of three ministries. IEDCR represents the public health sector, DLS represents the animal health sector, and the forest department is in charge of the environmental aspect"-009B11/12

A similar situation is happening in Myanmar too. And despite of being a high-income country USA still doesn't have an established structure or existing system dedicated to OH nationally.

"One Health governance system in Myanmar only happening at the national level" -001M4/11

"There is no official framework for OH in the USA"- 27US25/01

4.2.1.2. Composition of One Health Secretariat or Equivalent Unit

Institutional governance is a significant aspect of OH governance, and it is worth noting that feedback from participants indicates variations in the institutionalisation of OH across different countries.

"We don't have a structure for the OH work so far and also there is no specific institution dedicated to OH"-003N17/11

"We don't have any system of OH work going on at the national level" -004P2/11

The OHS and its equivalent units play a critical role in coordinating and facilitating OH activities in Bangladesh and the region. Bangladesh and Bhutan have a OHS and coordination committee with relevant other committees which carry out the work related to OH. Bangladesh has three deputed officers in the OHS from three different departments (department of livestock services, department of health and family welfare, department of forestry), whereas Bhutan has additionally included one representative from their academic partner. Both of these countries have IMSC which has members from different ministries and from the civil societies.

"Under the chair of the OH secretariat, three officials from three departments (the department of health, the department of livestock services, and one from the wildlife sector) are deputed and this is present now". -014B26/12

"We have our coordination committee, advisory committee, and then the steering committee at the ministry level"- 009B11/12

“And for the establishment of technical advisory committee and terms of reference of secretariat, there is the highest body called the IMSC. You can see that the secretary from three departments is working as a chair and co-chair. And all the relevant stakeholders from these three departments are also a member of the committees”.-013B22/12

"A representative from the university network in the Bhutan OHS is the key driver from academics"- 012Bh21/12

Vietnam has OHP and Thailand has One Health coordinating unit (CUOH) which is equivalent to the OHS and leads their OH works. Thailand CUOH has a direct connection with the highest level of the government administrative people and they connect several ministries in the unit which makes it more constructive.

"We have a designated committee for this type of work under the supervision of the deputy prime minister and the ministry of public health, a designated sub-committee that has representatives from several government agencies such as the department of disease control, ministry of public health, department of livestock, ministry of agriculture and cooperatives, national committee for zoological conservation and ministry of natural resources and environment"- 25T09/01

Also, Thailand CUOH has already decentralized their work which seems very effective to reach local level people.

"So we set up 12 sub-national offices of the CUOH. One sub-national office takes care of 5-8 provinces, so these 12 sub-national units will coordinate the collaboration among the provincial-level"- 26T13/01

Myanmar has an OHS like structure which seems to not have a formal yet. While in India some provinces are working on OH locally though they don’t have a OH initiative at the national level. The same goes for Nepal as they start working at the local level in spite of not having a formal structure.

"Actually, we have our OHS which was built 2-3 years ago. And as far as I know, it is led by medical doctors and the head of this secretariat is the DG of the national health laboratory" - 001M4/11

"To the best of my knowledge, there is no formal OH governance system here in India. But there are some states like Tamil Nadu, Kerala, Maharashtra, and Panjab; these states are really doing good in OH work" - 006I04/12

"We have many committees at the provincial level, federal level, and local levels"- 003N17/11

On the other hand, the UK has a different way to use OH in its existing system. They institutionalize it by incorporating the OH concept in different ministries at their national and policy level.

"We have had a specific coordination committee, collaboration, capacity-building initiatives, and communication mechanisms across the government for a long time which include human and animal health and obviously the environmental system"- 018U27/12

The next issue that was risen by the participants in terms of composition of the OHS or equivalent is the staffing. It was found that Bangladesh OHS is having a scarcity of full time and support staff dedicated to OH work. It is found that out of the three deputed officers, only the officer from the department of fisheries and livestock has a full time deputation.

"We don't have any support staff yet for the OHS. Yes, in the documentation they mentioned the support staff but it is not placed officially"- 28B14/01

They get some clerical support from different institutions and the donor organizations.

"Whenever you come to the OH secretariat all the clerical support is given by IEDCR still now and to some extent, we support them from CDC operational plan (OP)"- 013B22/12

And also as the deputed officers seem multitasking which lessens the efficiency of their work for OH which they were assigned for. So, the participants from Bangladesh who had previous experience working with the OHS suggested that alongside regular staff professional-level expertise from the international organizations should be brought back to the team which was practiced before and seemed very effective in terms of innovative OH works.

“The appointed officers are not consistently available at their designated office due to their multi-tasking. The human health officer holds a post at the IEDCR and appears occupied with laboratory-related tasks, while the officer from the forest department could not maintain regular attendance due to his other official tasks. It is important that deputed personnel maintain an interest and a strong motivation towards this concept; otherwise, the likelihood of achieving fruitful outcomes is diminished”- 019B03.01

“Expertise from universities across the country can be added as a part of the OHS”- 022B06/01

According to the participants from Bangladesh the rotational leadership of OHCC that was mentioned in the OH strategic documents is not happening yet. Here is a quote relevant to this matter-

“But regarding the ownership, I want to mention that according to the rules, OHCC should switch its sectoral ownership in 2 years interval. But after having the OHS still now the department of Health owns it where it should be led by the livestock service”- 002B3/11

Alongside the expertise representative from the young generation like university-level students can be added on a part-time basis for example as interns in the secretariat which helps their work and at the same time students are getting sensitized about OH.

"So I think the secretariat who will be in charge of spreading awareness to every people in a country if they are not dynamic enough and if an energetic generation is not given chance, then this OH platform will go on as it is I mean theoretically which refrain us from moving forward"- 013B22/12

In contrast, notable instances of efficient utilisation of human resources are observed among individuals from Bhutan, Thailand, and the United Kingdom. The OHS of Bhutan makes a dedicated day in a week for OH work which is compulsory for their officers though they are not designated as full-time staff. But Thailand CUOH has a full-time position for their staff who are from different sectors. And the UK has a group of people assigned in every department who have a good knowledge of OH and its relevance to their work.

"We are running this secretariat on a part-time basis. Like I'm a member of the OH secretariat so I'm committed to giving one day for OH activities. So the rest of the time I work for the department of livestock but every Friday I report to the Bhutan OH office" - 012Bh21/12

"The national coordinating unit is located in the ministry of public health office. They have a specific office space and 7-8 full-time staff there"- 25T09/01

"They have their regular day jobs and part of their portfolio is to do OH work as well. They are sufficiently skilled enough to maintain both of their roles. its part of their job"- 018U27/12

4.2.1.3. Regular activities from the secretariat and relevant One Health working bodies

Regular activities from the OH secretariat in Bangladesh involve meeting, workshops, and the reviewing of strategic documents or any relevant reports on OH. Normally, a bi-annual meeting is supposed to take place for the IMSC. Technical advisory committee and coordination committee can call for a meeting as and when required but due to the COVID-19 pandemic, few of these activities halted for a moment. As the COVID-19 pandemic ends, so all these activities are getting regular now.

"When there is a need of developing strategic documents or any emergency discussion OHS call for a meeting. Apart from that in human health when they do international health regulations development, bridging workshop with OIE is regulated by the OHS"- 014B26/12

"We had regular meeting before the COVID-19 pandemic, but during the pandemic and immediately after it got paused for some reason nowadays, we are trying to sit together. So far I had three meetings with the secretariat past few months. So it is starting to be regularized now"- 020B04/01

At the same time, there is a dedicated team who are developing the event-based surveillance data dashboard in Bangladesh. This data dashboard is almost constructed now

and the team is hopeful to get a good amount of field-level data from the human health, and animal health side. This initiative is taken very positively which was quoted like this-

“Recently Dr. Salim and his team are working on the OH data dashboard which is an excellent initiative, though it has not come into action yet, I think in the future this will come real handy”-019B03.01

Also, right now Bangladesh OHS is working to develop a comprehensive list of the national and international stakeholders and their primary objective is to reach the possible multi-sectoral stakeholders who are working on OH in Bangladesh and the SAARC region.

“Still now we are working on our national stakeholders. After getting a good response from them we will move on to our regional stakeholders like SAARC, ASEAN, and other international partners”- 28B14/01

At the same time OHS has to play a key role in terms of establishing two-way communication among the policy-level stakeholders and field-level officials.

"Our two-way communication is very weak which should be increased and OHS has to play a key role in terms of coordination"- 31B12/01

But, participants from Bangladesh suggested that the members of the OHS need to be more enthusiastic and passionate about their responsibilities.

"What I want to say is these deputed officers need to have that enthusiasm among them. Because the structure is there, people are there so they have to get support from the relevant stakeholders"- 032B26/01

Apart from the regular meeting, seminars and workshops we found some good activities and working strategy from Thailand and Vietnam. Vietnam OH partnership builds a formal collaboration among their university networks, academics and multi-sectoral professionals from the government institutions which boosts the enthusiasm among these young minds and helps spread OH concept at local level.

"We have a democratic agreement between the students' network and the government. It's kind of a memorandum of understanding (MOU) among the different disciplines with the student network, especially with human health, animal health, and environmental health

and they are working relentlessly in this regard by doing different workshops, seminars, and communication networks"-005V29/11

A similar kind of collaboration or MOU has been taken by Thailand CUOH. Not only that but also they produce educational materials and shared them with different levels of educational institutions and local level people.

"For handling the OH work and collaboration smoothly we have MOU and zoonotic diseases related collaboration with the sectors that are not common like with the people working with climate change issues"- 26T13/01

"One Health Coordination Unit produces learning materials as e-books and shares those in several districts and also we build many modules to teach the students like secondary school students, university students and also the veterinary students"- 26T13/01

4.2.1.4. Budgeting strategy of the One Health working bodies

While speaking about the operational system of the OHS and other OH structures that existed in the SAARC and ASEAN region the participants shared the budgeting scheme that is dedicated to the OH work. In Bangladesh, most of the government budget support comes from the CDC Bangladesh and other development partners. CDC Bangladesh and the MoHFW have allocated some budget in their operational plan for the OH and most of the seminars and workshops from the secretariat are supported by the development partners.

"Centers for disease control and prevention (CDC) has a budget from their operational budget (OP) which is dedicated to the OHS. Though the ministry of health allocated this budget, the regulatory body is the CDC"- 014B26/12

"We have an OP called National Nutritional Service, under this we allocate some budget for the secretariat and also we arrange some budgets through our development partners for them"- 020B04/01

"Development partners help the secretariat run their usual meetings or seminars. So far we couldn't manage sustainable government funding. Development partners come forward to help the secretariat on a need basis"- 24B11/01

On the other hand, Bhutan has recently proposed a plan regarding a sharing fund from the relevant ministries and agencies for OH which is very unique. As the proposal has been approved they are waiting now to get it formally allocated for the secretariat.

"The government has approved to support in allocating at least 1% of the budget from each of the concerned agencies for OH activities and the two main agencies at national level to propose funding are "Zoonotic Disease Control Programme" under the Department of Public Health and National Centre for Animal Health under Department of Livestock"- 016Bh31/12

Thailand has already allocated a specific fund for the CUOH and formally introduced the purpose of this budget in their strategic documents for combating emerging infectious disease.

"And about the funding, we have a specific fund for OH as in the strategic documents for emerging infectious diseases there was clearly mentioned that we will combat emerging diseases through the OH concept"- 26T13/01

The participant from the UK stated that it is very important to use the existing resource to the fullest alongside the other sources of funding as it makes the budget more sustainable.

"The ability to share the budget across ministries is one thing, and the ability to repurpose or retain staff or resources is another thing"- 018U27/12

4.2.2. Scope of One Health Surveillance and Outbreak

4.2.2.1. Existing joint surveillance and outbreak investigation programme

In terms of surveillance and outbreak investigation, the participants were asked about the existing joint approach in their country. Most of the participants from Bangladesh mentioned that they can't say we have a fully functional joint system for the surveillance rather than that they said it is more like disease-specific action. And also outbreak investigation is happening on an ad-hoc basis in the time of emergency. Some of their responses were like this-

"Actually, we don't have any typical joint surveillance facility yet in our country"- 017B01/01

"If you are talking about the outbreak investigation that is also done on an ad-hoc basis as involving multi-sectoral people is difficult"- 008B10/12

"I don't think except for Anthrax we do have any kind of joint surveillance. [00.27.00] The main reason behind this is we don't have any design that connects all the relevant documents under one platform"-029B17/12

But many of the participants agreed that in some zoonotic diseases we have several successful examples regarding Nipah and anthrax outbreak investigation and the initiatives that were taken can be considered as joint efforts.

"If you are talking about the typical OH surveillance or outbreak investigation we have not done that much on that regard. But for the zoonotic diseases, we did some joint outbreak investigation for example anthrax and Nipah outbreaks"– 014B26/12

"I think anthrax would be a typical example of this kind of joint efforts. When the Anthrax outbreak was notified at the Sirajgonj belt every department came forward, we build a joint investigation team, and each and every activity was collaboratively taken place"- 013B22/12

"In my opinion Nipah is one of the diseases where we do the most OH approach rather than other zoonotic approaches"-31B12/01

Not only that but also one of the participants mentioned that for the disease outbreak, we have an epidemiology unit from the DLS which plays a key role in terms of field-level outbreak investigation.

"I can't say it's fully functional but we do have some outbreak investigation facilities here. We have our Epidemiology unit from DLS. And we have our team of 3 members (one lab expert, one epidemiologist, and one representative from the regional Field Disease Investigation Laboratories (FDIL)) who are always ready to move whenever we get any report from the field" - 002B3/11

Regarding joint surveillance, Bangladesh has been working on avian influenza for a long time. Though there are some government funding for this purpose identified in our study, according to the participants, most of the surveillance activities have been donor driven so after a specific time period it lost its continuity.

"In 2008 we did a joint surveillance at a live bird market where we connected the human and animal health people to do avian influenza surveillance. It was USCDC funded. That was the first typical joint surveillance programme in our country"-015B23/12

"And about disease surveillance, this area is still development partners driven. As there are no sustainable government initiatives so far, most of the time it is project-based"-24B11/01

Alongside disease surveillance, some of the participants mentioned AMR related surveillance which is nowadays taken very seriously. Though it is not done in a typical joint manner still it has potential areas to work together. And also with the help of the donor fund specific organizations individual surveillance work like the IEDCR did some foodborne pathogen surveillance in a joint manner.

"Nowadays AMR surveillance is happening which is not fully OH surveillance but with the help of CDC and GHD we align this surveillance among the IEDCR and animal health people at the same site"-015B23/12

"We had donor-driven foodborne pathogen surveillance like cholera, typhoid, and hepatitis A surveillance. Also, there is some surveillance like rotavirus, and leptospira surveillance. But as it was donor-driven this surveillance is finished after a definite period"- 017B01/01

In this regard, one of the participants mentioned some project work like One Health Poultry Hub (OHPH), Bangladesh, Spillover project from the icddr,b which are working on OH topics and creating a great impact in joint surveillance work.

"There is some surveillance dedicated to the OH platform. [00.06.00] For example in CVASU you have OHPH, icddr,b doing the stop spillover project with us, and members of the OHS are also involved with AMR-related research which connects OH"- 008B10/12

On the other hand, one of the representatives from Myanmar mentioned that they do regular investigations for the priority diseases which are very common in their country. This plan looks efficient as this type of regular surveillance depicts the overview of a specific disease which in the long run helps in preventive measures too.

"As HPAI is common here we do a regular investigation two or three times per year. The same goes for Rabies. And also we do at least two times investigations for Japanese encephalitis per year"-001M4/11

The interviewee from Pakistan said that as they do joint surveillance with the help of donor organizations it's more like an emergency programme that gets stopped after that definite period.

"But it is more on an emergency basis. We have a collaboration with the WHO and FAO as we have a specific wing that works with them directly. But there is no specific documentation recorded so far so that's why I can say its kind a patchy works here in terms of joint surveillance"- 004P2/11

But in the UK the surveillance seems more structured as they already have a multi-sectoral risk surveillance group in their existing health system which is responsible for risk assessment and analysis too and then they share their findings with the government.

"Yes, we have a human, animal infectious risk surveillance group called Human Animal Infections and Risk Surveillance. They do both risk assessment and joint outbreak investigations or risk analysis. And then they represent their qualitative assessment to the government like the risk of likelihood hazard of disease"-018U27/12

4.2.2.2. Building sustainable surveillance and outbreak investigation mechanism through a proper coordination

Most of the participants from Bangladesh mentioned that it is more important to build a joint operational structure first if we want to create a sustainable joint surveillance system in our country.

"We have joint initiatives but in terms of sustainability, it is not satisfactory"-022B06/01

"In the outbreak investigation, we have done an excellent job but I can't say it is enough yet. Because regular systemic joint outbreak is not taking place that much" -029B17/12

According to the participants, to build a cohesive joint approach it is important to find out the common areas that we can work together. Some of them stated that there are some differences between human and animal health surveillance systems. That's why we need to search for interface study possibilities and set a collaborative plan. One of the participants quoted that-

"We have to keep in mind that the surveillance mechanism for human health and animal health is not the same, human health focuses more on the hospital or sentinel surveillance, whereas we the animal health people work on farm-based surveillance more. [00.36.00] The main area of joint surveillance should be our community as their people live together with their animals like livestock and poultry"-029B17/12

Also, we found that still now participation from all the sectors is not achieved yet in terms of joint surveillance or the outbreak investigation in Bangladesh.

"You can't call it a joint movement till you include all the relevant stakeholders in one common team"-31B12/01

"There are two phases of the outbreak investigation, the pre- and post-outbreak work. We need to give equal focus in these two phases, now wildlife area is managed by the forest department, they have their circle, and they have their conservator. But only the conservators can't do all the work alone. They need a team with several veterinarians, epidemiologists, and other relevant people"-029B17/12

While taking responses from the overseas participants we found that most of the countries take disease prioritization and simulation exercises very seriously and they do this type of discussion with all the relevant stakeholders every year which help them to prepare for future disease outbreak or any regular surveillance programme. Till now Bangladesh did one disease prioritization workshop, but no joint guideline for disease prevention was not set.

"Yes, there is always a disease prioritization workshop. It depends on what year, it depends on who participated in it in the past" - 025T09/01

"And every year agriculture and animal health sector have some kind of simulation activities for outbreak preparation. They do sentinel surveillance among the 5-6 provinces out of our 43 provinces of ours"-005V29/11

"Yes, we exercised a priority disease checklist under the "Preparedness and Response" project. But we do not set our surveillance or outbreak guidelines according to these diseases"-032B26/01

The next issue that was raised by most of the participants from the SAARC region was the lack of coordination in this kind of joint initiative. While some countries like Thailand and UK shared their strong coordination system in any kind of emergency situation. The respondents from Bangladesh mentioned the importance of making regular surveillance and outbreak investigation institutionalized rather than depending on the donor organizations. According to them if there is a specific regulatory system that will make the liaison among the relevant sectors in terms of joint activities it will make the work more coordinated and for that, they all asked the active involvement from the OH secretariat.

"It's time to make surveillance institutionalized. Still, now most of the surveillance is donor driven"-029B17/12

"And there is no coordination facility for surveillance and outbreak investigation from the secretariat. Yes, it is true that the secretariat not necessarily needs to do the surveillance and outbreak by themselves but they can lead this function"-31B12/01

"Previously there was some joint approach from different organizations but they did that under the name of the OHS. But it's time the OHS should take this type of joint approach from their setup and take the lead"- 019B03/01

"Currently, there is limited coordination among the stakeholders in responding to occurrence of zoonotic diseases (except for HPAI and influenza pandemics), thus lacking a holistic approach to disease control measures"-016Bh31/12

Here are some good examples of coordinated surveillance and outbreak investigation system that were quoted from our participants-

"Right now, for any outbreak in Thailand if we find that the department of disease control can't control it alone, we pass a letter issued by the prime minister or the deputy prime minister to let every relevant sector know that they need to come forward and work together to solve this problem"- 026T13/01

"So there is a local team and a national team and they will link through the local authority like the local municipality or whatever the local political chapter is and then go for a joint outbreak investigation"- 018U27/12

"We have an emergency operations center (EOC) which is under the ministry of health and funded by USCDC and in Vietnam, we have 5 EOCs. But they also need to work on their reporting network and joint activities. Under this system, they have a surveillance scheme which is called event-based surveillance (EBS), and also Indicator based surveillance"- 005V29/11

4.2.2.3. Joint standard operating procedure for zoonotic diseases

Many of our participants mentioned the importance of having a joint Standard Operating Procedure (SOP), especially for tackling zoonotic diseases. According to them instead of having an individual guideline in every sector it will be more effective if we build a joint lineup for the surveillance and outbreak investigation which also brings the different stakeholders under one platform.

"A technical exercise is needed and afterward a guideline should be generated, also we have to think about how could we disseminate the outcome of the investigation. We need a clear-cut idea and an action plan"-032B26/01

One of the participants from Bangladesh shared that they are working on the joint SOP of Anthrax which will be completed very soon.

"For anthrax, human health has already got a guideline for surveillance and we are working on our document too. The review is almost over so whenever we get our final document, we will share that with the OH committee and they will start combining the two

SOPs and try to compile it into a common guideline that could be related to the OH concept"-014B26/12

Again, one of the participants pointed out that the OHS should take responsibility to build a joint protocol for the outbreak investigation as they have this type of activity in their terms of reference (TOR).

"The main task for the secretariat now is defining the joint outbreak protocol for some specific diseases and then making a way to think about how can it be done jointly, who will be the members, and at what point they will join with each other"-032B26/01

Here is a positive example from Bhutan as they have a joint SOP for their priority diseases.

"Yes, we have a common SOP for the priority diseases. For Rabies we have a joint plan and even for outbreak investigations we have joint plans. The teams move together and when they come back, they have to submit a report to the Bhutan technical committee"-012Bh21/12

4.2.2.4. Regular data sharing mechanism across the sectors

If we want to build a sustainable joint initiative, we need a good data-sharing mechanism, so we asked the participants how they manage this matter. And we found most of them mentioned this is a very challenging issue whether it is a middle-income country or the developed country. Even the data-sharing protocol changes according to the sector and different departments.

"Some departments are not willing to share those pieces of information, especially the medical doctors of the WHO. So they hide those data which is the main problem in our country. You know we have a collaborative information facility but that doesn't work"-001M4/11

Another constraint regarding this type of data sharing is it only exists for a specific time period, which was shared by the participant from Pakistan. When the emergency situation ends this sharing system loses its continuity.

"And about the data sharing we do share our data with the National Institutes of Health. I mean the human health sector and they also share their data. But after the emergency situation, this type of data sharing is not done in a continuous pattern"- 004P2/11

The recent event-based data-sharing platform that is generated with the help of the secretariat can bring different departments in Bangladesh one step closer to an integrated data-sharing system.

"One Health secretariat has a OH event-based data-sharing dashboard and I personally feel that I successfully involved many important stakeholders there but still, this is a challenge for me. Also, there is no mechanism so far for this thing. But I'm not demotivated!"-008B10/12

"So an integrated dashboard with equal participation is much needed so that nobody is left behind"-013B22/12

As this project of data sharing dashboard is under piloting now so to before making it public the authority will have a discussion with the government-level people to define the data category.

"Yes, we are sharing our data on avian influenza, Anthrax, and Rabies in the EBS data dashboard. If you log into the website, you will find those data. We are working on the activation of this system now and at the same time, we want to add our Bangladesh Animal Health intelligence system (BAHIS) to the OH data dashboard too"-014B26/12

One of the participants shared the importance of generating evidence-based data first as he had some previous experience regarding this matter. According to him we only can make an effective decision when our data repository will be abundant and transparent.

"Before data sharing, you have to generate data, it is very important to produce data first, we initiated 4-way linking before but it failed due to the lack of data generation" - 029B17/12

While asking the participants about the complexity of inter-sectoral data sharing most of them said data sensitivity is the main fact, then comes the lack of trust and collaboration.

"In terms of data sharing, even if some institutions have good data, they don't want to share due to the lack of trust issue, the absence of an MOU, and is legally binding"-029B17/12

"But we can share data across the sectors in case of non-sensitive issues"-026T13/01

So, the participants emphasized in building the trust and sensitization among the policymakers from the relevant department. .

"*But in terms of inter-departmental sharing or institutional sharing, I don't think this is a big factor. Because we are analyzing the data and then identifying the outcome for the well-being of our country and also we share those findings with our policymakers. So if there is a gap in the sharing process how can we create a sustainable plan?"-019B03.01*

"If anyone has some sensitive data that would not be allowed by the authority to share, they can unpublish those but Director General of Department of Livestock Services (DLS) should play a vital role here which is not taking place yet. We need more sensitization"-30B23/01

We got some positive responses from the participants from Thailand and Bhutan as they shared that a MOU and setting up emergency communication across the ministries and departments are playing a big role in their effective data-sharing management.

"I think data sharing is easier for us as we have MOU with our ministries. All the department DGs are aware of it, all the departmental secretaries are aware and all the operational workers are aware of it. So these are enabling the environment for us"-025T09/01

"For now, we are sharing our data among human health, animal health, environment, and wildlife people, especially whenever we find any kind of outbreak information we send an official mail through the correspondents of different sectors"- 012Bh21/12

4.2.2.5. Dedicated government fund and human resource support for a joint approach

Another important point that we found from the participants is having a dedicated budget for the surveillance and outbreak investigation. Institutes/departments like DLS do not have multi-sectoral staff, so, in terms of emergencies it is very difficult to create a joint

team quickly. So, both the dedicated fund and creating posts for the expertise from the government are important.

"Note that IEDCR doesn't have any posts for a veterinarian so they request the officers or manpower from the relevant department"-013B22/12

"If we truly believe in OH, then we have to act like "One" and we need a dedicated office that can be arranged by the Government with every kind of facility and human resource support. Different experts will be assigned to different tasks so that the work burden will be lessened"-013B22/12

The importance of government funding was quoted like these-

"And I think budget allocation from different departments equally is needed for this, otherwise it will be a challenge. Sometimes they have interest but due to a lack of budget, they can't move forward"-015B23/12

"And also I want to mention once again that a specific funding from every ministry for surveillance purposes is necessary"-017B01/01

"We need continuous budget allocation for infectious diseases-related works. AMR and avian influenza seem the silent pandemic right now so a sustainable budget for continuous support is necessary"-022B06/01

The Bhutan government has a specific budget for their respective ministries regarding the OH activities. The relevant stakeholders in Bhutan have the opportunity to pursue financial assistance for the execution of OH initiatives from the Royal Government of Bhutan as well as several international and non-governmental organisations. Though they don't have a shared budget, yet they move together in terms of emergency situation and every sector uses their allocated budget individually.

"We go as a team and move together in any kind of emergency but the expenses are allocated for respective ministries"- 012Bh21/12

4.2.3. Capacity Building and One Health in Education

4.2.3.1. Laboratory facilities

In terms of laboratory facilities in comparison with other countries Bangladesh is not in a good position if we consider the bio-safety level (BSL) laboratories, which are a crucial resource for zoonotic infectious disease diagnosis.

"We don't have enough BSL 3 labs too. Yes, icddr,b has a laboratory for both purposes but that was not well made. They have a BSL 3 lab but somehow it got cracked, IEDCR had a BSL 3 lab but it was not maintained properly so it got disabled too. Now we get a BSL 3 lab at Bangladesh Institute of Tropical and Infectious Diseases and another BSL 3 lab in Sylhet for the tuberculosis diagnosis."- 015B23/12

On the other hand, India and Pakistan have developed strong laboratory facilities in the last few years. The same goes for Myanmar.

"In the last 25 years, our laboratories get bigger and more sophisticated, we have biosecurity lab level 1, and level 2 and even we have a BSL 3 laboratory facility here funded by the state government which costs approximately 12.5 crores. So our basic funding come from the state government and then from the federal government I mean the government of India which has a council for agricultural research situated in New Delhi"- 006I04/12

Though Bangladesh has a shortage of BSL 3 labs, it developed two dedicated zoonotic diseases laboratories so far in IEDCR and Bangladesh Institute of Tropical and Infectious Diseases. We don't have a common laboratory space for multi-sectoral use yet.

"Nowadays we have specialized zoonotic disease laboratories like Anthrax, we have a Rabies identification lab"-002B3/11

"And in terms of OH laboratories, we don't have a dedicated OH laboratory yet in our country"- 28B14/01

Also, it was shared by the participants that we do have a shortage of lab facilities at the periphery level as there are a limited number of laboratories at the central level. Even though we have a few regional laboratories those are not used properly because of lack of trained personnel.

"At the central level we have some reference laboratories but at the subdistrict level or periphery level this laboratory facility is not strong enough"- 014B26/12

"We don't have enough regional labs and also FDILs are not well established too. We have a limited number of epidemiologists support in the livestock department"- 019B03.01

But, after the COVID-19 pandemic, the scenario seems changed. As building new labs in a short time is not possible and it costs a lot so nowadays the number of laboratory networking is increasing which creates an opportunity for multi-sectoral collaboration. Different projects are playing a big impact in this aspect too.

"In terms of laboratory networking, we are doing really great, especially after the COVID-19 pandemic. We have lots of lab networks now"- 23B10/01

"I think in terms of lab networking we are in a strong position. Previously BALZAC and now OHPH makes a great impact in this area. We make partnerships with the IEDCR, icddr,b, Poultry Research and Training Centre and BLRI"- 022B06/01

We found the same scenario is happening in Nepal where the antimicrobial resistance issue plays a big role to bring together under one platform.

"The lab collaboration is in a good shape and I think AMR plays a big reason behind it"- 003N17/11

One of the participants shared rather than remodelling everything it is important to use our own resources the fullest.

"Now we need to strengthen the network among these laboratories so that we can use 100% resources of ours"- 013B22/12

Another participant pointed out the sustainability issue of this laboratory networking as most of the collaboration is taken place under different donor-driven project work. So, it is suggested to use the own funding to regularize this collaboration even after the project timeline.

"Joint capacity building is happening but through donor funds. We hope to regularize this in the future with our own funds as in terms of laboratory capacity, we are not that advanced"-012Bh21/12

4.2.3.2. Building trained human resource

Human resource is a crucial element in capacity building so building a OH trained workforce is very important. Though Bangladesh is emphasizing to use of the existing human resources nowadays, it is similarly important to make them equally sensitized to the OH concept and place the right person in the right post. Even one of the participants from Thailand mentioned the importance of including specialists in joint work.

"We are developing our human resources. But we need to find out how many of them are truly sensitized about OH, do they know epidemiology or if they are capable of laboratory work or not. This type of well-established team is not built yet!"- 31B12/01

"We have a lack of wildlife health experts. We also need epidemiologists to locate the host movements, and pathogens and do the modelling and disease risk assessment"- 25T09/01

As we have a scarcity of trained personnel at the field level DLS with the help of international funding support offered FETP to government officials. The same goes for the public health sector which is led by the IEDCR. There are several timelines for different types of courses which allows the professional to take short time as well as the long-term training.

"The Department of Livestock Services has a field epidemiology training programme for veterinarians, they also have some advanced level training to build a front liner from their side. Public health has an FETP programme which is an advanced training consisting of 2 years, intermediate one takes 9 months and front line one takes only 2 months from IEDCR"- 008B10/12

Recently, the similar programme is being explored for the wildlife officials in Bangladesh which is an excellent way to involve the forest department with the public health concept.

"Recently FAO supports us to create field-level training for wildlife officers, we don't call it the FETP programme we call it field training for the environment, biodiversity, and ecological health training (WEBE)"- 24B11/01

The FETP training is taking place in the other SAARC countries too. Participants from Bhutan and Nepal confirmed the similar training facilities there.

"We did carry a lot of FETP training and this training was joint training for animal health or wildlife and human health"-012Bh21/12

"We do have training facilities like field-level epidemiology training where animal health, public health and wildlife people join together. We also have specific OH-related training of 3-4 days in which multidisciplinary people participate"- 003N17/11

Apart from the FETP programme FAO and ACDI VOCA an NGO is doing regular training programmes at the community level with different disciplines in Bangladesh.

"Food and Agricultural Organization is doing some activities like the Bangladesh AMR response Alliance (BARA) initiative. [00.39.00] They are doing a joint training programme on antimicrobial usage (AMU) and AMR. ACDI VOCA is doing some of its rural-level extension work under the OH concept"- 014B26/12

In Myanmar, a good number of professionals got a chance to train regarding public health and the OH concept with the help of PREDICT project funded by USAID.

"PREDICT project was a great example for joint training and collaborative works. For that project partner organizer was Smithsonian, and the country partner was the Ministry of Health and also the ministry of agriculture, livestock, and irrigation, and the next one is ministry of natural resources and environmental conservation"- 010M15/12

4.2.3.3. Creating opportunities for multi-sectoral research

We asked our participants about their opinions on collaborative research work and everyone was positive about this. Nepal and Vietnam have started practicing this joint research for a while.

"We have the Nepal research council dedicated to animal health and the public health research council. Sometimes they seat together in a workshop and share the findings regarding any interesting findings over there"-003N17/11

"In our research center, we focused on the OH topic since 2013 and we worked on food safety issues together since then which connects the research works on the risk of foodborne pathogens from farms to tables. Public health is working on the E coli, Salmonellosis and AMR. We connect the veterinarians, and animal health workers also in this research especially when we work on these farm-based feed value chains"- 005V29/11

Most of the Bangladeshi respondents agreed that the joint research area is flourishing nowadays as researchers from different institutions are working together and some donor-driven projects are doing great in OH research work. Even policy-level people are getting interested to know the outcome of this joint research and scientists are encouraged to initiate this type of research more. Here are some responses-

"You know nowadays our honourable prime minister gives more emphasis on the research programme which was not a common scenario before"- 020B04/01

"In my opinion, OHPH-B is the best example because it creates a dimensional phase in terms of OH research. First of all, it connects multi-disciplines people and then it involves professional people but from different areas like microbiology, epidemiology, and economist"- 032B26/01

"Chattogram Veterinary and Animal Sciences University, IEDCR, and GHD are trying to do OH-driven research"- 015B23/12

Multi-disciplinary collaboration is happening at the institutional level too. The leading research institutions are building multi-sectoral teams to get the best outcome nowadays.

"In my team, there are 2 veterinarians, 3 physicians, 3 anthropologists, 2 bioinformatics specialists, and also there are people from data analysis. So, this type of common platform is growing in our country"- 23B10/01

In terms of the interface studies we found responses like these-

"We don't have sufficient interface study"- 31B12/01

"First of all our research fund is not sufficient, secondly as our officials are busy with institutional and bureaucratic work more so some of the funds are bounced back only because of our negligence"-013B22/12

4.2.3.4. Initiating One Health research area except for the disease interest

According to most of the participants, OH research is trapped under infectious zoonotic diseases still now. They think we need to come out of that old concept and embrace more interesting areas to work on.

"And another thing that I have noticed in our country and also in other countries is most people think OH is all about animal health and zoonotic diseases, even when we invited the representatives from the human health sector to our secretariat meeting or OHB regular gathering most of them seems uninterested"- 015B23/12

Nowadays AMR is a burning issue and researchers around the world think that this problem can't be solved by a specific discipline people. So, alongside Bangladesh, other countries like India, Nepal are taking this issue seriously and started joint research area about this matter.

"If I'm talking about the joint research area, then I must say AMR is an awesome topic to start this kind of activity"- 014B26/12

"We have active research on AMR going on in the collaboration with the council of medical research based in New Delhi. The AMR is a hot topic in our country and even you might hear about the Chennai declaration"- 006I04/12

Along with AMR, there were some interesting areas mentioned by the participants to incorporate OH like the humanitarian sector, global warming, climate change, and food safety.

"One interesting area that is growing now is the OH and the humanitarian sector, so a lot of humanitarian research, emergency response in conflict, in a climate emergency, they are developing OH portfolio for these research areas"- 018U27/12

"Nowadays global warming and climate change are important issues. And I believe these issues have some relationship with infectious diseases. We have also some important

research areas like food or crop related like AMR in vegetables, and pesticide effect in agriculture"- 022B06/01

One of the participants from Bangladesh suggested doing a regular exercise every year to find out the relevant working areas on OH.

"We need a simulation exercise to find out the possible working areas. And if possible, a mandatory simulation exercise per year should be incorporated into the system"- 032B26/01

4.2.3.5. Incorporating One Health curricula at the university level

While getting the responses related to OH curriculum, every participant agreed that if we want to build a future OH workforce, we need to share this concept in our education system. Our respondents from the Bangladesh expressed that still now not every educational institution of Bangladesh have incorporated this topic into their existing curricula.

"But as far as I know, human health has already included several OH modules like international health regulations in their syllabus curriculum where the veterinary education system is still lagging. Only the CVASU had this type of curriculum and has some special materials but the other universities are not having these types of modules"- 002B3/11

Even though Bangladesh has a OHI people are not satisfied yet with its activity.

*"We have our OHI but do you think that is functioning as expected? I don't think so. There is a lack of linkage between institutional research and policy-level involvement"- 002B3/11*Myanmar is trying to incorporate this concept slowly into its curriculum.

"We only have a veterinary university which is located in the center of Myanmar. I think in their curriculum of OH is already included. Maybe one or two lectures on OH"- 001M4/11

As Vietnam and Thailand have strong OH university networks, they have a structured course curriculum and module regarding OH and their students need to do mandatory community work where they share about this concept.

"When the OH topic comes in we see a superb interaction between the students and the community workers. Before that, we only take the class at the university level on OH and what is important is working together as a multidisciplinary sector. And they need to prepare themselves before going to the field. In the last 10 years, we had found so many ways to line this up"-005V29/11

"Some universities do offer OH as their Masters course because we are part of the USAID-funded Southeast Asia One Health university network (SEAUHUN)"- 25T09/01

In the USA and UK, they offer post-graduate degrees dedicated to OH. And they started teaching about this concept from the undergraduate level which makes their students more sensitized before starting their professional career.

"Some universities have both OH classes and modules. The University of Alaska Fairbanks has a master's in OH and that is the only university that provides a degree actually named OH"-007US07/12

"Regarding training, at the formal university level, we have Masters courses, and PhD. on OH, and within the undergraduate curriculum, [00.33.00] medical students and veterinarians and also people who are working in the environment are more interested in this concept"- 018U27/12

Regarding initiating OH higher studies, one of our participants from Bangladesh suggested creating more active participation from the OHI and offering a OH master's degree alongside public health.

"I think CVASU is doing really great in this regard, you have a OHI that gives you a public health degree. But I hope in the future we will have more Master's programmes in OH and further degrees from the joint institution under a common platform where the medical colleges and the other universities will join together to offer Master's fellowships for the students"- 019B03/01

4.2.4. One Health networking and culture

4.2.4.1. One Health Network at different levels

In terms of OH networking, the analysis showed some mixed responses from the participants as this collaboration varies at different levels at the national level, regional level, international level, community level, and even the personal level. Most of the participants agreed that they have good communication and collaboration at a personal level which is one of the key mediums for multi-sectoral networking.

"The networking and bond at personal level are very strong and it's a funny fact that even this bond works better than our official coordination"- 008B10/12

According to the participants from Bangladesh at the national level, Bangladesh has built a strong partnership since the inception of the OH concept in this country.

"Truly speaking overall OH movement is still in the national level"-24B11/01

"In terms of national level conventional partnerships among the health, animal health, and environmental departments networking is great"-24B11/01

And there was good feedback regarding the OHB, a civil society platform, which is leading the OH relationship at national level so far.

"One Health Bangladesh is doing really great nationally"-019B03/01

But still, now the advocacy regarding the OH concept at different levels is not same. Even at the national level, not all the government-level stakeholders are not aware yet familiar with this concept which is quoted like this-

"If I'm talking about the government level except for a group of people who are working on this concept commonly, the others are not familiar with it till now. Even at the ministry level, there is a lot of room for sensitivity"-020B04/01

Another strong networking is happening at the international level as many renowned scientists and OH enthusiasts from Bangladesh are playing an important role in different international platforms.

"I think international networking is stronger than the other types of networking"-002B3/11

Some of the participants shared that as the multi-sectoral research area is getting bigger day by day so does the international collaboration which is helping us to make the international partnership stronger.

"But if you are talking about the international networking of OH, it is growing bigger day by day as we have some global level partners like the WHO, FAO, GHD, etc"-015B23/12

Among the SAARC countries, Bangladesh is in a good position in terms of institutionalization of OH so far. Most of the participants suggested that as the other countries are trying to set up a specific OH working body like us it will create an opportunity for a regional partnership in the near future.

"Regionally I mean in terms of other SAARC countries we are doing great"-022B06/01

"Even nowadays many countries are starting to build the OH secretariat body so I'm hopeful in the future secretariat to secretariat collaboration at the regional level will take place"-019B03/01

In comparison with the national, regional, and international level networking community or local level OH advocacy is not flourishing still now.

"But at the community or the grass route level, we have a lot more to do"-022B06/01

One of the participants from Bangladesh stated that though in the strategic documents community-level engagement was mentioned previously, but it is not shaping yet.

"In all the policy documentation they mentioned the upazila or subnational level involvement area but in reality still, now we don't have any sustainable network there"-019B03/01

Some of the participants pointed out some important areas where we need to give more emphasis if we want to build a sustainable community-level engagement on OH in Bangladesh. Before establishing this concept at the local level, we need a trained workforce as scattered or unplanned ways of advocacy make the process fragile.

"We need lots to do at the field level and at the community level we don't have any type of OH advocacy. So now we have to work at the local level but before that, we need a strong workforce"-017B01/01

"Many works are happening at the community level regarding OH but it is taking place in a scattered way and even the people who are in charge of this programme are not well known about the OH concept"-029B17/12

In terms of this matter Thailand, Vietnam are creating some excellent examples which can be adopted by Bangladesh.

"To develop the OH workforce at community level we arrange leadership training focusing on several areas like public communication, strategy for good communication, and decision-making process and train the trainee how to solve problems with the help of OH strategy which develops their critical thinking capability"-26T13/01

"When the One Health topic comes in we see a superb interaction between the students and the community workers. Our main focus is to make their knowledge useful for the local people. So it is not only for the study purpose we bring them to the field to strengthen their capability in One Health communication. So that's how our community-level One Health work going on"- 005V29/11

Most of the participants from Bangladesh suggested creating small working bodies like the OHS at the local level to introduce the OH concept among community-level stakeholders.

"If we have a secretariat-like structure in every region of our country we can easily disseminate the OH concept at the district or upazila level"-019B03/01

The workforce development involving para-professionals wisely was suggested by one participant. At the same time, some of the collaborative research projects set good examples of community-level OH work which can be incorporated into the plan.

"Involving para-professional people in the main platform is not accepted by professional people"-029B17/12

"I think we are on the right track, BALZAC and OHPH created some examples for us so far"-30B23/01

4.2.4.2. Strengthening the institutional network and engaging students' community to the action

While discussing about the institutional networking most of our participants suggested that it is needed if we want to spread the OH concept in a broader aspect.

"We can build a subgroup of academicians from different agricultural or other universities who will be led by the main group of academicians to work at the subnational level"-020B04/01

Many of the participants suggested that educational platforms like the university level academics can take the lead at the subnational level, whereas the primary level and higher secondary or relevant institution teachers can play a big role to engage the community level people towards OH.

"Social and religious leaders like Madrasa teachers, School and College teachers who have an opportunity to work with the community people need advocacy regarding OH"-013B22/12

"Under civil society, we have NGOs, international NGOs, and universities. We need to build a strong relationship with these institutions"-24B11/01

Though we identified collaboration among some institutions for both research and academic in our review work and in the previous themes, one of our participants described the fact like this-

"Except for some institutions we are not in a good condition in terms of institutional networking too"-28B14/01

Also, one of the participants from Bangladesh pointed out that though OHB is working relentlessly to establish this concept in our country it is not an established institution yet. Rather than an institution it is addressed as a civil society forum.

"Another thing is OHB platform is a forum, not a proper institution so regular meetings are happening within this forum but the regular discussion between two institutions like CVASU and IEDCR is still missing "-015B23/12

In terms of university-level networking, we got feedback from our representative of the Vietnam that they did a brilliant job as they successfully bring multi-disciplines students and academics through their platform. Also, India has started to work on their OH institutionalization in a few states are doing great in terms of institutional networking.

"I must say in terms of university networking we are doing great. We have 27 university networks from North to South and it includes students from human medicine, public health, nursing, animal science, and veterinary medicine"-005V29/11

"Kerala is doing great in terms of university network and they do monthly consultations with the departments"-006I04/12

In terms of youth engagement, all of the participants agreed that the young generation especially the university level students can be the key source to build a strong OH workforce in a country. So, good mentoring and support are needed to make this huge student population motivated towards OH. Even they can be the perfect medium for the community level OH engagement. Here are a few quotes-

"I think if I'm talking about networking in terms of Health, student involvement is a necessary thing as they are the future leaders"-007US07/12

"I believe our young generation are change makers and I have faith in them so perhaps the more we involve them, the academics and the non-govt peoples [00.45.00] culture will automatically get stronger"-008B10/12

"In my opinion more mentoring is needed to build future leadership, otherwise there will be a gap. Our present leaders need to start mentoring the next generation focusing on some target areas to build a sustainable OH network"-31B12/01

"The students' community can disseminate the OH culture at the root level people too"-020B04/01

4.2.4.3. Growing One Health culture at institutional and personal level

One Health concept is getting familiar in the last ten years not only in Bangladesh but also all over the world. People are curious about it. Two of our participants from Bangladesh responded like these-

"Whenever I invite people to attend any of our medium- and small-scale programmes or events related to multi-sectoral collaboration I found hardly any people are absent. It shows that people are interested in OH and they want to know about it"-008B10/12

"Some of them at least know what is OH like at least they know this is the area which connects humans, animals, and the environment people though they are not clear about how it works"-019B03/01

The best part is policy level stakeholders from different countries are now feeling the importance of incorporating the OH concept in the relevant areas. Here are some responses from our participants-

"But still, if I'm comparing the present situation with 5-7 years earlier now many of our policymakers at least know the words "OH"!"-013B22/12

"The top-level or I can say the higher bureaucracy level has realized that we need to work together"-003N17/11

The next point that was raised by our participants is breaking out the silos. Many of them share that working with multi-discipline people is not an easy task as they are not used to it. But slowly this concept gets the momentum.

"But the main problem is everyone is working in their silo, so all the work is taking place at the individual level, there is less area of connectivity and the area of sharing is very narrow"-28B14/01

"If you want to set a tradition and try to bring all the officials like the human doctor, animal doctors, and wildlife people under one platform you need to break the stigma which is not an easy task"-014B26/12

"But whenever any emergency is there, we step aside all the negative things and try to work together and people communicate with each other and they call every relevant stakeholder for the solution"-004P2/11

Another positive impact of the growing OH culture is people know that there is no boundary to contribute in this concept from different sectors and that's why stakeholders from the environment sector are coming forward to work on OH issues.

"In the past, human doctors think that they are the only people who can talk about health but thanks to the OH concept now they get that there is a lot of common working area in the veterinary field"-31B12/01

"In Dhaka, there is an environmental organization called Professional Institute For Development and Socio Environmental Management *shortly known as "PRISM Bangladesh" that is working on it and we asked them to expand their activities to other regions of our country. In the Khulna region, there is an NGO called "Prodipon" that is working in this field too"-021B04/01*

"But now as the environment is connected directly to the OH theme I think it will create some opportunities for us. In the future, if we get a chance or are invited by the ministry of health, we will definitely join the programme"-021B04/01

Also, some international institution is building an open platform for discussion and collaborative working opportunity around the world on OH.

"I think Chatham House has a reputation for being a forum, a neutral forum where people can come and talk openly and that's the motto of OH and it doesn't hold anybody to talk, to join for the collaboration"-25T09/01

"And at the international level, they look at the right forum for OH discussions, for example in the UN forum, they think can we market it and make this a trade offer with other countries whether it is like providing advisory support"-018U27/12

4.2.4.4. Sustainable One Health network through good communication strategy and training

The key element to reaching more people with the OH concept is good communication which was mentioned by most of our participants. But we had found that communication strategy varies from country to country. And it creates a big difference in some cases. In Bangladesh, less emphasis is given to communication and media coverage. And, also the existing communication platform is not enough to reach a large number of people. Here are some responses-

"In Bangladesh we don't have a communication cell or even a media wing in our health department"-013B22/12

"As far as I know we don't have a structural communication cell yet"-002B3/11

"I believe without involving media you can't reach the level of general people"-015B23/12

On the other hand, countries like Thailand, Vietnam, and Bhutan give priority to their media coverage system and set a regular communication medium to let people know the latest news and information related to health or any emergency. These are some quotes from their side-

"We give more emphasis on the social media platform for the awareness purpose because nowadays it is difficult to bring people physically into any training programme and seminars, so social media is an easier option regarding this matter"-011B17/12

"You need regular communication, Facebook posts, social media posts, direct messaging in groups, or even demo-type exercise"-25T09/01

"We work on our personal communication regularly, and also we work with our health volunteers who help us a lot"- 26T13/01

One of our participants mentioned the controlled use of the media as people can easily be misled through false information. Another participant mentioned that while sharing the information we need to set the communication tools according to the audience.

"Even we can't ignore electronic print media, social media people too. But we need a controlled setup where we can share the positive news and make them learn about these concepts in a friendly way" –013B22/12

"We need to fix our communication strategy according to our audience"-029B17/12

Most of the participants pointed out the importance of having more training programmes like field-level epidemiology training which successfully connect professionals from different disciplines under one platform. Food and Agricultural Organization offers a joint training programme with human doctors and veterinary professionals regarding the safe use of antimicrobials which is a good example happening in Bangladesh.

"We did carry a lot of FETP training and this training was joint training for animal health or wildlife and human health"-012Bh21/12

"I must mention the BARA community from the FAO"-014B26/12

4.2.5. One Health new definition

4.2.5.1. Broader coverage of different disciplines and One Health issues

We asked the opinion of our participants regarding the new definition of OH that was published in 2022 by the quadripartite approach (Adisasmito et al., 2022) and most of the participants thought that the new one is more holistic and inclusive than the previous one. Here are some quotes-

"The new definition seems broader rather than the previous one. And I like it because we have more working areas now like the food safety and security issue"- 30B23/01

"This new definition is well written and very close to OH spirit"- 029B17/12

"I like it because it is inclusive and it's not all about diseases and pathogens"-025T09/01

Another thing of this new definition is adding some way out for a successful implementation of OH. One of our participants shared his point of view regarding this like this-

"The most important thing is they define the 5 principles for the implementation, like equity across the sectors, parity means universal health care across the society people, the proper balance of different societies, stewardship in terms of collective responsibility, and transdisciplinarity"-032B26/01

One of the participants pointed out that the new definition is more practical as it clarified the theoretical aspects of different topics.

"In the new definition I think it captures all the different elements and also places the definition into the real world. So it's moved away just from the theory and talks about where it can be practically applied"-018U27/12

Though the definition covers a broader area for working with a OH approach, still it missed the importance of tackling non-communicable diseases.

"I think it's good and this new definition set a big picture for us but we need to find more ways to join these issues together even if it's zoonotic diseases or NCDs as while emphasizing the zoonotic diseases we forget to address the issues related to NCD"- 005V29/11

4.2.5.2. Possible complexity

Though the definition is more inclusive some of the participants felt the new definition seems difficult for the common people to understand. According to them, the new one has a more scientific value but it needs to be simpler if we want to share this among the general people.

"I think the good thing about the new definition is it does give us a central, unified definition that we all agreed to but it may be too long for the general public to understand"- 27US25/01

"It's too long! One Health is all about teamwork. It is simple like that but defining it in a complex definition is not needed"- 007US07/12

Another participant commented as the new definition allows more sectors on board it will be more complex to relate OH in every aspect so a structured way to reach out to these people is needed.

"Again when there are more areas there are more challenges too! We need strong leadership. And I feel it's time to build our next-generation leaders"- 022B06/01

Chapter- 5: Discussion

Despite the fact that the OH concept was adopted in Bangladesh a long time ago, no extensive studies have been conducted till far in the context of exploring the existing OH operational system and its scopes in our country. The current study aims to review and analyze the existing OH initiatives that have been implemented in Bangladesh since the concept's inception, as well as to identify challenges and scopes from multiple stakeholder perspectives in Bangladesh and the other nine countries involved. In addition to the scoping literature analysis and KIIs, the study findings were presented at a policy level multi-stakeholder meeting (Roundtable Meeting). Following that, a framework analysis was conducted to determine the important results of the discussion in order to create a policy brief that is incorporated in the discussion part. Hopefully, the current investigation's findings will expand understanding of OH in Bangladesh and will serve as a framework for future researchers and policy level work. The study's key findings have been discussed in the sections below.

5.1. One Health Governance

Since the introduction of the One Health concept in Bangladesh, our country has made notable progress in the institutionalisation of One Health. However, this study along with the roundtable policy-level meeting held in Dhaka in March 2023 which was organized by OHPH (Bangladesh) and Chatham House, a UK-based policy institute identified some specific areas to consider strengthening the OH institutionalization and building ownership in this country.

5.1.1. One Health Secretariat

The establishment of a dedicated secretariat for OH is crucial in facilitating the coordination and consolidation of endeavours across various sectors. The secretariat is supposed to responsible for functioning as a central interface that facilitates the exchange of information, sharing of data, and collaboration among pertinent governmental entities, stakeholders, and development partners. But we found that there are some areas that need to be addressed for its betterment. One Health secretariat in Bangladesh currently has a

limited number of deputed officers, specifically three, who are assigned from the directorate general of health service, DLS, and Bangladesh forest department. Based on the conditions outlined in the TOR, it is expected that a minimum of three support staff members should be provided. However, it has been observed that the required level of assistance is not being received. Furthermore, the health service officer bears individual responsibility for the IEDCR in their capacity as a scientific officer within that organisation. Therefore, it is imperative to establish a dedicated secretariat with appropriate staffing in order to ensure the integrity and value of team work, as multitasking can have adverse impact. Our study reveals that the establishment of a dedicated workspace and the allocation of appropriate staffing, in accordance with the potential responsibilities, can significantly enhance the efficacy of OH initiatives in Thailand and Vietnam (Tangwangvivat et al., 2019). In addition to the designated officers, it is necessary to explore potential strategies for supporting the secretariat. The provision of short-term internship opportunities through collaborative efforts at the university level can effectively address the shortage of support staff.

Simultaneously, it is observed that the secretariat lacks any representation from the environment department, thereby creating a disconnect with this particular group of stakeholders. However, it is essential to dismantle the barriers of disciplinary silos in order to facilitate effective interdisciplinary collaboration, which is crucial for enhancing health outcomes and offering policymakers more pragmatic recommendations (Errecaborde et al. 2019; Adisasmito et al., 2022). So, adding technical expertise from other sectors like the environment, agriculture and international organizations like the FAO, WHO, USAID can also be a useful way to bring the enthusiasm among the secretarial staff and make them more efficient.

Another significant finding highlighted the significance of designating a predetermined portion of the budget for the OHS. We discovered that the operational budget of the CDC as well as donor organisations such as GHD, FAO have been providing the secretariat with logistical support for the purpose of regular meetings. At the same time, however, it was brought to everyone's attention during the discussion at the policy level that in order to get a good budget, it is essential to have a structural work plan, which the secretariat does not

have. Therefore, the secretariat has to carry out some short-term and long-term work plans in accordance with their TOR. This will assist in the process of obtaining a backup budget for the next activities.

5.1.2. One Health Coordination

As per the TOR, the OHS will be under the direct supervision of the Director of the IEDCR. Additionally, the secretariat will adhere to the technical guidance provided by the Technical Advisory Group (TAG). The Director of the IEDCR will provide updates to the IMSC regarding the activities of the OHS. A coordination committee, led by the Director of the IEDCR, has been established. The primary purpose of this committee is to oversee and evaluate the operations of the secretariat, as well as to offer on-site guidance regarding any pertinent matters. The sole means by which the secretariat can establish communication with either the TAG or the IMSC is via the coordination committee. Our study reveals the existence of a communication deficit within this chain, wherein obtaining immediate assistance from the chairperson and co-chairperson of the coordination committee is not always feasible due to their overlapping responsibilities. One possible approach to obtaining intellectual support when needed is by leveraging the expertise of individuals from various sectors, such as international organisations or academia.

Based on the insights gathered from our interviews with key informants, it was observed that the UK has chosen to integrate the principles of OH across various departments, rather than establishing a dedicated OH entity. In the policy level meeting mentioned earlier it was also suggested the establishment of a OH desk within the secretariat of each relevant ministry, with a designated focal person can be an efficient medium of OH coordination in Bangladesh.

Establishing MOU with the relevant stakeholders from government and non-government sector is another effective medium of building OH coordination. We found that Thailand coordination unit of OH maintained this relation across the ministries which seems very effective in terms of multi-sectoral collaboration (Tangwangvivat et al., 2019). Bangladesh OH coordination committee should take this example to build a strong inter-ministerial OH relationship.

The subsequent step involves establishing ownership. The rotation of the chair and co-chair positions among the ministries (MoHFW, MoFL, and MoEF) every three years has been clearly stated in both the OH strategic documents (Anonymous, 2012; Personal communication, Prof. Nitish Chandra Debnath, Fleming Fund, 2017) and the TOR. However, despite the establishment of the OH coordination bodies in Bangladesh in 2016, the implementation of rotational leadership has not yet occurred. Our study revealed that in 2020, COVID-19 public health crisis emerged just as this decision was about to be taken, leading it to be postponed. However, there is a collective sense of optimism among the relevant stakeholders that the rotation will occur in the near future. In addition, it is expected that each committee, excluding the coordination committee, will conduct biannual regular meetings as part of their routine activities. The coordination committee convenes for meetings as necessary. The regular meeting schedule has been affected by the COVID-19 situation, necessitating prompt regularisation. In addition to this, it was proposed by our interviewee and also discussed during a policy-level meeting in Dhaka in March 2023 that the venue for these meetings should be allocated within various ministries or departments. Meanwhile, it is worth noting that the OH secretariat is located under the IEDCR. Based on our thematic analysis, it has been observed that this organizational structure has resulted in a state of perplexity among the general people, as they believe the primary focus of the OHS to be centered on the IEDCR and concerns pertaining to human health. In addition to implementing rotational leadership, it is crucial to establish a designated space for the OHS.

5.1.3. Development of One Health network at different level

Our scoping review and thematic analysis show that Bangladesh has made significant progress in national and international collaboration since implementing the OH concept. However, there is a significant amount of work that needs to be undertaken at the sub-national and community levels in order to establish the OH concept. The priority of decentralizing OH to facilitate institutionalization is crucial. During the policy discussion, everyone agreed that this concept should be spread from the ministerial level to the district, and upazila levels.

In 2018, the initiative known as "One Health Bangladesh support group, Chittagong" was taken in order to offer support to the goals and objectives of OHB as well as its constitution. However, since its inception, this organisation has not yet engaged in any worthwhile endeavour. Everyone expected an active movement to result from this being the first initiative taken in Bangladesh to form a local chapter of the OH endeavour; unfortunately, it was not functioning very well. Therefore, as of right now, there is no OH entity operating at the local level that is functioning. Concurrently, the establishment of a structure for the coordination of OH at the community level is essential. Several notable instances of implementing community-based OH interventions and participatory research in Thailand, Vietnam, Bhutan, and Kampala have been documented in the literature, specifically focusing on zoonotic parasitic infestation (Wallerstein and Duran, 2010; Stärk et al., 2015; Dickmann et al., 2018; Pawestri et al., 2021; Rinchen et al., 2021; Kiratitana-olan et al., 2022), Ebola, rabies, avian influenza, and rift valley fever which exemplify the advantages derived from the integration of human and animal health data over time. This integration facilitates early identification of outbreaks, enhances risk evaluation, and enables the implementation of more precise interventions. It is imperative for Bangladesh to draw insights from these nations and initiate stakeholder engagement in order to formulate and execute effective policies that emphasise the significance of community-based OH approaches in disease surveillance and response.

5.1.4. One Health Bangladesh platform

In Bangladesh, the civil society forum known as OHB has played a significant role in fostering national and international collaboration and cooperation since the introduction of the OH concept. The initiative originated at CVASU in 2008 and subsequently gained widespread recognition. Since its establishment, Professor Nitish C. Debnath, the founding Vice Chancellor of CVASU, Professor Mahmudur Rahman, the former Director of IEDCR, and Professor Stephen Luby, the former Country Director of the USCDC in Bangladesh and Director of icddr,b's centre for communicable diseases, have consistently worked towards uniting stakeholders from diverse institutions and professional backgrounds through different events, and partnerships. This platform played a crucial role in the establishment of the inter-ministerial steering committee and OHS in Bangladesh as well.

However, it was discovered through interviews with key informants that due to the platform's lack of official registration as an organisation or institutional entity, the contributions made by OHB have occasionally been disregarded.

Establishing a strong presence of OHB in all collaborative initiatives inside the country is crucial, given its position as the foremost platform in the field of OH. One Health Bangladesh requires establishing a robust relationship between the OHS and the One Health Coordination committee in order to facilitate the decentralisation of the OH concept at various levels in Bangladesh. Given the platform's established international presence, it is anticipated that they would develop connections between the OH coordination structures of other countries and our country's current OH secretariat.

5.2. Sustainable joint surveillance and outbreak investigation system

The significance of an effectively coordinated surveillance and outbreak investigation system cannot be emphasised enough, especially in a country such as Bangladesh that confronts numerous types of public health obstacles. In the context of Bangladesh, the surveillance system involves not only government institutions but also a diverse range of stakeholders, including non-governmental organisations and international partners. Institute of Epidemiology, Disease Control and Research and the DLS have been actively involved in assuming a prominent position in this field thus far. We have successfully established notable examples in the context of joint anthrax and Nipah surveillance and outbreak investigation. However, other from the efforts made in addressing anthrax and Nipah, our progress in implementing a collaborative strategy has been limited. Presently, stakeholders from diverse sectors demonstrate a strong inclination towards launching more joint undertakings concerning infectious diseases, including avian influenza, rabies, and other foodborne diseases, which exhibit significant future potential. Additionally, there is a growing interest in addressing topics beyond infectious diseases, such as AMR and AMU, within our country. The country programme of the Fleming Fund has implemented a number of initiatives pertaining to AMR surveillance, potentially fostering collaborative efforts across sectors in addressing this issue.

When studying the surveillance systems of other SAARC countries, it is evident that they also exhibit a commendable multi-sectoral approach. Singhai et al. (2021), Acharya et al.

(2021), and Chattu et al. (2018) emphasise the significance of adopting a OH framework to tackle the complexities associated with Nipah virus disease and rabies. The aforementioned statement underscores the necessity of fostering collaboration among the domains of human, animal, and environmental health in order to achieve optimal prevention and control measures for these diseases. Simultaneously, the authors emphasise the importance of inter-sectoral coordination and the integration of research endeavours, as well as the sharing of data across sectors, in order to facilitate the development of efficient diagnostic tools and their implementation at the community level. These findings align closely with the results of our study. It has been identified that the development of a strategic plan is crucial for addressing both current zoonotic diseases and emerging issues. In Bangladesh, professionals from various sectors are actively collaborating to establish a comprehensive preparedness plan specifically targeting anthrax and avian influenza.

Bangladesh has launched two National Avian and Pandemic Influenza Preparedness and Response Plans. The initial plan concluded in December 2008, while the subsequent plan was designed to cover the period from 2009 to 2011 (WHO, 2009). Both Plans offer a strategic framework for effectively coordinating actions among many sectors and stakeholders in Bangladesh, with the aim of enhancing preparedness and response to avian and pandemic influenza. It was anticipated that the plans would undergo regular review and revision; but, to date, no updates have been received. According to a review conducted by McKenzie et al. (2016), a successful collaboration at the government level in Bhutan has been identified. This collaboration involves the Department of Public Health, the Department of Livestock, and the Bhutan Agriculture and Food Regulatory Authority. Together, these entities have developed guidelines for the prevention and control of zoonotic diseases. Specifically, they have created the National Influenza Pandemic Preparedness and Response Plan for H5N1 and H7N9, the National Rabies Prevention and Control Plans in Animals (2016), the National Guidelines for Rabies Prophylaxis in Humans (2012), and the Guidelines for Preparedness, Surveillance, and Control of Anthrax in Humans and Animals in Bhutan (2013). Thailand has already developed a national strategic plan on AMR and avian influenza (H1N1), which (Ungchusak et al., 2012; Sumpradit et al., 2021) outlines the difficulties encountered during the emergency and guides them to make timely decisions, evidence-based interventions, and effective risk

communication to lessen the impact of upcoming pandemics. Bangladesh should prioritise the establishment of SOPs associated with endemic zoonotic diseases.

Given that disease patterns are shifting as a result of climate change, regular simulation exercise is necessary. Our thematic analysis revealed that there is a significant requirement for a proactive and adaptable surveillance approach in order to achieve an efficient intervention and establish sustainable surveillance facilities in Bangladesh. According to Bond et al. (2013) and Yasobant et al. (2020), it is essential to utilise current networks, technology, and the exchange of best practices in order to establish a comprehensive and region-specific disease surveillance system that is responsive to climate-related factors. This approach is crucial for improving surveillance and emergency response capabilities. Many nations, including Vietnam, Thailand, and Bhutan, set the priority diseases list and annually update it in accordance with the disease burden of those particular diseases in order to conduct better monitoring and outbreak response. The prioritisation of zoonotic diseases has underscored the necessity for focused interventions, such as enhanced surveillance and prevention efforts (Siembieda et al., 2015; Kheirallah et al., 2021). However, the regular practice of this is not observed in Bangladesh. Although there exists a list prioritising diseases, it has not been updated to date.

Bangladesh possesses the capacity to further improve its current level of preparedness and response capabilities; however, it is necessary to maintain an ongoing process of monitoring and evaluating these initiatives. The involvement of the OHS is crucial in addressing this issue. Given their pivotal role in coordinating OH efforts in Bangladesh, it is vital for them to establish a systematic disease assessment system in collaboration with experts, and thereafter share the findings at the local level.

5.3. Multi-disciplinary research

Despite facing a scarcity of laboratory facilities, Bangladesh is actively working towards strengthening its existing laboratory network in order to address this gap. So far some mention worthy multidisciplinary collaborative research projects have been conducted at the human-animal and ecosystem interface including BALZAC research by RVC, CVASU, LSHTM, Chatham House, DLS, BLRI, FAO, and IEDCR. Also, different institutional level research has been conducted by major stakeholders including IEDCR,

DLS, BLRI, Forest Department, CVASU, SAU, Dhaka, Bangladesh Agriculture University (BAU), icddr,b, EcoHealth Alliance, US-CDC, FAO, WHO, Massey University, Relief International etc. In recent years, there has been a notable increase in the prevalence of donor-driven multi-sectoral research projects within the field of collaborative research. The OHPH in Bangladesh places significant emphasis on collaborative research efforts aimed at addressing public health challenges. It serves as a platform to inspire scientists from diverse disciplines and institutions, providing them with various research training opportunities to enhance their skills and capabilities. These researches recognized the importance of developing appropriate policies and interventions that enable stakeholders to control diseases and hazards. However, it is evident that institutional collaboration is occurring at an inconsistent rate, highlighting the necessity for further enhancement.

The limited presence of OH research in Bangladesh, indicating a lack of integration among various disciplines within this field. A similar scenario has been observed in other countries belonging to the SAARC. According to Chatterjee et al. (2017), there is a notable difference in the emphasis placed on career development programmes versus research-oriented programmes in the South Asian (SA) region and the South-east Asian (SEA) region. Specifically, the SA region exhibits a greater concentration of programmes aimed at cultivating professionals for careers in various fields, while the SEA region demonstrates a contrasting trend, with a higher prevalence of programmes that prioritise the development of research skills. In the context of Bangladesh, research pertaining to zoonotic diseases is mainly carried out within the animal health sector, while investigations concerning non-infectious diseases remain comparatively overlooked. Additionally, a comparative analysis of peer-reviewed articles on zoonotic disease research by McKenzie et al. (2016) reveals that only a very small amount of ad hoc research can be classified as truly multidisciplinary OH research. While the majority of animal health institutions in South Asia engage in research on zoonotic diseases, there is a notable scarcity of reliable information regarding the prevalence and impact of these diseases on human populations within public health institutions.

Based on our KII and literature review, it has been observed that the initiation of a conventional OH research project is often challenging due to the complexities associated with coordinating experts from diverse sectors. The sharing of data continues to be a significant concern. Simultaneously, researchers exhibit a reluctance to explore beyond their own surroundings, so fostering the formation of distinct disciplinary silo. Lastly, funding is a significant determinant. The majority of multi-sectoral research initiatives are influenced by donor funding, resulting in a limited duration of sustained momentum. Therefore, it is essential to maintain a consistent advocacy across different sectors. Multiple recommendations were received about this issue, with the most notable recommendation being to request collaborative project initiatives from relevant scientists and institutions across many sectors, facilitated by the secretariat of the OH.

5.4. Next generation One Health workforce

To build a robust OH workforce Bangladesh has already taken some comprehensive training programmes with the help of government and non-government organisations. Field level epidemiology training programme is one of them. This is funded by the CDC which offers significant training prospects for the animal health and public health sectors in the SAARC and the ASEAN region. Field Epidemiology Training Programme Bangladesh is a joint effort between the IEDCR and the CDC located in Atlanta. The programme was initiated in 2013 and provides comprehensive training opportunities, encompassing both long and short-term durations. The training is overseen by a steering committee, led by the Secretary of Health from the MoHFW in Bangladesh. To date, a total of 186 fellows specialising in human health and animal health have successfully completed the programme in Bangladesh (TEPHINET, 2019). In a recent collaboration, the FAO and GHD have developed a field-level training programme for wildlife officers known WEBE. It has been observed that the fellows of the FETP provide significant assistance during outbreaks of various diseases such as anthrax, Nipah, and lead poisoning in our country. According to Seffren et al. (2022), this training programme is of utmost importance in enhancing the capacity of the public health workforce within a nation, as well as in augmenting the reach of regional and global disease detection networks in times of emergencies. In the past several years, the BARA has implemented an intriguing integrated

training programme within Bangladesh. From 2016 to the present, a substantial number of competent human doctors, including both government and private veterinary doctors, as well as other important stakeholders, have received training from the BARA about the proper AMU and the AMR. This initiative receives support from the DLS and the FAO, with funding provided by the Fleming Fund and the USAID.

In light of the themes listed in our study regarding this issue, it is clear that in order to create a future workforce for OH, it is important to integrate the OH concept into the existing curricula at various educational levels. A number of universities in Bangladesh, such as CVASU and SAU, Sylhet have included the OH concept in the relevant courses within their undergraduate level education. Postgraduate occupational health education programmes are now being introduced in the SAARC region. Notably, the Centre for OH education, advocacy, research, and training programme at Kerala University in India, as well as the Masters of Applied Epidemiology in Sri Lanka, have emerged as prominent examples (McKenzie et al., 2016). In our country, the academic institutions of CVASU and SAU, Sylhet have implemented a Master's programme in Epidemiology that is designed for veterinary students at the university level. Additionally, the national institute of preventive and social medicine, which serves as a prominent public health institute, provides a Master's programme in Epidemiology.

In 2017, Bangladesh successfully established the OHI; however, the current collaboration remains limited in scope. Most of the participants of our KII mentioned that OHI should offer a specialized Masters in OH rather than their existing Public Health degree. At the same time, when incorporating this concept into educational systems, it is crucial to take a strategic approach. We can look at Thailand and Vietnam as examples. In a study conducted by Chatterjee et al. (2017), a thematic analysis was performed to examine the integration of OH modules into the regular curricula for medical and veterinary students in Vietnam and Thailand. The findings revealed that Vietnam has successfully incorporated OH modules into their curricula, whereas Thailand has adopted a more flexible approach by modifying their curriculum in order to adapt to different target groups. This includes implementing field-level shorter or more intense in-service programmes that encompass graduate students and other full-time participants.

Bangladesh necessitates a structured approach to integrate several institutions across diverse disciplines into a consistent OH advocacy programme. Incorporating the OH mentorship programme at the university level has the potential to establish a meaningful connection between experts and students. The secretariat has the capacity to provide small project opportunities for students, which can be mutually beneficial for both sides involved. In our country, every year the discipline of veterinary medicine provides students with the chance to participate in internships, during which they are required to spend a specified duration in the field. This presents an advantageous situation wherein the substantial student population can be used to disseminate the OH principles at the community level. Furthermore, it is recommended that a more comprehensive and integrated training programme, such as the FETP, be implemented at the grassroots level.

5.5. One Health University network

Bangladesh possesses the capacity to foster a diverse and multidisciplinary workforce, despite the absence of a comprehensive university network. However, several student-led organisations, including the International Veterinary Students Association, Bangladesh, One Health Young Voice, the International Federation of Medical Students Associations Bangladesh, and the International Association of Students in Agricultural and Related Sciences, Bangladesh, have demonstrated commendable achievements within their respective fields. The efficiency of these organisations cannot be fully demonstrated unless an established OH university network is in place, regardless of their effective use of limited resources.

In numerous nations, community-level engagement is facilitated through university-level networks, with the involvement of academicians and researchers from various disciplines. An illustration of this is the establishment of the SEAOHUN, which serves as a regional network with the objective of enhancing capacity in the field of OH within South-east Asian nations. Southeast Asia One Health University Network has demonstrated commendable efforts in fostering interdisciplinary collaboration and education to effectively tackle emerging health challenges in this particular region (Fenwick, 2012; Nguyen-Viet et al., 2022). Amuguni et al. (2019) emphasised the significance of cross-border university networks as a development strategy for effectively addressing emerging

pandemic threats. The authors specifically discussed the implementation of OH curricula in East and Central Africa, with a particular focus on the One Health Central and Eastern Africa network. Our study findings indicate the necessity for a comprehensible module on OH and the dissemination of research outcomes in our country, in order to effectively engage people of all ages. While examining the USAID RESPOND project's efforts to build global OH core competencies and training modules, Hamilton et al. (2015) noted the significance of structured training and competency building too.

It is strongly recommended for Bangladesh to establish a unified OH platform that facilitates collaboration across various student organisations engaged in fragmented efforts, enabling them to collectively contribute their expertise to the community. In addition to this, an efficient and well-coordinated network of students can also contribute to community-level engagement. If the OH secretariat, platforms for civil society, and international organisations step forward to support the current student platforms and their ongoing awareness and research initiatives, we can easily spread the OH concepts in the local setting. Similar to other countries, it is needed to develop a comprehensive OH curriculum that can be adapted to the educational backgrounds of students. This will enable them to effectively disseminate the principles of OH within their respective communities.

5.6. Limited Resources and Infrastructure

The implementation and sustainability of OH initiatives are significantly challenged by resource constraints, encompassing both financial and infrastructural limitations. Comprehensive health interventions are impeded by a lack of adequate human resources, technical expertise, laboratory facilities, surveillance systems, and proper waste management systems. The current workforce may exhibit a lack in the interdisciplinary skills necessary for the successful implementation of OH. So, a continuous training is needed to keep the existing manpower coped up with the advanced knowledge according to the time change. From our KII and policy discussion we found that it is important to prioritise the utilisation of existing resources in order to address this obstacle. Simultaneously, it is imperative to pursue the development of diagnostic technologies and implement a well-designed and sustainable project plan, while also securing appropriate financial support from donors. The Fleming Fund has already begun some remodelling of

the current lab facilities. Although the icddr,b possesses a zoonotic laboratory facility, it is currently insufficiently equipped to effectively function as an integrated laboratory. In order to adequately prepare for the emergence of zoonotic diseases, it is needed to enhance our laboratory infrastructure by including modern facilities such as BSL-3 laboratory.

The seamless exchange and fusion of data from many sectors is essential for the successful implementation of OH. Coghlan and Hall (2013) observed comparable results in their investigation of the practical application of OH strategies. Bangladesh faces challenges in terms of standardised data collection systems, limited mechanisms for data sharing, and inconsistent data quality. The lack of interoperability between health, veterinary, and environmental databases pose a significant obstacle to conducting thorough analyses and promptly addressing emerging health threats. We have a BAHIS system for collecting field level outbreak and surveillance data as well as an event-based data dashboard, but both are not yet operational. It is understood that certain confidential information cannot be disseminated to the general public. Therefore, it is imperative to address these concerns by engaging in a thoughtful decision-making process including key stakeholders. This will ensure that these platforms become more accessible to the researchers and also for the general people.

5.7. Socioeconomic factors and behavioural practices

We identified that the establishment of OH in Bangladesh is faced with additional challenges due to socioeconomic factors and behavioural practices. Various factors, including poverty, urbanisation, and population density, are known to contribute to an elevated susceptibility to disease transmission and environmental degradation. In addition, a majority of the participants in the KIIs highlighted that the presence of traditional farming methods, insufficient waste management systems, and the consumption of unregulated animal products pose additional challenges in addressing zoonotic diseases and environmental health concerns. Simultaneously, in accordance with the revised OH definition, there is a call to incorporate additional stakeholders. However, prior to this, it is necessary to implement further advocacy initiatives utilising a comprehensive approach that encompasses education and policy interventions. Based on our research, it has been found that setting up focused public awareness campaigns, educational initiatives, and

community engagement programmes can enhance individuals' knowledge and comprehension of zoonotic diseases, hygiene principles, and responsible animal husbandry. However, it is crucial to consider the right language that is suited for individuals of varying age groups and educational backgrounds while implementing these programmes. The involvement of local leaders, religious institutions, and community organisations can be instrumental in facilitating behaviour modification and advocating for the adoption of OH principles within the local community.

5.8. Safeguarding the poultry industry through One Health approach

The poultry industry in Bangladesh plays a crucial role in fostering economic development and ensuring nutritional security. Nevertheless, this issue presents substantial challenges, particularly in relation to the occurrence of disease outbreaks, such as avian influenza. These outbreaks have the potential to cause considerable economic damages due to the need for extensive culling, trade limitations, and a decline in customer trust. Simultaneously, the presence of inadequate biosecurity protocols and ineffective waste management practices inside farms and across the entire value chain are contributing factors to the dissemination of diseases. Despite the implementation of measures by both the public and private sectors to enhance biosecurity conditions at commercial farms and LBMs, there has been a persistent occurrence of unsafe practices. Rimi et al. (2019) state that the stakeholders seem accept the absence of a viable solution to enhance biosecurity conditions within the backyard poultry sector. Conversely, there have been sporadic and unsettling endeavours aimed at enhancing the conditions of the commercial poultry industry and LBMs, primarily driven by concerns regarding large financial investments. Consequently, it is vital to increase farmer awareness by robust field-level campaigning, as suggested frequently in our study. Noteworthy cases have been documented in countries such as Thailand and Vietnam, where frequent community-level awareness campaigns are conducted and freely accessible online modules are generated for the general population. Sultana et al. (2011) and Zhang and Pan (2008) reported comparable findings in their respective studies. According to the authors, the alteration of the general public's perspective on zoonotic diseases, such as avian influenza, necessitates the implementation of mass communication, whether through online or offline channels. In Bangladesh,

several NGOs such as ACDI/VOCA and BRAC, as well as research programmes like are currently engaged in the implementation of community level advocacy. However, it is worth noting that the execution of these programmes lacks proper organisation and coordination. Consequently, there is a need for a formal training module that encompasses the essential principles of secure farming practices and the mitigation of zoonotic diseases.

When considering the topic of surveillance, there exist some notable instances that have proven to be effective. Since 2007, the icddr,b has been engaged in the implementation of poultry monitoring activities, specifically targeting avian influenza within LBMs (Khan et al., 2018). Furthermore, from 2016, icddr,b has implemented a sink surveillance project and a poultry worker monitoring plan, as documented by Nasreen et al. (2015). In addition, the icddr,b has initiated a hospital-based influenza surveillance programme aimed at documenting instances of influenza in humans. Furthermore, the IEDCR has implemented a nationwide influenza surveillance system (Zaman et al., 2009). While the examples provided are commendable, it is important to note that the number of active surveillance programmes and integrated approaches addressing this issue remains limited at present. The urgent need involves the establishment of a comprehensive disease surveillance and outbreak investigation mechanism inside the poultry industry, aligning with the principles of OH. Furthermore, a number of participants in our study expressed that limited availability of veterinary services and testing facilities hampers timely identification and effective management of diseases.

Our analysis also revealed a scarcity of evidence-based research studies, as well as a deficiency in effectively communicating the study findings to the general public in an easily understood way. Based on the findings of Abbas and Kakkar (2013) and Galaz et al. (2015), it can be observed that research on zoonotic diseases is predominantly conducted in an ad hoc manner. A significant portion of this research is dedicated to the creation of preventive measures, such as vaccines, therapeutics, and diagnostic tests, rather than generating evidence to inform policy formulation and implementation. Therefore, there is a need for increased integration of research in Bangladesh to provide support to farmers at the rural level from the highest level of authority. Addressing these challenges will require a collective endeavour involving various stakeholders, such as governmental bodies,

industry actors, and public health authorities. Additionally, an integrated and interconnected approach that considers the interdependencies between animal, human, and environmental health is essential.

5.9. Study Limitations

During the process of doing our scoping literature review on the topic of OH, we encountered difficulties in obtaining a substantial number of documents. This was mostly due to the limited availability of open access sources containing relevant materials. The utilisation of contemporary personal communication methods may result in the unintentional exclusion of relevant documentary evidence. Given the nature of this study and its aim to gather expert opinions on the current operational structure of OH work in Bangladesh, it is important to realise that participants' personal biases may serve as a potential constraint.

During the establishment of the sampling strategies for the study, we opted for purposive sampling in order to obtain the most pertinent representatives from the many sectors. However, it is important to acknowledge that this approach may include selection bias. However, purposive sampling is widely accepted for any qualitative study (Etikan et al., 2016). Although there is a desire to achieve equitable participation of stakeholders from all key sectors, it has been determined that the current number of representatives from the fields of human health and forestry is insufficient. The non-highlighted sectors, such as agriculture, fishery, food safety, etc., could not be interviewed due to time restrictions. Additional comprehensive research incorporating focus group discussions (FGDs) and a more extensive systemic literature review would be advantageous in order to obtain a thorough evaluation of the impact of infectious diseases within the framework of OH, as this aspect was not addressed in our current investigation. However, our roundtable policy discussion was added value to the research which minimizes the thrust of conducting FGD.

Despite these constraints, the notable merits of this study lie in its distinctive methodology, encompassing a comprehensive scope at both national and international levels, and incorporating valuable insights from prominent OH experts who hold significant influence

in various domains such as veterinary health, public health, ecohealth, zoonoses, vector-borne diseases, and disease surveillance systems. The participants have contributed valuable and in-depth data, which has facilitated a thorough comprehension of the difficulties associated with the implementation of OH initiatives in Bangladesh. Additionally, this understanding has been enhanced through a comparative analysis of the chosen countries. We are hoping that will serve as guidance for overcoming obstacles to OH implementation in Bangladesh and the neighbouring regions.

Chapter 6: Conclusion, Recommendations and Future Directions

6.1. Conclusion and recommendations

1. Bangladesh has been depicted as an example for the implementation of OH in the South Asian region. However, there persists a lack in the coordination and collaboration among several sectors, encompassing health, agriculture, the environment, and wildlife. Typically, the health, veterinary, and environmental departments operate independently, leading to a lack of coordination and cohesive endeavours. To promote inclusivity across all sectors, it is vital to foster active engagement within existing institutional frameworks.

2. The field of OH is characterised by its dynamic nature, as it continually adapts to emerging challenges while previous difficulties are replaced. As a result, the new strategic framework of OH must be thoroughly redesigned and extremely practical in order for all important sectors to feel connected to it. We must develop a comprehensive national OH strategy and policy that explains the roles and duties of several ministries and agencies (e.g., health, agriculture, and the environment) in dealing with zoonotic diseases, AMR, and other relevant concerns.

3. The OHS is expected to be the focal point for OH efforts in Bangladesh. And in order to do so, it must be updated and dedicated towards the OH concept. They should lead the way to build a liaison between the national and international level stakeholders. Each committee, including the OH secretariat, comes with specific TOR for its work. It is expected that these committees adhere to their TOR and carry out effective OH activities at all levels throughout Bangladesh.

4. If we want to establish OH ownership across sectors, we must carry out the rotational leadership that was intended to take place over a particular time period. Furthermore, all meetings and discussions between the OHCC and the IMSC should be organized according to the TOR.

5. Promoting a OH approach requires the active participation of national governments, whose political commitment is crucial. As a result, guaranteeing a high-level government commitment is necessary to implement the relevant policy decisions. The OHCC and the IMSC should lead these actions.

6. Multiple training programmes are being conducted in diverse sectors. Nonetheless, it is essential to establish a conventional training establishment that underscores the need of multidisciplinary teamwork. Consequently, there is a necessity to formulate and implement more comprehensive training initiatives, such as the FETP. However, we must remember that cooperation between governmental and non-governmental organisations is essential in all fields. In order to achieve this objective, it is necessary to develop a unified module that has resemblance to the BARA activities, conveying an identical message for every sectors.

7. There is a need for enhanced financial resources to be directed into collaborative research initiatives that focus on studying of disease transmission patterns, interactions between hosts and pathogens, and the influence of environmental factors on health outcomes. Simultaneously, the establishment of an effective surveillance and outbreak system necessitates the integration of data from human health, animal health, and the environment. It is now necessary to activate the current integrated health information system, which enables seamless sharing of health data across sectors while upholding data security and privacy.

8. The decentralisation of the OH concept can be achieved through the establishment of local or regional OH centres of excellence. These centres would function as hubs

for research, training, and capacity-building initiatives in adjacent districts. Given that Bangladesh is divided into eight administrative divisions, it is required to our primary focus should be on creating local chapters in each of these divisions. Furthermore, these institutes have the potential to improve cross-border disease surveillance and response efforts. The organisation of frequent regional workshops and conferences facilitates the interaction of professionals from different sectors, enabling them to exchange experiences, disseminate best practices, and derive insights from lessons learned. The initiative aims to facilitate joint research endeavours and projects that effectively tackle shared health challenges.

9. If we want to disseminate the OH concept at the community level, we need to reach out to them in an approachable way, and seminars, community meetings, and awareness campaigns can help out. However, this cannot be accomplished by a single organisation, so we must first promote the role of local leaders and community health professionals and educate them about the OH concept. Local champions linked with government entities, non-governmental groups, and academic institutions are also needed.

10. As the upcoming workforce for OH, youth play a crucial role which cannot be undervalued. The incorporation of OH education into school curricula, followed by its extension to the university level, has the potential to cultivate a culture of health awareness starting from a young age. In addition, it is important that they receive ongoing mentoring. In addition to this, it is necessary to build an educational network that actively engages students and academics. The network will assume responsibility for organising the interactive events, wherein it will showcase the ways in which they can disseminate their expertise within their respective local communities.

11. Since practically all initiatives, whether research, surveillance, or community level work, require financial support, it is important to have strong financial back up from

all relevant ministries. A shared budget for the integrated approach could be the most efficient way to build a sustainable financial source.

12. The adoption of a OH approach in Bangladesh's poultry sector is suggested, which entails the establishment of an interconnected surveillance and response system including human, animal, and environmental health. The implementation of an integrated monitoring facility is necessary within the industry to effectively detect disease outbreaks, particularly zoonotic threats such as avian influenza, across poultry farms, LBMs, and other nodes throughout the value chain. The sharing and real-time analysis of data across Veterinary and public health institutions, environmental experts, and relevant governmental bodies is of utmost significance. Enhancing the industry's ability to manage health emergencies can be achieved through the establishment of cross-sectoral alliances, regular risk assessments, implementation of stakeholder capacity-building programmes, and spread of public awareness regarding biosecurity and zoonotic disease concerns.

The implementation of OH in Bangladesh necessitates a comprehensive strategy that encompasses effective governance, cooperative efforts, and a dedication to tackling health issues through a holistic and interdisciplinary perspective. Continuous review, feedback loops, and adaptive tactics are necessary for the ongoing success of OH initiatives in tackling intricate health issues that arise at the interface of humans, animals, and the environment.

6.2. Future directions

- Determine feasible ways by which an increased level of OH community engagement can be achieved.

- Create a standardised protocol for the integrated surveillance and investigation of outbreaks for the priority diseases.

- A more thorough investigation of neglected sectors such as agriculture, fisheries, forestry, etc., in order to sketch out their potential working opportunities.

- By exploring, reviewing, and analysing the possible challenges caused by the disease burden in terms of implementation of OH home and abroad separately, identify the most effective way to overcome those challenges.

- After the results of this study have been thoroughly analysed by the research team, the offered recommendations should be prioritised in order of importance and put into actions. Subsequently, a more in-depth investigation should be planned in order to evaluate the effects of the obstacles that have been identified.

References

Abbas SS, Kakkar M. 2013. Research and policy disconnect: the case of rabies research in India. Indian Journal of Medical Research. 138(4):560-561.

Abdul Aziz Z, Onaolapo JA, Ibrahim YK, Olayinka B, Abdulaziz MM 2022. Prevalence and antimicrobial resistance profile of methicillin resistant *Staphylococcus aureus* isolates from wound infections in Zaria, Nigeria. Journal of Current Biomedical Research. 2(5):475-489.

Acharya KP, Karki S, Shrestha K, Kaphle K. 2019. One Health approach in Nepal: Scope, opportunities and challenges. One Health. 8:100101.

Acharya KP, Subedi D, Wilson RT. 2021. Rabies control in South Asia requires a One Health approach. One Health. 12: 100215.

Adeyi OO, Baris E, Jonas OB, Irwin A, Berthe FCJ, Le Gall FG, Marquez PV, Nikolic IA, Plante CA, Schneidman M. 2017. Drug-Resistant Infections: A threat to our economic future. HNP/Agriculture Global Antimicrobial Resistance Initiative. V.2. [cited: 2023 July 20]. Available from: http://documents.worldbank.org/curated/en/323311493396993758/final-report

Adisasmito WB, Almuhairi S, Behravesh CB, Bilivogui P, Bukachi SA, Casas N, Becerra NC, Charron DF, Chaudhary A, Zanella JRC, Cunningham AA.2022. One Health: A new definition for a sustainable and healthy future. PLoS Pathogens. 18(6):1010537.

Ahmad AA, Mustafa M, Ghafoor A, Rizwan-ul-Haq M. 2018. One Health in Afghanistan: Current status and future prospects. In One Health: The theory and practice of integrated health approaches, Springer. p. 261-275.

Alam MU, Rahman M, Islam MA, Asaduzzaman M, Sarker S, Rousham E, Unicomb L. 2019. Human exposure to antimicrobial resistance from poultry production: Assessing hygiene and waste-disposal practices in Bangladesh. International Journal of Hygiene and Environmental Health. 222(8):1068-1076.

Allen T, Murray KA, Zambrana-Torrelio C, Morse SS, Rondinini C, Di Marco M, Breit N, Olival KJ, Daszak P.2017. Global hotspots and correlates of emerging zoonotic diseases. Nature Communications. 8(1):1124.

Amuguni H, Bikaako W, Naigaga I, Bazeyo W. 2019. Building a framework for the design and implementation of One Health curricula in East and Central Africa: OHCEAs One Health training modules development process. One Health. [cited: 2023 July 20]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6288412/

Anonymous. 2004. One World, One Health: Building interdisciplinary bridges to health in a globalized world. [cited: 2023 July 20]. Available from: http://www.oneworldonehealth.org/sept2004/owoh_sept04.html

Anonymous. 2008. A strategic framework for reducing risks of infectious diseases at the animal–human–ecosystems interface. [cited: 2013 July 20]. Available from: https://www.preventionweb.net/files/8627_OWOH14Oct08.pdf

Anonymous. 2012. Strategic framework for One Health approach to infectious diseases In Bangladesh. [cited: 2023 July 20]. Available from: http://www.iedcr.org/pdf/files/One%20Health/Strategic_framework_for_One_Health_Bangladesh-26%20Jan.pdf

Auburn University. 2023. Bachelor of Science in Public and One Health (B.S. PAOH). [cited: 2023 July 20]. Available from: https://www.vetmed.auburn.edu/academics/public-and-one-health/

Bhatia, R. 2021. National framework for One Health. Food and Agriculture Organization. [cited: 2023 July 20]. Available from: https://www.fao.org/documents/card/es/c/cb4072en/

Bloom DE, Cadarette D. 2019. Infectious disease threats in the twenty-first century: Strengthening the global response. Frontiers in Immunology. 10:549.

Bond KC, Macfarlane SB, Burke C, Ungchusak K, Wibulpolprasert S. 2013. The evolution and expansion of regional disease surveillance networks and their role in mitigating the threat of infectious disease outbreaks. Emerging Health Threats Journal. 6(1):19913.

Braun V, Clarke V. 2006. Using thematic analysis in psychology. Qualitative Research in Psychology. 3(2):77-101.

Braun V, Clarke V. 2012. Thematic analysis. American Psychological Association. 2:57–71.

Burkle FM. 2020. Political intrusions into the international health regulations treaty and its impact on management of rapidly emerging zoonotic pandemics: What history tells us. Prehospital and Disaster Medicine. 35(4):426-430.

Cediel-Becerra NM, Prieto-Quintero S, Garzon ADM, Villafañe-Izquierdo M, Rúa-Bustamante CV, Jimenez N, Hernández-Niño J, Garnier J. 2022. Woman-sensitive One Health perspective in four tribes of indigenous people from Latin America: Arhuaco, Wayuú, Nahua, and Kamëntsá. Frontiers in Public Health. 10:245.

Centers for Disease Control and Prevention. 2017. Workshop summary One Health zoonotic disease prioritization for multisectoral engagement in Bangladesh. [cited:

2023 July 20]. Available from: https://www.cdc.gov/onehealth/pdfs/bangladesh-508.pdf

Centers for Disease Control and Prevention. 2022. One Health basics. [cited: 2023 July 20]. Available from: https://www.cdc.gov/onehealth/basics/index.html

Chala B, Hamde F. 2021. Emerging and re-emerging vector-borne infectious diseases and the challenges for control: A review. Frontiers in Public Health. 9:715759.

Chatterjee P, Kakkar M, Chaturvedi S. 2016. Integrating One Health in national health policies of developing countries: India's lost opportunities. Infectious Diseases of Poverty. 5(05):93-97.

Chatterjee P, Chauhan AS, Joseph J, Kakkar M. 2017. One Health/Eco Health capacity building programmes in South and South East Asia: A mixed method rapid systematic review. Human Resources for Health. 15:1-9.

Chatterjee P, De R. 2018. One Health in South Asia: current status and future prospects. One Health: The theory and practice of integrated health approaches, Springer. p. 59-71.

Chattu VK, Kumar R, Kumary S, Kajal F, David JK. 2018. Nipah virus epidemic in southern India and emphasizing "One Health" approach to ensure global health security. Journal of Family Medicine and Primary Care. 7(2):275.

Chen H, Yuan H, Gao R, Zhang J, Wang D, Xiong Y, Fan G, Yang F, Li X, Zhou J, Zou S. 2014. Clinical and epidemiological characteristics of a fatal case of avian influenza A H10N8 virus infection: a descriptive study. The Lancet. 383(9918):714-721.

Chereau F, Opatowski L, Tourdjman M, Vong S. 2017. Risk assessment for antibiotic resistance in South East Asia. British Medical Journal. 358:3393.

Chowdhury S, Rahman MM, Sarkar MAR. 2019. One Health Bangladesh symposium 2018: Development of One Health policy, strategy, and implementation plan in Bangladesh. One Health Outlook. 1(1):1-5.

Chowdhury S, Aleem MA, Khan MSI, Hossain ME, Ghosh S, Rahman MZ. 2021. Major zoonotic diseases of public health importance in Bangladesh. Veterinary Medicine and Science. 7(4):1199-1210.

Claas EC, Osterhaus AD, Van Beek R, De Jong JC, Rimmelzwaan GF, Senne DA, Krauss S, Shortridge KF, Webster RG. 1998. Human influenza A H5N1 virus related to a highly pathogenic avian influenza virus. The Lancet. 351(9101):472-477.

Coghlan B, Hall D. 2013. The development of One Health approaches in the Western Pacific. One Health: The Human Animal Environment Interfaces in Emerging Infectious Diseases, Springer. p. 93-111.

Collinge J. 2001. Prion diseases of humans and animals: their causes and molecular basis. Annual Review of Neuroscience. 24(1):519-550.

Criado MF, Sa e Silva M, Lee DH, Salge CADL, Spackman E, Donis R, Wan XF, Swayne DE. 2020. Cross-protection by inactivated H5 prepandemic vaccine seed strains against diverse Goose/Guangdong lineage H5N1 highly pathogenic avian influenza viruses. Journal of Virology. 94(24):10-1128.

Dasgupta R, Tomley F, Alders R, Barbuddhe SB, Kotwana A. 2021. Adopting an inter-sectoral One Health approach in India: time for One Health committees. The Indian Journal of Medical Research. 153(3):281.

Del Popolo F, Jaspers D, Cepal NU. 2014. Guaranteeing indigenous people's rights in Latin America. Progress in the past decade and remaining challenges. Summary.

Economic Commission for Latin America and the Caribbean. [cited: 2023 July 20]. Available from: http://hdl.handle.net/11362/37051

Dickmann P, Kitua A, Apfel F, Lightfoot N. 2018. Kampala manifesto: Building community-based One Health approaches to disease surveillance and response—the Ebola legacy—lessons from a peer-led capacity-building initiative. PLoS Neglected Tropical Diseases. 12(4):e0006292.

DLS. 2023. Livestock Economy, Directorate of Livestock Services, Dhaka, Bangladesh. [cited: 2023 July 20]. Available from: http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621_fa3a_40ac_8bd9_898fb8ee4700/2023-07-23-12-04-afbcccb96f8b27d4bab6501aa8c2c2ff.pdf

Durant S, Faunce TA. 2018. Analysis of Australia's new biosecurity legislation. Social Science Research Network. 25(3):647-654.

Elbers AR, Raj SM. 2016. One Health approach: A driver for research and policy change in India. One Health: The Human Animal Environment Interfaces in Emerging Infectious Diseases, Springer. p. 83-96.

Errecaborde KM, Macy KW, Pekol A, Perez S, O'Brien MK, Allen I, Contadini F, Lee JY, Mumford E, Bender JB, Pelican K. 2019. Factors that enable effective One Health collaborations-A scoping review of the literature. PLoS One. 14(12):0224660.

Etikan I, Musa SA, Alkassim RS. 2016. Comparison of convenience sampling and purposive sampling. American Journal of Theoretical and Applied Statistics. 5(1):1-4.

Food and Agriculture Organization, World Organisation for Animal Health, World Health Organization. 2010. A tripartite concept note. [cited: 2023 July 20]. Available from: https://www.who.int/publications/m/item/the-fao-oie-who-collaboration

Food and Agriculture Organization, United Nations Environment Programme, World Health Organization, World Organisation for Animal Health. 2022. Global plan of action on One Health: Towards a more comprehensive One Health, approach to global health threats at the human-animal-environment interface. [cited: 2023 July 20].

Fenwick S. 2012. Cross-disciplinary university engagement in Southeast Asia: the establishment of a One Health university network in Southeast Asia. International Journal of Infectious Diseases. 16:466.

Galaz V, Leach M, Scoones I, Stein C. 2015. The political economy of One Health research and policy STEPS Working Paper 81 Brighton: STEPS Centre. [cited: 2023 July 20]. Available from: https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/6598th

Gill P, Stewart K, Treasure E, Chadwick B. 2008. Methods of data collection in qualitative research: interviews and focus groups. British Dental Journal. 204(6):291-5.

Government of Bangladesh. 2018. National One Health coordination committee: guideline. [cited: 2023 July 20]. Available from http://dghs.gov.bd/images/docs/Guidelines/national_one_health_coordination_committee_guideline.pdf

Grace D, Mutua F, Ochungo P, Kruska RL, Jones K, Brierley L, Ogutu F. 2012. Mapping of poverty and likely zoonoses hotspots. International Livestock Research Institute, Kenya. [cited: 2023 July 20]. Available from: https://hdl.handle.net/10568/21161

Green J, Willis K, Hughes E, Small R, Welch N, Gibbs L. 2007. Generating best evidence from qualitative research: the role of data analysis. Australia and New Zealand Journal of Public Health. 31(6):545-50.

Haines J, Neumark-Sztainer D, Eisenberg ME, Hannan PJ. 2006. Weight teasing and disordered eating behaviors in adolescents: longitudinal findings from Project EAT (Eating among Teens). Pediatrics. 117(2):e209-e215.

Hamilton K, Nutter F, Olson DK, Steele J. 2015. USAID RESPOND project's global One Health core competencies and One Health modules. Annals of Global Health. 81(1):150-151.

Havelaar AH, Kirk MD, Torgerson PR, Gibb HJ, Hald T, Lake RJ, Praet N, Bellinger DC, De Silva NR, Gargouri N, Speybroeck N. 2015. World Health Organization global estimates and regional comparisons of the burden of foodborne disease in 2010. PLoS Medicine. 12(12):e1001923.

Islam A, Epstein JH, Rostal MK, Islam S, Rahman MZ, Hossain ME, Uzzaman MS, Munster VJ, Peiris M, Flora MS, Rahman M. 2018. Middle East respiratory syndrome coronavirus antibodies in dromedary camels, Bangladesh. 2015. Emerging Infectious Diseases. 24(5):926.

Joseph I. 2015. Middle east respiratory syndrome corona virus (MERS CoV): The next steps. Journal of Public Health Policy. 36:318-323.

Kakkar M, Chauhan AS, Mahajan P, Singh G, Giridhar M. 2013. Operationalising the "One Health" approach in India: facilitators of and barriers to effective cross-sector convergence for zoonoses prevention and control. The Onderstepoort Journal of Veterinary Research. 80(1):1-9.

Kaphle K. 2020. Veterinary medicine as the core of the One Health approach for Nepal's preparedness to pandemics like COVID-19. Applied Science and Technology Annals. 1(1):122-130.

Khan SU, Gurley ES, Gerloff N, Rahman MZ, Simpson N, Rahman M, Haider N, Chowdhury S, Balish A, Zaman RU, Nasreen S. 2018. Avian influenza surveillance in domestic waterfowl and environment of live bird markets in Bangladesh, 2007–2012. Scientific Reports. 8(1):9396.

Khanal P, Sah R. 2018. One Health in Nepal: Opportunities and challenges. One Health: the theory and practice of integrated health approaches, Springer. p. 249-260.

Kheirallah KA, Al-Mistarehi AH, Alsawalha L, Hijazeen Z, Mahrous H, Sheikali S, Al-Ramini S, Maayeh M, Dodeen R, Farajeh M, Masadeh N. 2021. Prioritizing zoonotic diseases utilizing the One Health approach: Jordan's experience. One Health. 13:100262.

Kiratitana-olan K, Chaisowwong W, Thongkorn K, Kreausukon K. 2022. One Health perspectives on sustainable rabies prevention in Thailand: a qualitative interview study. Veterinary Integrative Sciences. 20(2):443-457.

Lebelo K. 2012. Communicable disease surveillance by environmental health practitioners: Ekurhuleni Metropolitan Municipality. [Dissertation on the Internet]. University of Johannesburg (South Africa). [cited: 203 July 20]. Available from: https://ujcontent.uj.ac.za/vital/access/manager/Index?site_name=Research%20Output

Lee DH, Bahl J, Torchetti MK, Killian ML, Ip HS, DeLiberto TJ, Swayne DE. 2016. Highly pathogenic avian influenza viruses and generation of novel reassortants, United States, 2014–2015. Emerging Infectious Diseases. 22(7):1283.

Mackenzie JS, Martyn H Jeggo. 2011. 1st International One Health Congress. Eco Health. [cited: 2023 July 20]. Available from: https://link.springer.com/article/10.1007/s10393-011-0676-z

Mackenzie JS, Jeggo M, Daszak P, Richt JA. 2013. One Health: The human animal environment interfaces in emerging infectious diseases, Springer. P. 365.

McKenzie JS, Dahal R, Kakkar M, Debnath N, Rahman M, Dorjee S, Naeem K, Wijayathilaka T, Sharma BK, Maidanwal N, Halimi A. 2016. One Health research and training and government support for One Health in South Asia. Infection Ecology and Epidemiology. 6(1):33842.

Marjaei S, Yazdi FA, Chandrashekara M. 2019. MAXQDA and its application to LIS Research. Library Philosophy and Practice. [cited:2023 July 20]. Available from: https://digitalcommons.unl.edu/libphilprac/2325/

Ministry of Health and Family Welfare. 2017. National action plan: Antimicrobial resistance containment in Bangladesh 2017–2022. Directorate General of Health Services. p. 1–12. [cited: 2023 July 20]. Available from: https://cdn.who.int/media/docs/default-source/antimicrobial-resistance/amr-spc-npm/nap-library/antimicrobial-resistance-containment-in-bangladesh-2017-2022.pdf?sfvrsn=bfa46b_3&download=true

Murray CJ, Ikuta KS, Sharara F, Swetschinski L, Aguilar GR, Gray A, Han C, Bisignano C, Rao P, Wool E, Johnson SC. 2022. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. The Lancet. 399(10325): 629-655.

Mushtaq MH, Hameed S. 2018. One Health in Pakistan: Current status and future prospects. One Health: The theory and practice of integrated health approaches, Springer p. 215-230.

Nambiar P. 2020. India to envision One Health movement for confronting emerging health threats: From concept to approach toward institutionalization. International Journal of One Health. 6(2): 165-176.

Nasreen S, Khan SU, Luby SP, Gurley ES, Abedin J, Zaman RU, Sohel BM, Rahman M, Hancock K, Levine MZ, Veguilla V. 2015. Highly pathogenic avian influenza A (H5N1) virus infection among workers at live bird markets, Bangladesh, 2009–2010. Emerging Infectious Diseases. 21(4):629.

Nguyen-Viet H, Lam S, Nguyen-Mai H, Trang DT, Phuong VT, Tuan NDA, Tan DQ, Thuy NT, Linh DT, Pham-Duc P. 2022. Decades of emerging infectious disease, food safety, and antimicrobial resistance response in Vietnam: The role of One Health. One Health. 14: 100361.

Osmani MG, Ward MP, Giasuddin M, Islam MR, Kalam A. 2014.The spread of highly pathogenic avian influenza (subtype H5N1) clades in Bangladesh, 2010 and 2011. Preventive Veterinary Medicine. 114(1):21-27.

One Health Commission. 2020. COVID-19: The One Health approach. [cited: 2023 July 20]. Available from https://www.onehealthcommission.org/index.cfm/37538/53252/covid19_the_one_health_approach

One Health Commission. 2023. What is One Health?. [cited: 2023 July 20]. Available from: https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/

Paudel S. 2020. Scope and challenges of One Health approach in Nepal. International Journal of Infectious Diseases. 101:399-400.

Pawestri AR, Thima K, Leetachewa S, Maneekan P, Deesitthivech O, Pinna C, Yingtaweesak T, Moonsom S. 2021. Seasonal prevalence, risk factors, and One Health intervention for prevention of intestinal parasitic infection in underprivileged communities on the Thai-Myanmar border. International Journal of Infectious Diseases. 105:152-160.

Petersen LR, Roehrig JT. 2001. West Nile virus: a reemerging global pathogen. Revista Biomédica. 12(3):208-216.

Plowright RK, Reaser JK, Locke H, Woodley SJ, Patz JA, Becker DJ, Oppler G, Hudson PJ, Tabor GM. 2021. Land use-induced spillover: a call to action to safeguard environmental, animal, and human health. The Lancet Planetary Health. 5(4):e237-45.

Premaratna R, de Silva HJ, Jayasooriya HTR. 2018. One Health in Sri Lanka: Past, present, and future. One Health: The theory and practice of integrated health approaches, Springer. p. 231-248.

Rimi NA, Sultana R, Ishtiak-Ahmed K, Rahman M, Hasan M, Nipa MH, Daszak P. 2017. One Health approach to address zoonotic diseases in Bangladesh. PLOS Neglected Tropical Disease. 11(10): e0005653.

Rimi NA, Hassan MZ, Chowdhury S, Rahman M, Sultana R, Biswas PK, Debnath NC, Islam SS, Ross AG. 2019. A decade of avian influenza in Bangladesh: Where are we now? Tropical Medicine and Infectious Disease. 4(3):119.

Rinchen S, Tenzin T, Gurung RB, Rinzin K, Cork S. 2021. One Health in policy development: options to prevent rabies in cattle in Bhutan. One Health: the theory and practice of integrated health approaches, Springer. p. 382-393.

Samad MA. 2011. Public health threat caused by zoonotic diseases in Bangladesh. Bangladesh Journal of Veterinary Medicine. 9(2): 95-120.

Samad MA. 2016. Veterinary Medical Education and Profession: Past, present, and future with especial emphasis to biomedical sciences and One Health concept in Bangladesh. Bangladesh Veterinary Medical Record. 2(1):1-28.

Seffren V, Lowther S, Guerra M, Kinzer MH, Turcios-Ruiz R, Henderson A, Shadomy S, Baggett HC, Harris JR, Njoh E, Salyer SJ. 2022. Strengthening the global One Health workforce: Veterinarians in CDC-supported field epidemiology training programmes. One Health. 14:100382.

Siembieda J, Huong NT, Hung P, Bandyopahyay S, Olowokure B. 2015. Prioritization of zoonotic diseases of public health significance in Vietnam. The Journal of Infection in Developing Countries. 9(12):1315-1322.

Singhai M, Jain R, Jain S, Bala M, Singh S, Goyal R. 2021. Nipah virus disease: Recent perspective and One Health approach. Annals of Global Health. 87(1): 102.

Smith KM, Machalaba CC, Seifman R, Feferholtz Y, Karesh WB. 2019. Infectious disease and economics: The case for considering multi-sectoral impacts. One Health. 7:100080.

Stärk KD, Kuribreña MA, Dauphin G, Vokaty S, Ward MP, Wieland B, Lindberg A. 2015. One Health surveillance–More than a buzz word? Preventive Veterinary Medicine. 120(1): 124-130.

Subedi D, Gautam A, Sapkota D, SubediS,Sharma S, Abdulkareem M, Kandel M, Ghimire H, Odetokun IA. 2022. Knowledge and perception of veterinary students on One Health: A first nationwide multi-institutional survey in Nepal. One Health. 8(1): 34-42.

Sumpradit N, Wongkongkathep S, Malathum K, Janejai N, Paveenkittiporn W, Yingyong T, Chuxnum T, Vijitleela A, Boonyarit P, Akaleephan C, Manosuthi W. 2021. Thailand's national strategic plan on antimicrobial resistance: progress and challenges. Bulletin of the World Health Organization. 99(9):661.

Sultana R, Rimi NA, Azad S, Islam MS, Khan MSU, Gurley ES, Nahar N, Luby SP. 2011. Bangladeshi backyard poultry raisers' perceptions and practices related to zoonotic transmission of avian influenza. The Journal of Infection in Developing Countries. 6:156-165.

Tangwangvivat R, Boonyo K, Toanan W, Muangnoichareon S, Iamsirithaworn S, Prasarnphanich O. 2019. Promoting the One Health concept: Thai Coordinating Unit for One Health. Revue Scientifiqueet Technique (International Office of Epizootics). 38(1): 271-278.

Training Programmes in Epidemiology and Public Health Interventions Network. 2019. Spotlight on the Bangladesh field epidemiology training programme. [cited: 2023 July 20]. Available from: https://www.tephinet.org/news/spotlight-bangladesh-field-epidemiology-training-programme

Ungchusak K, Sawanpanyalert P, Hanchoworakul W, Sawanpanyalert N, Maloney SA, Brown RC, Birmingham ME, Chusuttiwat S. 2012. Lessons learned from influenza A (H1N1) pdm09 pandemic response in Thailand. Emerging Infectious Diseases. 18(7):1058.

United Nations. 2015. Transforming our world: The 2030 agenda for sustainable development. [cited: 2023 July 20]. Available from: https://sdgs.un.org/2030agenda.

University of Alaska Fairbanks. 2023. One Health Master's Programme. [cited: 2023 July 20]. Available from: https://www.uaf.edu/onehealth/education/master.php

University of Arizona. 2023. Master of Public Health (MPH)-One Health. [cited: 2023 July 20]. Available from: https://publichealth.arizona.edu/academics/masters/mph/one-health

University of Washington. 2023. Graduate Certificate in One Health. [cited: 2023 July 20]. Available from: https://sph.washington.edu/programme/graduate-certificate-one-health

United States Agency for International Development. 2017. Emerging Pandemic Threats. [cited: 2023 July 20]. Available from: https://2012-2017.usaid.gov/news-information/fact-sheets/emerging-pandemic-threats-programme

Van Kerkhove MD. 2012. Poultry Movement and Sustained HPAI Risk in Cambodia. Health and Animal Agriculture in Developing Countries. Springer. p. 233–263.

Wallerstein N, Duran B. 2010. Community-based participatory research contributions to intervention research: the intersection of science and practice to improve health equity. American Journal of Public Health. 100(S1):S40-S46.

Wan H, Sorrell EM, Song H, Hossain MJ, Ramirez-Nieto G, Monne I, Stevens J, Cattoli G, Capua I, Chen LM, Donis RO. 2008. Replication and transmission of H9N2 influenza viruses in ferrets: evaluation of pandemic potential. PloS One. 3(8):e2923.

World Bank. 2010. People, pathogens, and our planet: towards a One Health approach for controlling zoonotic diseases. [cited: 2023 July 20]. Available from: http://documents.worldbank.org/curated/en/214701468338937565/Volume-one-towards-a-one-health-approach-for-controlling-zoonotic-diseases

World Health Organization. 2008. Zoonotic diseases: a guide to establishing collaboration between animal and human health sectors at the country level. [cited: 2023 July 20]. Available from: https://apps.who.int/iris/handle/10665/207731

World Health Organization. 2009. 2nd National Avian and Pandemic Influenza Preparedness and Response Plan, Bangladesh (2009-2011). [cited: 2023 July 20]. Available from: https://www.apaci.asia/images/Resources/Pandemic_planning/bangladesh_2nd_national_avian_pandemic_influenza_preparedness_response_plan_2009_draft.pdf

World Health Organization. 2018. Nepal – WHO country cooperation strategy: 2018-2022. [cited: 2023 July 20]. Available from: https://apps.who.int/iris/handle/10665/272476

Yasobant, S, Bruchhausen W, Saxena D, Falkenberg T. 2019. One Health collaboration for a resilient health system in India: Learnings from global initiatives. One Health. 8:100096.

Yasobant S, Saha S, Puwar T, Saxena D. 2020. Toward the development of an integrated climate-sensitive disease surveillance in Southeast Asian countries: A situational analysis. Indian Journal of Community Medicine. 45(3):270.

Yin J, Li H, Sun Q. 2021. Analysis of antibiotic consumption by AWaRe classification in Shandong Province, China, 2012–2019: a panel data analysis. Frontiers in Pharmacology. 12:790817.

Zaman RU, Alamgir AS, Rahman M, Azziz-Baumgartner E, Gurley ES, Sharker MA, Brooks WA, Azim T, Fry AM, Lindstrom S, Gubareva LV. 2009. Influenza in

outpatient ILI case-patients in national hospital-based surveillance, Bangladesh, 2007–2008. PloS One. 4(12):e8452.

Zhang L, Pan T. 2008. Surviving the crisis: Adaptive wisdom, coping mechanisms and local responses to avian influenza threats in Haining, China. Anthropology and Medicine 15: 19-30.

Zhou L, Chen E, Bao C, Xiang N, Wu J, Wu S, Shi J, Wang X, Zheng Y, Zhang Y, Ren R. 2018. Clusters of human infection and human-to-human transmission of avian influenza A (H7N9) virus. Emerging Infectious Diseases. 24(2):397.

Appendix-I

Interview Guide of Key Informant Interviews (KII)

Interview Guide for Substantiation of Review Findings of "One Health Strategic Document" in the Countries under the SAARC and ASEAN Networks

Topic 1: One Health Governance

1.1. How is "**One Health Governance System**" in your country? How does it work there**?**

Topic 2. One Health Surveillance

2.1. Does your country have a functional "**One Health Surveillance Programme"** that connected/connect the human, livestock and environmental problems in one working platform?

2.1.1. If yes, what is the coordination mechanism to conduct activities and share the surveillance data and dissemination of the data across sectors?

Topic 3: Outbreak Investigation

3.1. Do you have a functional "**Joint One Health Disease Outbreak Investigation System**" in your country?

3.1.1. If yes, could you please briefly describe this system?

3.1.2. If no, what other systems are in place that are being used to investigate outbreaks?

Topic 4: Multidisciplinary Research4.1. Does your country have a "**One Health Research Programme**"?

Topic 5: Networking and Partnerships

5.1. Does your country have functional "**One Health Organizations/Associations/Networks**" at community, regional and national levels?

Topic 6: Stakeholder Communication and Policy Advocacy

6.1. Do you have a "**One Health Communication Cell**"?

6.1.1. If yes, how does it work?

Topic 7: Capacity building

7.1. Does your country or institutions within the country have a functional and structured system/programme for the development of "**One Health Work Force**", "**One Health Facility**" and "**One Health Culture**"?

Topic 8: Challenges and solutions

8.1. Are there any challenges affecting the implementation of "**One Health Strategies/One Health Activities**" in your country?

8.1.1. If so, can you suggest any potential solutions?

Topic 9: Do you have any recommendations/ work to be done in terms of One Health implementation in your country?

Topic 10: Overall feedback on "One Health"

10.1. What is your comment on the "**One Health**" definition?

10.2. From when and how did you get to know/involved with "**One Health**" in your country?

Appendix-II

One Health, multiple impacts: a review of 10 years of One Health work in Bangladesh and the region with a focus on the poultry industry in Bangladesh

The project will involve

1. Reviewing the foundations of the One Health initiative in Bangladesh and selected south and

south-east Asian countries and their importance to the countries

2. Reviewing the existing One Health components

3. Identifying the One Health approach relates to the increasingly important challenges of emerging diseases and AMR

4. Recommendation on how One Health approaches are best pursued

Principal Investigator (PI) (Bangladesh): Professor Md. Ahasanul Hoque, Department of Medicine and Surgery, Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University, Bangladesh.

CoPIs of the project (International): Professor Robyn ALDERS, Honorary Professor, Development Policy Centre, Australian National University

Research Assistant (CVASU): Dr Easrat Jahan Esha, MS-Fellow (Epidemiology), Chattogram Veterinary and Animal Sciences University, Bangladesh

Consent for participation

I volunteer to participate in a research project led by Professor Md. Ahasanul Hoque from Chattogram Veterinary and Animal Sciences University. I understand that the project is designed to gather information about the background and One Health implementation strategy in my country.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.

2. I have the right not to answer any of the questions. If I feel uncomfortable in any way during the interview session, I have the right to withdraw from the interview.

3. I understand that the researcher will not identify me by name in any reports using

information obtained from the interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of recordings and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

4. No one except the investigators and research assistant will have access to audio recordings, raw notes or transcripts. This precaution will prevent my individual comments from having any negative repercussions.

5. I understand that this research study has been reviewed and approved by the Chattogram Veterinary and Animal Sciences University (CVASU) Animal Experimentation Ethics Committee (AEEC). For research problems or questions regarding subjects, the AEEC may be contacted through drecvasu@gmail.com.

6. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

7. I have been given a copy of this consent form.

I consent to participate in the study,

_____ Date:

Signature

Name and Designation

Appendix-III

List of conference attended and abstract published in conference proceeding

Conference: *3rd One Health Poultry Hub Conference, 2022, Radisson Blu water Garden, Dhaka, Bangladesh.*

One Health, multiple impacts: a review of 10 years of One Health work in Bangladesh and the region with a focus on the poultry industry in Bangladesh

Abstract

Bangladesh is embracing "One Health" (OH), with a strong focus on zoonotic diseases. This study assesses the impacts and lessons learned from implementation of OH approaches in Bangladesh and the region over the last decade. It also identifies new OH endeavors that can better support health security, especially for the poultry sector. The scoping review protocol set inclusion and exclusion criteria for Bangladesh and selected South Asian Association for Regional Cooperation and Association of Southeast Asian Nations documents. A tailored interview guideline used with 25 key informants determined how effectively the OH approach connects to emerging diseases and antimicrobial resistance (AMR). Bangladesh is at high risk for zoonotic diseases like Avian influenza, Nipah, Rabies, Anthrax and leptospirosis due to high human population density, human-animal interaction and environmental degradation. Deforestation, natural disasters, and AMR encourage OH stakeholders to strategies how best to implement this approach across all sectors in a robust and efficient manner. Our review revealed that, relative to the other study countries, Bangladesh has made solid progress in institutionalizing the OH approach via an inter-ministerial steering committee and a OH secretariat. However, despite the establishment of these bodies, Bangladesh lags behind in effective OH communication between sectors and with the public. Inadequate coordination among stakeholders, incompatible funding, and minimal evidence-based research were common obstacles. Bangladesh can learn from several countries regarding more effective OH action through strengthening of their inter-sectoral and public awareness communication, and establishment of local OH teams. Strong coordination mechanisms, which enable multi-sectoral stakeholders to promote honest and timely knowledge sharing and management are essential. Engaging high-level government bodies that oversee frontline ministries

helps overcome bureaucratic hurdles in OH implementation.

Key words: One Health; AMR; coordination; zoonotic

Conference: 7th World One Health Congress, 2022, Singapore

One Health, Multiple Impacts of One Health Work in Bangladesh and the Asian Region Focusing on the Poultry Industry

Abstract

Bangladesh is embracing "One Health" (OH), with a strong focus on zoonotic diseases. This study assesses the impacts and lessons learned from the implementation of OH approaches in Bangladesh and the region over the last decade. It also identifies new OH endeavors that can better support health security, especially for the poultry sector.

The scoping review protocol set inclusion and exclusion criteria for Bangladesh and selected South Asian Association for Regional Cooperation and Association of Southeast Asian Nations documents. A tailored interview guideline used with 25 key informants determined how effectively the OH approach connects to emerging diseases and antimicrobial resistance (AMR).

Bangladesh is at high risk for zoonotic diseases like avian influenza, Nipah, Rabies, Anthrax, and leptospirosis due to high human population density, human-animal interaction, and environmental degradation. Deforestation, natural disasters, and AMR encourage OH stakeholders to strategize how best to implement this approach across all sectors robustly and efficiently. Our review revealed that, relative to the other study countries, Bangladesh has made solid progress in institutionalizing the OH approach via inter-ministerial steering committee, technical advisory committee, coordination committee and an OH secretariat. However, despite the establishment of these bodies, Bangladesh lags in effective OH communication between sectors and with the public. Inadequate coordination among stakeholders, incompatible funding, and minimal evidence-based research were common obstacles. Bangladesh can learn from several countries regarding more effective OH action through the strengthening of their inter-sectoral and public awareness communication, and the establishment of local OH teams.

Strong coordination mechanisms, which enable multi-sectoral stakeholders to promote honest and timely knowledge sharing and management are essential. Engaging high-level government bodies that oversee frontline ministries helps overcome bureaucratic hurdles in OH implementation.

Keywords: One Health; AMR; coordination; zoonotic

Brief Biography

Easrat Jahan Esha obtained her Doctor of Veterinary Medicine Degree in 2020 from Chattogram (previously Chittagong) Veterinary and Animal Sciences University (CVASU) securing a CGPA 3.61 (in the scale of 4.00). Now she is a candidate for the degree of MS in Epidemiology under the Department of Medicine and Surgery, Faculty of Veterinary Medicine, CVASU. She is interested in conducting research on One Health and participatory Epidemiology in future.