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Review Article

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A Review on the Concept (Challenges and Opportunities) of One Health Approach to Control Emerging and Re-Emerging Zoonosis

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Summary

Zoonotic diseases are infectious diseases that are naturally transmitted from vertebrate animals to humans and vice versa. They are caused by all types of pathogenic agents, including bacteria, parasites, fungi, viruses and prions. Infectious diseases have for centuries ranked with wars and famine as major challenges to human health and survival. Emerging and re-emerging of zoonotic diseases negatively affect a human and animal population. One Health approach has a great role, it needs strong collaborative efforts and interdisciplinary communication to prevent epidemic or epizootic diseases and to maintain ecosystem integrity thereby improving and defending optimal health of globe. Despite this potential, failure to work collaboratively, lack of awareness, absence of a standardized frame work to capture the concept of disciplines and other problems with difficulty of wildlife management had negative impact on one health implementation. However, with changes in the environment, human behavior and habitat, increasingly these infections are emerging from wildlife species. By solving the challenges of one health approach; it is possible to make it more powerful tool to protect defend living things and the environment from diseases around the globe, therefore all concerned body should participate in the one health activity to achieve the future expected of one health approach. Although this review focuses on the approaches to challenge control of emerging and re-emerging zoonotic disease.

Keywords: Emerging, Challenging Health Problem, Health Problem, Re-Emerging, Zoonoses

Introduction

Many of the human diseases that are new, emerging and re-emerging at the beginning of the 21st century is caused by pathogens originating from animals or from products of animal origin referred to as zoonotic diseases. More than 60% of pathogens that cause diseases in humans are zoonotic diseases of animals that can infect people and among thus, 75% of them are zoonotic as well. During the past decades, many previously unknown human infectious diseases have emerged from animal reservoirs, from agents such as human immunodeficiency virus (HIV), Ebola virus, West Nile virus, Nipah virus and Hanta virus. A wide variety of animal species, domesticated, per domesticated and wild, can act as reservoirs for these pathogens, which may be viruses, bacteria, parasites or prions. Considering the wide variety of animal species involved and the often-complex natural history of the pathogens concerned, effective surveillance, prevention and control of zoonotic diseases pose a real challenge to public health [1].

WHO has estimated that upwards of 75 of about 100 known human infections currently regarded as emerging (newly defined) or r e-emerging (previously recognized) can bet transmitted to humans either directly with or without the involvement of a vector, or indirectly via food, water or other environmental sources. Data available suggested that zoonotic pathogens (especially viruses and protozoa) were three times more likely to be associated with emerging diseases than non-zoonotic pathogens [2].

Emerging zoonoses: new zoonotic diseases, not observed before, not diagnosed before. Examples: RVF, Ebola haemorrhagic fever, EHEC 0 l57: H7, Salmonella Enteritidis, Campylobacter etc. Emerging zoonosis (Ezs) can also define as "zoonosis that have newly appeared in a population or have existed previously but are rapidly increasing in incidence or geographic range". Zonotic diseases are diseases caused by all types of pathogenic/disease causing agents which are directly or indirectly transmitted from animals to humans and vice versa [3]. The WHO noted that, zoonotic diseases caused either by totally new or partially new agents, or by microorganisms previously known, however, they are appeared in places or in species where the disease was previously unknown, called emerging and re-emerging zoonosis [4]. The re-emerging zoonoses are those organisms that have reappeared in locations from which they have previously disappeared or radically decreased in prevalence and also the diseases that have reappeared after a significant decline in incidence. The re-emerging zoonosis are well-documented zoonotic diseases appears to be driven by climatic, habitat and population density factors that affect hosts, pathogens or vectors frequently causing natural increases and decreases in disease activity in different geographical areas and over various periods of time [5]. Re-emerging zoonosis appearance after 10-20 years of complete absence or manifestation in large numbers than usual. Examples: TB, leptospirosis, plague (Yersinia pestis), yellow fever, rabies, etc. [6].

Emerging zoonotic diseases have potentially serious human health and economic impacts and their current upwards trend is likely to continue. The last 30 years have seen a rise in emerging infectious diseases in humans and of these over 70% are zoonotic [7,8]. One

health concept starts longtime ago in human history but becomes inaction and globally recognized as a major area of concern in recent years. This integrated strategy gives a unique and significant opportunity for veterinary medicine to be in a leadership role and to work collaboratively for ecosystem health for the greater wellbeing of society [9].

Future occurrences of newly emerging diseases are most likely to erupt at these intensifying interfaces. In less developed countries, the communities most likely to be affected by such outbreaks, those that are poor or in less accessible areas. Such communities frequently rely on inadequate methods of medical surveillance and diagnostics, as well as traditional treatment methods. Many factors lead to the emergence of zoonotic diseases. The environments associated with pathogens and their reservoir hosts are constantly changing and the rate of change is increasing [2].

The drivers of change include the modernization of farming practices, particularly in the developing world, habitat destruction, human encroachment and climate change. It is critical to evaluate and understand the impacts of these changes on the interactions between pathogens and their hosts and between the host and other species, including other wildlife, livestock and humans. These interactions are at the core of disease emergence, understanding these drivers and impacts will allow the development of mitigation strategies and enable an effective and timely response. As the result, it is unfortunately quite likely that an emerging disease with high epidemic potential may only be detected after it has become established in humans or their livestock and has already spread significantly [10].Therefore, the objective of this paper is to assess the available data on the concept (challenges and opportunities) of one health approach to control emerging and re-emerging zoonosis.

Challenges and Opportunities of One Health Approach to Control emerging and Re-Emerging Zoonoses.

Problem of Working Collaboratively

One Health approach offers an even broader multi-systems perspective on health means and the inclusion of a wider range of expertise to include areas of academic specialization. Conceptual and methodological differences between professionals of veterinary and human medicines are the most substantial challenges faced collaborative working across the globe especially this challenge appears in determining the appropriate level of integration of different disciplinary methods [11]. One Health approach should emphasize interdisciplinary collaboration, involving different disciplines both within and beyond the health sciences to address transnational health issues and solutions. To develop more holistic and diverse understandings of health across cultures, species, ecosystems and local communities there are a lot of global challenges [12].

Socio-Political Challenges

An application of one health concept will be challenged with Socio-political issues because of people's belief and attachment with right and freedoms even though; they cannot pay sacrifice for the concern of others. For this reason, zoonotic disease control and prevention policy making depends on individual behavior than factors that drive disease emergence/re-emergence [13]. Scientific evidence and societal perceptions proved that political intervention had role in zoonotic disease prevention and control. Indeed, in the face of scientific uncertainty and ethical ambiguity, ideological perspectives and short-term political considerations often supplant efforts to devise effective long-term interventions. In the case of zoonotic and EIDs, powerful interests dominated early government responses, leading policy makers to make decisions that avoided public controversy but had major economic consequence [14]. Egoism, perceptions, short term solutions, populism and avoiding argument are characteristics of politics, which result in challenges for emerging zoonotic disease prevention and control policy making and affect development of effective strategies for addressing EIDs [15].

Ethical Concern

Ethical aspects concerning the secure distribution of sensitive medical information, the balance between groups of patients' needs, expectations of health professionals and the health care industry's requirements are major challenges to the recent development of health management [13]. Effective zoonotic disease combating policy relays on its implementation context and especially on its alignment with stakeholder and public principles [16]. However, this is in particular what has been missing in epidemics where fracture lines differences and value conflicts have become noticeable. Other occurrence happen that stakes are high, evidence and the implications of actions are uncertain, the situation is complex and resources are limited but where decisions need to be made its ethical differences are exposed to challenge [17]. This condition results adverse costs of public fear, doubt, misinformation and disobedience with public health directives [15].

Legal Challenges

The legal frame work that made for control and prevention of EZDs has its own set of challenges. The laws that govern disease outbreak control mechanism in most jurisdictions are scattered, confusing and interpreted based on interest individual whose idea is dominant at the time of decision making. The other complication and confusion appear to the epidemic regulatory structures rather than facilitating public health responses to EID. The cost of laws restricts development of greater global health inequities with consequential effects for health outcomes. In order to simplify EID related legal complications in between economic development and health security. In order to simplify EID related legal complications in between economic development and health security, additional precise and clear-cut recognition is needed of who are the principal beneficiaries and who bears the expenses of EIDs [18].

Challenges of Managing Wild Life Ecosystem

The ecosystem changes due to driving forces can alter the state of well-being and leads change the interaction between human and animal population. It is important to identify the routes by which the wild animal reservoirs agent found their way to the human host and their impact on the animals that serve as the primary and intermediate hosts. It is intrinsically more difficult to monitor diseases in wildlife due to; afraid of aggressive wild animals, lack of knowledge and experience, inadequate financial recourse and lack of road. Wild animals are not limited by boundaries and can extend over large distances. This is particularly for migratory birds or mammals which seasonally move across continents or vast oceans which they cause spreading of disease [19].

Wildlife studies involve uncontrolled populations, and many of the complexities that arise from surveying wildlife are related to the inherent difficulties of capturing, re-capturing, sampling, and running diagnostic tests on species. Working in remote locations also makes the collection, storage, and transport of biological samples difficult, especially when optimal diagnostic results depend on maintaining a cold chain. Identifying appropriate diagnostic tests and facilities that have the technology to test samples represents another challenge [20].

Global Burden of Infectious Disease Challenging to Control Emerging and Re-Emerging Zoonoses

The term burden of disease generally describes the total, cumulative consequences of a defined disease or a range of harmful diseases and their respective disabilities on a community. This approach combines measurement of mortality and morbidity with non-fatal outcomes, such as quality of life aspects. The burden of morbidity (ill health) and mortality associated with infectious diseases falls most heavily on people in developing countries, and particularly on infants and children (about three million children die each year from malaria and diarrheal diseases alone). In developed nations, infectious disease mortality disproportionately Affects indigenous and disadvantaged minorities [21].

Newly Emerging and Newly Recognized Infections

The classification of EIs as 'newly emerging', 're-emerging or 'deliberately emerging' is useful because, the underlying causes of emergence and the optimal prevention or control responses frequently differ between the groups. Many diverse factors contribute to their emergences these include microbial genetic mutation and viral genetic recombination or assortment, changes in populations of reservoir hosts or intermediate insect vectors, microbial switching from animal to human hosts, human behavioral changes (notably human movement and urbanization), and environmental factors. These numerous microbial, host and environmental factors interact to create opportunities for emerging and re-emerging zoonotic disease to evolve spread more easily between them [2].

Dead-End Transmission of Zoonotic and Vector-Borne Diseases

Some emerging and re-emerging zoonotic disease that have adapted to non-human hosts can jump to humans but, unlike HIV, are not generally transmitted from person to person, achieving only 'dead end' transmission. Infections in animals that are transmitted to humans (zoonosis), and those transmitted from one vertebrate to another by an arthropod vector (vector-borne diseases), have repeatedly been identified as ranking among the most important EIs [20, 22]. Examples include the Arenavirus hemorrhagic fevers (AHF) and Hantavirus pulmonary syndrome (HPS). Viruses in these groups have co-evolved with specific rodent species whose contact with humans has increased as a result of modern environmental and human behavioral factors. Farming, keeping domestic pets, hunting and camping, deforestation and other types of habitat destruction all create new opportunities for such infectious agents to invade human [23].

Virus aerosolization caused infection of pigs, with overcrowding leading to explosive transmission rates and ultimately to infections in pig handlers. Variant Creutzfeldt–Jacob disease (vCJD) is another example of a zoonotic disease emerging in humans. VCJD is caused by the human adapted form of the prion associated with the emerging epizootic (large-scale animal outbreak) of bovine spongiform encephalopathy (BSE), commonly known as mad cow disease. BSE itself is suspected to have emerged because of even earlier use of cattle feed containing the agent of sheep scrapes, a prion disease recognized by farmers more than 250 years ago [24].

Environmentally Persistent Organisms

Infectious agents indirectly transmitted to or between humans by way of human-modified environments account for other emerging zoonosis, as well as certain non-zoonotic diseases. *Campylobacter jejuni* and Shiga-toxin-producing *Escherichia* coli (E. coli O157:H7 and other agents of haemolytic uraemic syndrome) infect agricultural animals, gaining access to humans through food, milk, water or direct animal contact. Other enteric pathogens, such as the vibrios causing classical cholera (re-emerging) and serogroup O139 cholera, and the zoonotic protozoa C*ryptosporidium parvum* and *Cyclospora cayetanensis*, seem to have come from environmental or animal organisms that have adapted to human-to-human 'faecal–oral' transmission through water [20].

Geographical Spread of Infections

The impact of both new and re-emerging infectious diseases on human populations are affected by the rate and degree to which they spread across geographical areas, depending on the movement of human hosts or of the vectors or reservoirs of infections. Travel has an important role in bringing people into contact with infectious agents [25]. An increase in travel-associated importations of diseases was anticipated. This has since been demonstrated dramatically by an international Airline hub-to-hub pandemic spread of acute hemorrhagic conjunctivitis in 1981, by epidemics of meningococcal meningitis associated with the Hajj, and more recently by the exportation of epidemic SARS (a newly emerging disease) [26].

Conclusion and Recommendation

Health care issues of human is facing several problems that need world wide solutions for the prevention and control of the spread of emerging and re-emerging infectious zoonosis between animals, humans and the ecosystem. Globalization, human population increment and frustration with current health care method enforce the world to look for latest health care alternatives. One health is a means of effective control and prevention of zoonotic diseases. To implement one health, one should consider all the components of it which are interacting each other. By solving the challenges of one health approach it is possible to make it more powerful tool for prevention and control of zoonotic diseases. Therefore, to overcome challenges for application of one health there should be awareness creation on the approach and political commitment is needed.

Based on above conclusion the following recommendations are forwarded:

- There should be awareness campaigns addressed to animal and human health professionals.
- There should be need to develop epidemiology at the community level,
- The medical and veterinary communities should work closely together in clinical, public health and research settings.
- There should be educating to veterinary practitioners, human medical and public health professionals.

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