

An Approach to One Health with a Pakistan perspective to Address Zoonotic Health Issues

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Abstract

Review Article

Human health is severely impacted by the proliferation and recurrence of zoonotic diseases, particularly in poor regions where people have more interaction with domiciliary and zoo animals. Approximately three-quarters of all animal-borne ailments are spread either directly from animals to people or indirectly through contact between animals and humans, acting as vectors. Factors including population growth, international trade, urbanization, and interactions between wildlife, humans, and the natural environment all have a role in the emergence and dissemination of zoonotic diseases. When it comes to improving the health of humans, animals, and ecosystems, "One Health" is a multidisciplinary idea that is seldom adopted in less developed countries. There is a detrimental effect on human, animal, and environmental health due to the shortage of resources in Pakistan. This overview describes the most common animal-borne illnesses in Pakistan and highlights the value of the "One Health" idea in the struggle to eradicate them. In light of the present situation, multidisciplinary research is needed to carry out and maintain long-term, constructive approaches by using accurate diagnostic tools and environmental health monitoring.

Keywords: Humans, Wildlife, Animals, Health, Environment, Ecosystem.

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INTRODUCTION

The infectious illnesses known as zoonoses are caused by bacteria that jump from animals to humans. The prevalence of zoonoses raises significant public health issues since approximately 60% of all infectious illnesses are zoonotic and 75% of newly emerging transmissible viruses have animal origins (Mangili & Gendreau 2009; Supramaniam *et al.*, 2018). Transmission of zoonotic diseases often occurs via interaction between humans and animals, either directly

or indirectly (Figure 1) (McArthur 2019). The proliferation of humans, the spread of cities, the mobility of animals, and the prevalence of squatter settlements are all contributors to the creation of zoonotic diseases (Rahman 2020). Most industrialized countries now use the "One Health" approach, which promotes cross-sector collaboration to improve health outcomes. Fostering and supporting a network that promotes health across the world via more effective communication, coordination, and cooperation between people, animals, and the natural world is the goal (Behravesh 2019).

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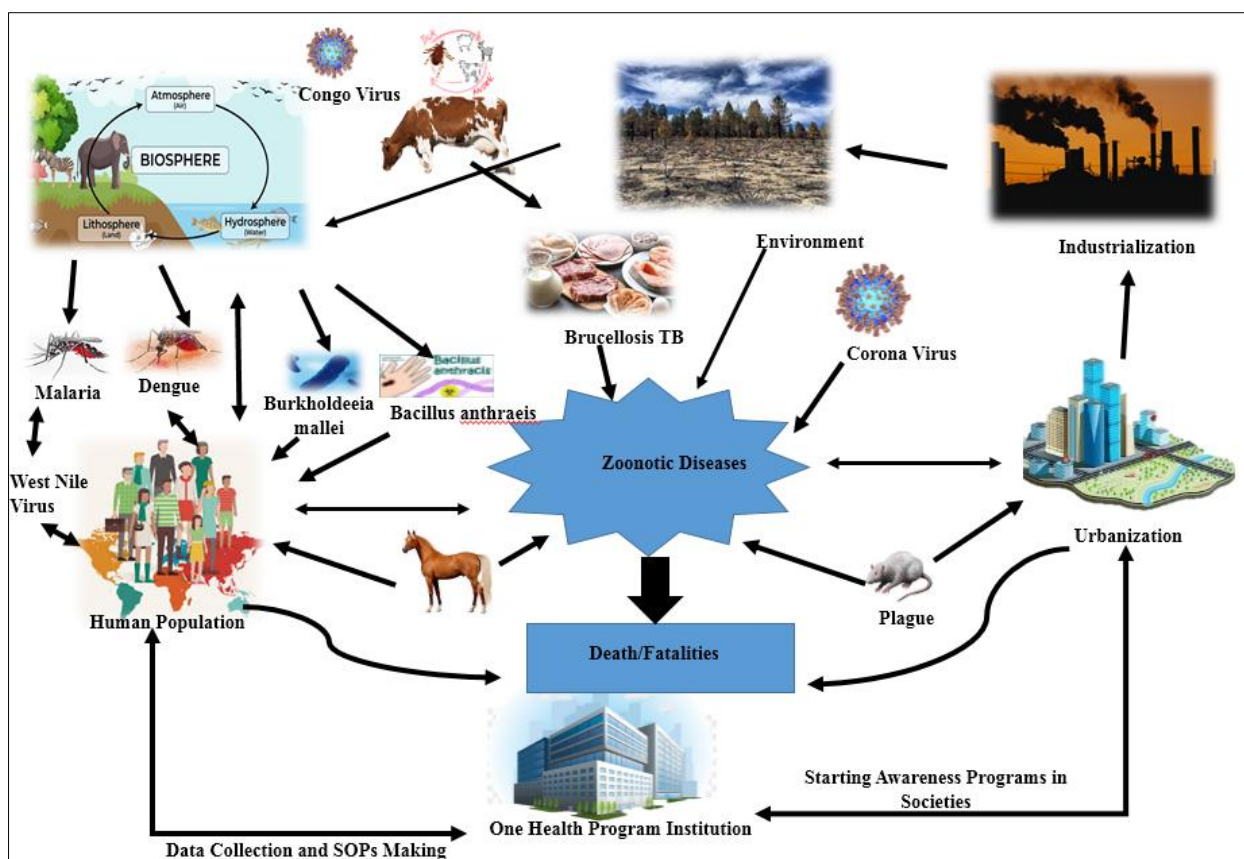


Figure 1: Zoonotic ailments and One Health idea

Pakistan, with its 208 million inhabitants, is the sixth most populous nation on Earth and is situated in South Asia near the Arabian Sea (Pakistan Bureau of Statistics [PBS] 2017).

Pakistan is home to around 300 million animals, the majority of which are chickens (147 million), large ruminants (83 million), and small ruminants (103 million) (Central Intelligence Agency [CIA] 2016). Large refugee influxes to Pakistan from Afghanistan during the last 40 years may be attributed to regional hostilities in that country (World Health Organization [WHO] 2004). The country of Pakistan has a wide range of domestic and wild animal species, as well as a varied natural terrain and temperature (Turnbull 2008). Public health and disease surveillance may be impacted by factors such as environmental variety, poverty, socioeconomic inequity, regional conflicts, and a lack of political will (Ashraf 2014).

The "One Health" concept is still not widely accepted in resource-poor countries like Pakistan, where infectious illnesses and hazardous biological pollutants have had a devastating impact on the environment and the well-being of humans and other animals. According to a 2017 WHO study, the Chikungunya virus has been connected to the sickness of more than 800 people in Pakistan (World Health Organization [WHO] 2017). Crimean-Congo hemorrhagic fever (CCHF) caused the deaths of 11 persons and infected another 63 in Pakistan

(Altmann *et al.*, 2019). Due to interactions between humans, animals, and the environment, hazardous pathogens have the potential to spread in any direction.

Several government agencies in Pakistan are working to combat and prevent the spread of zoonotic diseases. These agencies include the Ministries of Climate Change, Education, Industry, and Food Safety (Bartges *et al.*, 2017). This review provides an overview of the most common zoonotic diseases in Pakistan, and it emphasizes the value of public-private partnerships in reducing exposure to disease-causing organisms in keeping with the "One Health" approach.

Briefing on Zoonotic Ailments in Pakistan

In Pakistan, people often get zoonotic diseases such as avian flu, giardia, lyme disease, foot and mouth disease, chronic wasting disease, chronic helminthic fever, rabies, encephalitis, and anthrax.

Soil-borne zoonotic pathogens including *Burkholderia mallei* and *Bacillus anthracis* have been linked to human and animal diseases in Punjab province. DNA-based analyses also indicate a significant frequency of *B. anthracis* in Pakistan (Shabbir 2015).

Most cases of TB in humans in the 19th and 20th centuries were caused by the intake of raw cow's milk contaminated with the bacteria *Mycobacterium bovis* (Khan *et al.*, 2014). Pakistan's massive animal

population, which has adapted to the local climate, produces 1.6 million tons of meat annually. Bovine tuberculosis infections are lethal for animals and may be transmitted to humans by coughing, sneezing, or consuming raw milk, as stated by Jafar (2014). Pakistan ranks fifth among countries with a high TB burden, with an annual rate of 510,000 new cases (Shah *et al.*, 2017).

Four cattle and seventeen buffaloes (10.18 and 11.53% respectively) were found to have *M. bovis* after testing lung and liver tissue samples from 121 buffaloes and 30 cattle at three principal slaughter facilities in Peshawar (Jafar Khan 2014).

Despite the fact that a lack of preventive treatments for bovine tuberculosis has been linked to the disease's widespread distribution, the presence of diseased animals in slaughterhouses suggests that there is a deficiency in the quality of veterinary inspection and monitoring for animal TB prevention and control. The quality of meat from animals may be improved and the spread of tuberculosis (TB) from infected animals to people can be avoided with the use of stringent inspection and monitoring protocols.

A number of dengue outbreaks have been reported from different regions of Pakistan since the first epidemic was documented in 1994 (Ali 2019; Fatima 2021; Junaidi 2019; Khan *et al.*, 2015). More than 6,000 cases and 52 deaths were attributed to the outbreak in Karachi in 2005. In 2011, almost 21,000 cases of dengue fever and 350 deaths were recorded in Lahore; in 2019, 44,415 cases of dengue fever and 66 deaths are expected. This is according to Junaidi (2019), dengue virus incidence is rising, while deaths have decreased overall. The World Health Organization (WHO), regional public and commercial organizations, and staff training organized awareness campaigns with the public have all worked together to achieve this milestone.

The bacteria *Bacillus anthracis* responsible for anthrax also has a major detrimental effect on the health of animals, especially cattle, sheep, and goats. Also, the bacterium *Bacillus anthracis* may quickly spread to human hosts. The risk of getting *B. anthracis* is greatest in settings where there are frequent encounters between people and animals, such as abattoirs. Vaccinating animals is essential to any effective disease monitoring program and is needed to prevent further outbreaks.

Among the *Rhabdoviridae* family of viruses is the rabies virus, one of the most severe and devastating single stranded RNA viruses that may infect humans and other warm-blooded creatures. Canines, raccoons, and bats all play major roles in the transmission of these viruses to humans. It is estimated that there are 5 million dog attack incidents and 50,000 related deaths per year (World Health Organization [WHO] 2018). Statistics show that 54.7% of dogs that attack humans in Pakistan have not been vaccinated against rabies, according to the

National Rabies Control Program (NRCP) (Noureen 2018).

Salmonella Typhi, the bacteria responsible for typhoid fever, may spread via direct contact with infected animals or humans, as well as through the consumption of tainted water or food. Estimated annual prevalence of typhoid fever is 451.7 per 100,000 people, with 11-12 million new cases reported annually throughout the globe (Ochiai 2008). As a result, effective methods of illness surveillance and monitoring are required for its management (Fatima 2021).

A tick-borne viral illness that causes fever and internal bleeding, Crimean-Congo Hemorrhagic Fever is one of the worst diseases in Pakistan. Industrialization, agriculture, and other human activities, as well as population growth, have all contributed to Pakistan's rapid climate change and the subsequent rise in the incidence of CCHF there. The rapid development of CCHF is attributed to many factors, including a lack of skilled healthcare workers, inefficient tick-control programs, nomadic lifestyles, insufficient sanitation in farms, villages, and towns, and the filthy transportation and slaughter of animals inside cities. Lack of an efficient disease monitoring system in Pakistan is connected to the spread of chronic chagasic fever (CCHF), which has been documented in several major cities throughout the country, including Karachi, Quetta, Peshawar, and Multan (Yousaf *et al.*, 2018). Local and provincial governments have a responsibility to raise awareness about the spread of CCHF and its effects among the general public, farmers, and healthcare professionals. Urgent action is needed to implement a monitoring system, preventative measures, identification, and treatment in order to bring this deadly illness under control and ultimately remove it from the nation.

Solutions to Zoonotic Disease: What We Might Need frequency in Pakistan

Monitoring the Spread of Illness Disease outbreak monitoring aids in the diagnosis, transmission, and pathophysiology of zoonotic illnesses and directs preventative efforts (Supramaniam 2018). In order to effectively manage the health of a community, epidemiological monitoring is required to identify the underlying causes of illness persistence and transmission. However, there is a lack of population-level data on the incidence of zoonotic diseases in Pakistan. To combat the long-term presence of diseases, it is possible to convene clinicians, epidemiologists, and experts in ecosystem safety and veterinarian. The public should be educated via awareness campaigns and immunization programs. The "One Health" system mapping and analysis resource toolset has instruments useful for such projects (Breslin *et al.*, 2015; Brown & Nading 2019). Another key factor in reducing the prevalence of zoonotic illnesses is the practice of regular monitoring, as well as the constant declaration or

reporting of public health-related disorders (George *et al.*, 2020). Since Pakistan is primarily an agricultural nation, it is crucial that the incidence and hazards associated with emerging zoonotic infections in soil, plants, vegetables, and fruits be assessed, and a strategy for preventing them be developed (H. Ahmed 2017).

Adapting to a new Environment, and the "One Health" Idea as the human population has grown, so too have carbon emissions into the atmosphere, leading to a rise in average world temperature that has wreaked havoc on natural ecological processes. Close encounters between people and animals like squirrels, mice, jackals, foxes, and pigs have increased as cities have grown. Environments like this are ideal for the spread of zoonotic illnesses (Sleeman *et al.*, 2019). Air pollution from agricultural and coal burning, melting ice owing to global warming, extremes of temperature, overpopulation, higher humidity and temperatures, and decreasing food production are all having devastating consequences on natural variety. Further, these factors contribute to the persistence and spread of zoonotic pathogens (El-Sayed *et al.*, 2020). Coronavirus, for instance, may remain in an active form on most surfaces for at least 2 weeks regardless of humidity or temperature (Lin 2020).

Inadequate infectious waste management is a leading cause of pollution in Pakistani communities and contributes to the widespread spread of infectious diseases. Chemicals, pulp, biologicals, textiles, and leather are only some of the waste products that are often not separated by hospitals and factories. These pollutants have the potential to spread diseases like hepatitis A and hepatitis E, as well as Salmonella and other gastrointestinal and respiratory bacteria (Qasim *et al.*, 2014). Drinking water may be tainted when improper waste disposal from industries, hospitals, farms, and households combines with natural disasters like floods (Daud 2017).

Environmental factors, such as bacteria in tainted soil and water sources, play a significant role in the transmission of enteric zoonotic illnesses (Klumb *et al.*, 2020). Some zoonotic infections may be transmitted to people from wildlife as well (Rothenburger 2019). Dengue fever, Vibrio cholera, malaria, Lyme disease, COVID-19, influenza, respiratory syncytial virus, tuberculosis, and skin cancer are only few of the diseases that are strongly correlated with poverty in Pakistan (Velraj *et al.*, 2020). Preventing the spread of disease caused by the careless disposal of hazardous materials begins at the community hospital level and may serve as a model for other initiatives, such as enhancing public garbage disposal and controlling agricultural and industrial runoff. These goals may be realized via the "One Health" process's strategic strategies (Majeed & Munir 2020).

Animals and the Quality of Food Infections from pathogens such *Listeria monocytogenes*, *Campylobacter* spp., *Salmonella* spp., *Toxoplasma gondii*, and Norovirus are widespread among Pakistani citizens. And during the course of its growth, harvesting, processing, and storage, food is exposed to a wide range of potentially harmful compounds (Nisar 2018). However, the quality of Pakistan's milk and halal meat is typically subpar, making it one of the world's leading producers despite this. Diseases like brucellosis and bovine tuberculosis are spread from farm to consumer via activities including milking, slaughtering, and processing animals (Claeys 2013). Pasteurization is the most effective strategy for boosting milk output. Raman spectroscopy provides a simple method for testing milk for the presence of pollutants including microorganisms and residual antibiotics (Hatami *et al.*, 2019). Raw or unpasteurized milk may contain harmful microorganisms that may cause illness in humans, hence its shelf life is greatly increased after pasteurization. Therefore, modern methods of milk production and processing must be introduced on a national scale in Pakistan in order to reduce the spread of zoonotic diseases.

Worldwide, meat is a very popular food and a major contributor to protein intake. Standard operating procedures for farm and slaughterhouse cleanliness are required for safe meat production since improper processing is connected to the development of food-borne diseases such Bovine Spongiform Encephalopathy (BSE), hepatitis, and typhoid. Professionals in environmental health are essential to ensuring that meat is safe to consume and that proper sanitation standards are met. Export-labeled meat must also pass food inspections, and technologies like multiplex PCR for meat screening may be used quickly and easily. The same precautions must be used while growing organic foods. Quality requirements for animal handling, slaughtering, dressing, and storage are essential for ensuring that consumers may buy meat that is free of harmful bacteria (Ishaq 2021).

Factors that Influence the Spread of a Vector Changes in global climate have a significant role in the proliferation of mosquito- and tick-borne illnesses. From 2030 to 2050, 250,000 more fatalities per year are projected as a result of malaria, starvation, heat stress, and diarrhea related to climate change, as estimated by the World Health Organization. Extreme weather events, floods, and excessive humidity as a consequence of climate change are ideal conditions for the spread of rodents, fleas, and mosquitoes, all of which spread illness (Ngeleja *et al.*, 2017). Deforestation, increasing hydrocarbon burning, the warming effect, and higher emissions of harmful gases all enhance the likelihood that zoonotic diseases may spread. Diseases spread by vectors affect over 50% of the world's population, leading to 1,000,000 annual fatalities and >17% of all infectious illness cases. Malaria, plaque, leishmaniasis,

African trypanosomiasis, Japanese encephalitis, and illnesses of viral origin including Rift Valley Fever are on the rise due to the rise in warmth and humidity. Negligence on the part of medical professionals has also been blamed for the rise in illness rates (Fouque & Reeder 2019).

The consequences of climate change threaten Pakistan. It is unknown how widespread vector-borne illnesses are in Pakistan; nevertheless, the country presently has 1.5 million cases of malaria, which is on par with Somalia, Afghanistan, and Djibouti. The most likely root reasons of the high rate of vector-borne illnesses in Pakistan are the country's poor living conditions, including its lack of proper housing, water, and sanitation, as well as its scarce supply of medical professionals and facilities. The "One Health" initiative can help reduce morbidity and mortality from three major causes: the resurgence of Leishmaniasis caused by the female phlebotomine sand fly, Colorado tick-borne illness (Altmann 2019), and Rift Valley fever (Mosquito bites or drinking unpasteurized milk) (Fouque & Reeder 2019). Vector-borne zoonotic disease management in Pakistan may benefit from new approaches and partnerships between health administrations, the environmental ministry, entomologists, zoologists, veterinarians, and NGOs (Breslin 2015).

Consequences of Ignoring the Need for Health Education The foundation of "One Health" is health education, with the overarching goal being to increase people's knowledge of, and motivation to improve, their own health. Major barriers to maintaining Pakistan's health security include malnourishment, food insecurity, poverty, congestion, late reporting of sickness, and inadequate adherence of sanitary treatment procedures, as well as a shortage of vaccinations and polluted drinking water. Three hundred lawyers from 35 nations got together in March 2002 to talk about the dangers to public health posed by environmental risks and share warnings. Pakistan has to invest in modernizing its healthcare infrastructure and raising public knowledge about these issues via its human resources in order to strengthen its management structures, especially in the country's rural regions (J. Ahmed & Shaikh 2011). Everyone should have easy access to resources that educate them on food safety and provide dietary suggestions for the prevention of zoonotic diseases. In addition, measures should be taken to enhance agricultural output, cleanliness, and food storage. Improving public health is the end goal of local government's engagement with the Ministry of Health and Livestock to provide effective immunization against zoonotic illnesses (W. Suk 2003). Animal health education for farmers and consumers should get benefit from this method as well. The importance of education cannot be overstated, since it is more likely that people would embrace the ideals proposed by health services if they have a firm grasp of the processes involved. However, owing to a poor literacy rate and a lack of

awareness of how illnesses spread and how they are associated with health parameters, socio-cultural and environmental concerns, and political difficulties, the Pakistani population is less likely to be aware of the fundamental issues. Accordingly, adopting, enforcing, and implementing awareness programs, particularly linked to health-seeking behavior, and conducting in-person surveys and developing assessment exercises with private and public sector collaborators are required to overcome and stop this hazardous condition (Shaikh & Hatcher 2005; Zahid 2018).

Density of a population enhances the risks of zoonotic disease transmission in locations where animals and people share living spaces (Owczarczak-Garstecka 2018; Tomori 2012) and in places with insufficient sanitation facilities (Kilpatrick & Randolph 2012; J. E. Suk 2014). (Gayer *et al.*, 2007; Moïsi 2011). The sedentary lifestyles of those living in camps and informal settlements pose a greater threat of zoonotic pathogen transmission, especially after a disease has become established in a people population (Braam *et al.*, 2021; Paterson *et al.*, 2018). Furthermore, the population size and density of an area can impact the pathogen's ability to infect susceptible hosts (Brooker 2004; Hammer *et al.*, 2018). Crowd management, space separation, and access to handwashing and sanitizing facilities are all essential in a market environment and should be strictly enforced by management.

Challenges of Poverty and Economic Disparities Poor health is linked to poverty and social inequality (S. U. Khan & Hussain, 2020). Poverty is made worse as a result of disruptions in education, employment, and quality of life caused by natural disasters (Du *et al.*, 2018). Structured discrimination, violence, and unequal access to services are common experiences for displaced communities (Castañeda 2015). Further, displaced populations often reside in remote, underdeveloped places (McMichael *et al.*, 1998). Vector-borne diseases have a particularly negative impact on people along the Pakistan–Afghanistan border, for instance (Nieto 2012). Numerous activities should facilitate communication and cooperation between elected officials, researchers, policymakers, and medical professionals. Cities around the country should host seminars and conferences on topics including illness prevention, unemployment and health insurance, progressive taxation, worker rights, and medical facility expansion.

The Value of Proper Sanitation Procedures for Food and Water

Many zoonotic diseases are spread by contaminated food. The majority of zoonoses that originate in a food-based reservoir are spread by ingestion of tainted foods or drinks. There is also a danger of contamination from farm to fork because of the presence of several zoonotic bacteria in the digestive systems of animals used in food production. As a result,

the prevention and control of food-borne illnesses is a top priority for public health officials across the world (Gizaw & medicine 2019; Ishaq 2021). One of the most important ways to prevent the spread of infectious illnesses caused by eating is via careful food handling. Zoonotic disease prevention has historically been difficult in developing nations (Ma 2019), and this is especially true in Pakistan, where food is often sold on the streets without proper sanitation. A lack of education

on food safety also contributes to the spread of zoonotic pathogens such Salmonella, Campylobacter, Listeria, E. coli O157:H7, Bacillus cereus, and Clostridium (Ma *et al.*, 2019) (Asmat *et al.*, 2020). As part of its "One Health" initiative, the United Nations is advocating for the health of all animals, including domesticated pets and wildlife. With this strategy, environmental health experts may work together to reduce the incidence of many food-borne illnesses shown in (table 1).

Table 1: List of zoonotic ailments

Animal-borne ailment	Signs in people	Origin of spread	Risk elements	References
Direct transmission/contamination				
Hepatitis E	Rise in temperature, pale complexion, fatigue, nausea, stomach discomfort, appetite loss, and liver failure	Consuming raw pig meat and drinking water that has been tainted with human sewage	poor quality of life, improper hygiene	(Butt & Sharif, 2016)
Leptospirosis	chest discomfort, shortness of breath, sweating blood, nausea, lack of appetite, jaundice, swollen limbs, fever, headache, and nausea	animal urine-contaminated soil and water	Skin blemishes/injuries, work-related exposure	(Ijaz 2018)
Bovine TB	Fever, fatigue, appetite loss, weight loss, a persistent cough, diarrhoea, and big, noticeable lymph nodes	Direct contact with sick animals, tainted water, food, animal products,	animal husbandry, housing, workplace exposure	(Awah Ndukum 2010)
Rabies	Hyperexcitability, hydrophobia, motor neuron weakening, paralysis, and encephalitis	Animal bites (for example, dogs)	roving dogs; seldom seen pets	(Garshasbi, Ramazani, Sorouri, Javani, & Moradi, 2014)
Salmonellosis	Fever, nausea, vomiting, diarrhoea, and stomach pain	contaminated food, polluted water, animal products, exposure to infectious animals	poor quality of life, improper hygiene	(Hussain 2020)
Brucellosis	Fever, lack of appetite, stomach discomfort, weakness, and body pains	Contact with milk, urine, semen, vaginal fluids, placentas, aborted foetuses, and excrement	exposure at work, use of unpasteurized dairy products	(Bilal, Khan, Avais, Ijaz, & Khan, 2009)
Anthrax	headache, chills, nausea, sore throat, vocal cord problems, swallowing pain	<i>Bacillus anthracis</i> : a soil-borne pathogen that is spread by herbivores, spores, or carcasses that have been infected		(Doganay & Demiraslan, 2015)
Vector-borne diseases				
Leishmaniosis	skin lesions from cutaneous leishmaniosis, weight loss, splenomegaly, and liver enlargement	Seventy animal species, including humans, are natural reservoirs for the leishmania parasite, which is transmitted by the bite of female phlebotomine	changes in the environment, urbanisation, malnutrition, migration of people, unclean lifestyle, poor health, and poverty	(Tiwananthagorn 2012)

		sandflies, which feed on blood.		
Rift Valley Fever	include everything minor cold-like signs to high hemorrhagic temperature	Insect sting, exposure to infectious animal blood or tissues	Workplace exposure	(Atif, 2012)
Foot and mouth	Infants and toddlers who exhibit symptoms such as fever, sore throat, soreness, anorexia, red lesions on their tongues and gums, rashes on their palms, soles, and buttocks	Animals have cloven hooves, and humans	The virus can spread to small ruminants.	(Ur-Rehman, Arshad, Hussain, Iqbal, & diseases, 2014)
Crimean-Congo	Symptoms of liver failure include disorientation, tiredness, neck hemorrhagic fever pain, migraine, backache, diarrhea, stomach discomfort, and sore throat.	bites from ticks and through diseased animals	Workplace exposition and emigration	(Yousaf 2018)
Chikungunya	Fever, headache, muscular discomfort, joint pain or swelling, and skin rashes	Fever, headache, muscular discomfort, joint pain or swelling, and skin rashes	The chikungunya virus is spread by Aedes mosquitoes from sick to healthy individuals.	(Atif, 2012)

One of the most vital components for living is clean drinking water and water is the most basic resource (Pandey 2006). Animals and people exposed to bacteria and chemicals in unsafe water may develop gastric and nervous system problems (Lee & Murphy 2020). Urban sprawling, industrialization, and environmental changes have contaminated the majority of the world's water supplies (Pandey 2006) To put it another way, around 2.2 billion people throughout the globe rely on water that is not safe to drink (World Health Organization [WHO] 2019).

Pakistan, in South Asia, is a developing nation. Because of rapid urban sprawling, industrialization, and population increase, Pakistan's water supplies are now severely depleted. This means that just 20% of the population in Pakistan has access to clean water (Daud 2017). Pakistan has been rated #80 out of 122 nations for the quality of drinkable water. The untreated combination of municipal sewage, storm water, and industrial waste has led to a 60% drop in available drinking water, which might soon become a crisis if water quality problems aren't addressed (Sun 2022). As of 2020, almost half of the water samples examined in a random sample of 400+ Pakistani schools were tainted with extremely harmful microbes. There was yet another research that found the water in the Sibi area of Baluchistan to be severely polluted with lead and cancer causing pollutants (Chandio 2021). Crops grown in polluted water are not safe for people usage, and this is a big problem in Pakistan (Mutengu *et al.*, 2007). Climate change, chemical and biological contaminants, inadequate sewage systems, and a lack of quality assurance methods have all had a negative impact on

Pakistan's water supply (Aziz 2005). WASH interventions, Water and Sanitation Extension Programs (WASEP) projects, Oxfam GB, Quantitative Microbiological Risk Assessment (QMRA), Punjab Saaf Pani project, and Changa Pani scheme are just some of the rules and regulations that governments and NGOs have implemented to mitigate the threat of water contamination (J. Ahmed 2020). WASEP initiatives are often implemented in rural areas to improve or repair water supply infrastructure (Nanan *et al.*, 2003). Similarly, Oxfam GB, a non-governmental organization, is doing an assessment of key issues relating to the safety of drinkable water (Baig *et al.*, 2012). The Punjab Saaf Pani and Changa Pani projects are also helping to raise standards for both rural and urban water supplies (T. Ahmed *et al.*, 2020).

The National Environmental Quality Standard is only one example of the protective measures that groups like the Pakistan Environmental Protection Council (PEPC) and the Pakistan Environmental Protection Agency (Pak-EPA) are working to adopt (NEQS). Providing microbiologically certified safe water and conducting scientific evaluations of water quality according to guidelines set out by the Environment, Health, and Safety (EHS) ministry are the main concerns. They were not able to implement such environmental safety requirements throughout all sectors, unfortunately (Azizullah *et al.*, 2011). We can fix this by establishing comprehensive approaches and regulations at the national, regional, and individual levels, and then monitoring their effects.

CONCLUSION

Since people, animals, and the environment all take part in the transmission of zoonotic illnesses, they provide the greatest challenge to developing nations. The absence of long-term planning on how to deal with zoonotic disease outbreaks presents significant difficulties for Pakistan. Through partnerships with the private sector and non-governmental organizations (NGOs), the "One Health" idea can help government agencies like the Ministries of Climate Change, Industry and Production, and Food Safety in Pakistan adopt constructive and practical approaches to control or prevent zoonotic diseases in the country. A "One Health" approach is necessary to address zoonotic illnesses in the context of the ecosystem safety (Lammie *et al.*, 2016).

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