

Strategy to Prevention and Control of Pandemic Zoonoses

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Abstract

Zoonoses are a significant public health concern and cause considerable socioeconomic problems globally. Zoonoses lead to millions of deaths annually. Out of all microbial diseases, 61% are zoonotic with 13% species regarded as emerging or re-emerging. Among emerging infectious diseases, 75% are zoonotic with wildlife being one of the major sources of infection. Different factors such as climate change, urbanization, animal migration and trade, travel and tourism, anthropogenic factors, and natural factors responsible for emergence or re-emergence of zoonotic diseases. Multisectoral approach and key strategy for control of pandemic zoonoses are monitoring and surveillance of pandemic zoonotic diseases, implementation of One Health measures, capacity building programme, and policy at international level, financial support for developing countries by international organization, new diagnosis and scientific technique for zoonoses, re-governing animal origin food systems, biosecurity and awareness about pandemic zoonoses.

Keyword:-One Health, Pandemic, Prevention and control, Zoonoses.

Introduction

Zoonoses are diseases that can be transmitted from animals to human and vice versa. Almost all types of pathogens, including viruses, bacteria, parasites, fungi, spirochetes, mycoplasma and chlamydia, can cause zoonoses, and more than 800 pathogens have been shown to transfer between humans and vertebrates, with more than 73% of infectious diseases in humans originating from animals (Liu et al., 2014). More than 60% of the 400 emerging infectious diseases that have been identified since 1940 are zoonotic, and these pathogens are public health significance (Jones et al., 2008). The different factors that are responsible for emergence or re-emergence of zoonotic diseases are etiological changes in mans, environment and agricultural operations, increased movement or traveling of man, handling of

animal by-products and waste, overcrowding of animals, increased trade in animal products, globalization, drug resistant organisms, changing livestock farming practices, climate change, Increased contacts with a wildlife reservoir, accelerated degradation of the natural environment (deforestation, building of dams, land consolidation), global warming, disaster and changes in microbial pathogens due to genetic shift and drift. Climate change can impact physiological status of hosts, pathogens and vectors, distribution in life cycle of virus, and can also drive novel cross-species viral transmission (Polley and Thompson, 2009). Zoonoses may cause a serious health hazard to the international community. About 58–61% of the human diseases are communicable and up to 75% are zoonotic. Zoonosis involves the interaction of humans, animals, and environment, and therefore a multi-sectorial approach is required to ensure effective control measures (Aenishaenslin et al., 2013).

Strategy to prevention and control of pandemic zoonosis are as follows

Monitoring and Surveillance of pandemic zoonotic diseases

Develop efficacious method of monitoring and regulating practices associated with zoonotic disease, including food systems from farm to fork. Surveillance is crucial to prevent and control zoonotic diseases. It can be used to detect early infection, affected humans and animals, reservoirs, vectors and endemic areas including the “hotspots”. It aid in the adaptation of control strategies against emerging and re-emerging diseases to improve human health status, to manage disease properly, and to minimize morbidity and mortality of humans and animals. Pandemic zoonotic diseases like severe acute respiratory syndrome and highly pathogenic avian influenza can spread across the globe to affect global communities, coordinated surveillance approaches at local, regional, national, and international levels are essential to control these types of pandemic zoonoses. All potential sources of zoonoses including exotic animals and birds, pet and companion animals, aquatic animals, wildlife and rodents need to be subject to surveillance. There are different types of surveillance that need to be conducted (Van der Giessen et al., 2010). Successful and functional surveillance requires well equipped laboratory, adequate modern diagnostic facilities, skilled manpower and enough funding. The four surveillance types can be practiced for the control of zoonoses are pathogen surveillance to detect and identify pathogens. In serological surveillance to detect the presence of pathogens in the blood of humans or animals through monitoring immune responses. In syndrome surveillance to determine the propensity of diseases through data analysis based on symptoms of diseases. Risk surveillance is used to detect risk factors responsible for the transmission of disease.

One Health approach for control of pandemic zoonosis

Zoonoses are complex, responsibility for their prevention and control falls across multiple sectors. For the prevention and control of pandemic zoonotic diseases, international organizations and many researchers described the relationship among human, animals, and environments and adopted a concept known as “One Health Concept”. This One Health concept was adopted to properly deal with global health challenges. The one health concept encourages collaborations among wildlife biologists, veterinarians, physicians, agriculturists, ecologists, microbiologists, epidemiologists, and biomedical engineers to ensure favourable health for animals, humans, and environment. World Health Organization, Food and Agriculture Organization, World Organization for Animal Health, US Centres for Disease Control and Prevention, US Department of Agriculture, United Nations System Influenza Coordination, and European Commission recognize the prevention and control strategies involving the one health approach (Dahal and Kahn, 2014). One Health concept and research offers an approach to break down traditional sectoral barriers to achieve effective control of zoonoses. A promising progress in the wake of the avian influenza pandemic is the establishment of collective zoonoses working groups in many countries and other international collaborations.

Capacity building programme at national and international level

Need a Capacity building programme at national level for strengthen existing and build new capacities among health stakeholders in all countries to improve outcomes and to help them understand the human, animal and environment health dimensions concern to zoonoses and other emerging and re-emerging diseases.

National and International policy for pandemic zoonoses

For control of pandemic zoonoses requires strong policy frameworks rules, regulation and judicious legal mechanisms to accompany policy frameworks. It also demands well-functioning institutions that have adequate capacity, adequate financing and a clear plan for implementing interventions.

Financial support for developing countries for control of pandemic zoonoses

The developed countries and international funding donor agencies such as World Health Organization, Food and Agriculture Organization of the United Nations, World Organization for Animal Health, US Agency for International Development, US Department of Agriculture, European Union, Department for International Development Agency need to support the developing countries for effective zoonoses control.

Awareness of pandemic zoonoses

Raise public awareness and increase knowledge of zoonotic and Emerging /re-emerging disease risks and prevention at all levels of society to build widespread support for risk-reduction strategies. Awareness about health education. Mass media and electronic information system, social networks and other communication channels can play a significant role in increasing public awareness to control pandemic zoonoses.

Improved innovations and new scientific technologies for diagnosis, prevention and control of pandemic diseases

Without more fundamental knowledge of pathogen epidemiology and more rapid and inexpensive genome sequencing, every new serious emerging zoonotic disease will continue to take us by new challenges. However, additional investments in new technologies, particularly biotechnologies, bio information and communication technologies, could stimulate the innovation in disease surveillance, rapid diagnosis, response and control measures.

Transforming and re-governing animal origin food systems

For control of pandemic zoonosis as well as for preventing future outbreak of zoonotic disease also requires improvements in policy, regulation and monitoring of traditional animal origin food markets. Millions of people depend on unorganized food markets that occur in public spaces where small-scale retailers come together to sell fresh produce, fish and meat from domesticated animals and in some cases, from wild animals where sanitary and hygienic practices are poor control. Many recent zoonotic pandemics originated in wildlife. To control of pandemic zoonoses and reduce risks of future zoonotic diseases, meat from both wild and domesticated origin and the places in which the meat is sold should be subject to similarly strict sanitary standards (Pike *et al.*,2010).

Sustainable co-existence of agriculture and wildlife habitats

Support integrated management of landscapes and seascapes that enhance sustainable co-existence of agriculture and wildlife, including through investment in agro ecological methods of food production that alleviate waste and mitigate pollution while reducing risk of zoonotic disease transmission. Reduce destruction of natural habitat and fragmentation of wildlife habitat by strengthening the implementation of existing commitments on habitat conservation and restoration.

Biosecurity and other control measures

Identify key drivers of emerging diseases in animal husbandry sector, both in industrialized agriculture and small-scale holder production. Develop new practices that strengthen the health, opportunity and sustainability of diverse smallholder systems. Breaking the chain of zoonoses through practicing biosecurity in livestock system. Other important activities for the control of zoonoses include issuing laws and regulations related to the isolation and quarantine, establishment strong and effective disease reporting systems, farm biosecurity, mass vaccination of animals, test and slaughter or culling of animals. Decontamination of infected pathogenic materials is needed to reduce the chances of acquiring new infections in the populations. Many neighbouring countries are affected by zoonotic disease, for those proper coordinated approaches need to be adopted for zoonoses control. Ensure safe food production of animal origin and ensure safety of infectious laboratories to avoid the accidental spread of zoonotic infections and bioterrorism need to be ensured.

Conclusion

The implementation of multisectoral approach is required for the effective prevention and control of pandemic zoonosis. The strategy to combat these pandemic zoonoses needs One Health approach, a strong public health structure, effective risk communication, epidemic, pandemic preparedness and rapid response. Strong interrelatedness among animals, humans, and environment, research focusing on the one health approach need to be prioritized to identify critical intervention steps in the transmission of pathogens. Active surveillance targeting all components of the one health approach need to be implemented to early and accurately detect pandemic zoonoses. Integration of efforts of local and national governments, coordination of budgetary resources, awareness of zoonotic disease is necessary for prevention and control of pandemic zoonoses.

References

- Aenishaenslin, C., Hongoh, V., Cissé, H.D., Hoen, A.G., Samoura, K., Michel, P., Waaub, J.P. and Bélanger, D. (2013). Multi-criteria decision analysis as an innovative approach to managing zoonoses: Results from a study on Lyme disease in Canada. *BMC Public Health*, 13: 897.
- Dahal, R. and Kahn, L. (2014). Zoonotic diseases and one health approach. *Epidemiology* 10.
- Jones K.E, Patel N. and Levy M. (2008). Global trends in emerging infectious diseases. *Nature*, 451:990–994.
- Liu, Q., Cao, L., Zhu, X. Q. (2014). Major emerging and re-emerging zoonoses in China: a matter of global health and socioeconomic development for 1.3 billion. *International Journal of Infectious Diseases*, 25: 65–72.

- Pike, B.L., Saylor, K.E., Fair, J.N., LeBreton, M., Tamoufe, U. [Cyrille F. Djoko](#), [Rimoin](#), A. W. and [Wolfe](#), N. D. (2010). The origin and prevention of pandemics. *Clinical Infectious Diseases*, **50**(12): 1636–1640.
- Polley, L. and Thompson, R.C.A. (2009). Parasite zoonoses and climate change: molecular tools for tracking shifting boundaries. *Trends Parasitology*, **25** (6):285–91.
- Van der Giessen, J.W.B., Van De Giessen, A.W. and Braks, M.A.H. (2010). Emerging Zoonoses: Early Warning and Surveillance in the Netherlands; RIVM: Utrecht, The Netherlands.
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