One Health 8 (2019) 100101

Contents lists available at ScienceDirect

One Health

journal homepage: www.elsevier.com/locate/onehlt

One health approach in Nepal: Scope, opportunities and challenges

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ARTICLE INFO

Keywords:
Animal health
Budget
Environmental health
Human health
Infectious diseases
Non-governmental organizations
Zoonoses

ABSTRACT

One Health (OH) is a collaborative effort to attain optimal health for people, animals and the environment. The concept of OH is still in its infancy in Nepal but is increasingly growing. The Government of Nepal (GoN) has taken some initiatives to tackle burgeoning problems such as antimicrobial resistance, highly pathogenic avian influenza and rabies using OH approach but there are several challenges at the level of implementation. Few non-governmental organizations support GoN to promote an OH approach. The major bottlenecks in implementing OH in Nepal include poor organizational structure to support OH, absence of a legal framework to implement OH, poor coordination among different governmental agencies, insufficient technical expertise, poor data sharing mechanism across sectors, limited budget and poor understanding at political level. We encourage GoN to address these gaps and prioritize the health problems where OH approach would give the best outcome. Institutional and legal frameworks need to be created to effectively implement an OH approach in Nepal. Increasing awareness among policy makers including political leadership and increasing regular government budget for OH activities would be helpful to promote OH in Nepal.

1. Introduction

The World Organization for Animal Health (OIE) has estimated that more than 60% of total infectious diseases, including more than 75% of emerging and re-emerging diseases in humans originate in animals [1,2]. Humans and animals live in the same environment and share several pathogens [3]. The diseases that can be transmitted from animals to humans and vice versa are known as zoonoses. Since these diseases can affect both humans and animals, and the environment plays a role of mixing vessel, a multi-sectoral approach is helpful to minimise the transmission of these zoonotic diseases [3,4]. One such approach that is growing popular is the concept of One Health.

One Health (OH) is a cost effective, sustainable and practical approach for attaining optimal health for people, animals and the environment [5,6]. The OH helps to solve health problems requiring holistic and multi-disciplinary approaches, especially in resource-poor countries [7]. It aims to “educate” and to “create” networks to improve health outcomes and the well-being of humans, animals and the environment and to promote environmental resilience through a collaborative approach [8]. OH approach is useful to control traditionally occurring zoonotic problems such as rabies and tuberculosis and has been practiced in some form for the few decades. The World Organization for Animal Health (OIE) together with World Health Organization (WHO) and Food and Agricultural Organization (FAO) has been promoting this concept since early 2000's. The occurrence of potential global epidemics such as highly pathogenic avian influenza (HPAI),

Abbreviations: AFU, Agriculture and Forestry University; AICP, Avian Influenza Control Project; AMR, Antimicrobial resistance; AMRCSC, AMR multi-sectoral steering committee; ANSAB, Asia Network for Sustainable Agriculture and Bio-resources; AMU, Antimicrobial Use; CDC, Center for Disease Control and Prevention; CVL, Central Veterinary Laboratory; DFTQC, Department of Food Technology and Quality Control; DHS, Department of Health Services; DLS, Department of Livestock Services; DoAH, Directorate of Animal Health; EDCD, Epidemiology and Disease Control Division; FAO, Food and Agriculture Organization; GoN, Government of Nepal; HPAI, Highly Pathogenic Avian Influenza; MERS, Middle East Respiratory Syndrome; MoALD, Ministry of Agriculture and Livestock Development; MoHP, Ministry of Health and Population; NPHL, National Public Health Laboratory; NGO, Non-Governmental Organizations; NTWC, National Technical Working Committees; NZFHRC, National Zoonosis and Food Hygiene Research Center; NOHH, Nepal One Health Hub; OH, One Health; OHAN, One Health Alliance Nepal; OIE, World Organization for Animal Health; PVS, Performance of Veterinary Services; RI, Relief International; UN, United Nations; WHO, World Health Organization; ZCP, Zoonosis Control Project

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https://doi.org/10.1016/j.onehlt.2019.100101
Received 26 April 2019; Received in revised form 10 August 2019; Accepted 11 August 2019
Available online 12 August 2019
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severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and Ebola have provided major impetus for international advocacy and funding to strengthen the OH approach and promote collaboration between human health, animal health and environmental sectors [9,10]. OH has since gained momentum and expanded to include areas of food safety and problems like antimicrobial resistance (AMR) [7,11]. In view of the complex nature of these diseases, specialists across various health sectors must work together to prevent, control and avert possible epidemics. In recent years, the emergence of HPAI, Nipah, Chikungunya and Zika virus infections in neighbouring China [12], and India [13–15] have put Nepal under threat from these diseases for which Nepal need to remain prepared. This demands increased OH activities in Nepal. This paper discusses status, challenges and opportunities of OH in Nepal and suggests ways to promote and institutionalize it.

2. Status of one health in Nepal

In Nepal, several efforts have been made to promote OH from the Government of Nepal (GoN) mostly through donor funded projects together with inter-governmental agencies such as WHO, FAO and OIE and other international and national non-governmental organizations. Awareness campaigns on zoonoses and the necessity of using the OH approach among health professionals have been conducted all over Nepal by both governmental and non-governmental organizations, mostly during celebrations such as World Rabies Day, World Antimicrobial Resistance Awareness Week and World Animal Health Day. In the past, GoN has followed an OH approach to some extent in the control of rabies and Japanese encephalitis but the coordination mechanism was not efficient as expected. This approach was emphasized recently during the World Bank funded Avian Influenza Control Project (AICP) (2007–2011) and Zoonotic Disease Control Project (2012–2014) in Nepal [16]. In addition to well-funded government projects like AICP and ZCP, several other initiatives with funding from donors have been taken to promote OH in Nepal.

Currently, GoN is taking an OH approach to tackle the AMR problem in Nepal. The Fleming Fund Country Grant for tackling AMR in Nepal has been implemented in Nepal. The funding from August 2018 to August 2020, from Department of Health and Social Care of the UK government is intended to strengthen AMR/ Antimicrobial Use (AMU) surveillance in Nepal. Likewise, the One Health Network, South Asia was implemented in Nepal by Massey University, New Zealand with funding from the European Commission to increase capacity through training of professionals from human, animal and wildlife sectors. Under this network, the Nepal One Health Hub (NOHH) was formed to promote OH in Nepal with involvement from Epidemiology and Disease Control Division (EDCD), Department of Health Services and Directorate of Animal Health, Department of Livestock Services (DLS) to create a platform for networking, communication and resource sharing [17–19]. Likewise, Relief International (RI) with its partner, Asia Network for Sustainable Agriculture and Bio-resources (ANSAB) implemented the One Health Asia Program in Nepal from March 2014 to March 2017 in three districts of Nepal, namely Chitwan, Banke and Rupandehi with funding from European Union with an objective to alleviate the effect of zoonotic diseases in rural Nepal through behaviour change and increased awareness [20]. Under this program, the "One Health and Zoonoses" course was developed in collaboration with Agriculture and Forestry University (AFU) [20]. The National Zoonoses and Food Hygiene Research Center (NZFHRC) is implementing the One Health Alliance Nepal (OHAN) since 2012 to strengthen the capacity of the national public health system for disease surveillance through institutionalizing the OH approach in food and nutritional security, food safety and healthy populations in thriving ecosystems [8,21,22].

3. Current institutional framework for one health in Nepal

Despite several efforts to promote OH in Nepal, there is no separate institutional framework for the implementation of OH in Nepal. At the federal government level, the Ministry of Health and Population (MoHP) and Ministry of Agriculture and Livestock Development (MoALD) and their respective departments, Department of Health Services and Department of Livestock Services, are leading the human and animal health components respectively. Another department under MoALD, Department of Food Technology and Quality Control (DFTQC) are also involved in some OH activities. There is a Zoonoses Section under the Epidemiology and Disease Control Division (EDCD) of Department of Health Services (DHS) but only one Veterinarian is employed in the section. The Department of Environment under the Ministry of Forestry have only few OH activities going on within the department. For specific disease like HPAI and problems like AMR, there are separate multi-sectoral steering committees representing human and animal health sectors as well as other stakeholders. These steering committees mainly facilitates to coordinate between sectors, provide guidance and advocates for policies. However, the functioning of these committees is mostly dependent on external support. At the provincial and local government levels, there are no institutional arrangements for OH activities until now.

4. Opportunities for one health in Nepal

There has been increasing proximity among the human population, domestic animals and wildlife in the last couple of decades due to increasing human population and encroachment onto forested areas. This has created an opportunity for the exchange of pathogens at the human and animal interface. Further, awareness of zoonotic diseases among the general public is limited, hygiene and sanitation conditions are poor, and resources are inadequate increasing the vulnerability to zoonotic diseases [23]. Local practices of drinking raw milk, raw blood and partially cooked meat in some communities is creating an enabling environment to transmit zoonotic diseases. Further, several antibiotics that are used in humans are also used in livestock husbandry primarily for therapeutic purposes, but also occasionally as growth promoters, which might be contributing in the AMR problem in Nepal.

Nepal is a hotspot for many zoonotic diseases that include Avian influenza, rabies, Japanese encephalitis, leptospirosis, brucellosis, tuberculosis, cysticercosis and fascioliasis. Of the 39 zoonotic diseases reported in Nepal, viral diseases (rabies, Avian influenza, Japanese encephalitis), bacterial diseases (leptospirosis, salmonellosis, brucellosis) and parasitic problems (cysticercosis, hydatidosis, toxoplasmosis) were prioritized by the ZCP [24]. These zoonoses have huge burdens on morbidity and mortality in both humans and animals in Nepal [25,26] and cause significant economic loss to the country [27,28]. Frequent outbreaks of highly pathogenic avian influenza (HPAI) after its first detection in 2009 [29], anthrax and rabies [30]and increasing problem of AMR [31,32] have necessitated strong coordination among veterinary, human health and environment related professionals to control these problems [33]. Food-borne outbreaks are also common in Nepal for which OH approaches will be helpful. As these problems requires holistic approach and multi-sectoral involvement to effectively contain, there is a great opportunity for OH in Nepal. Recent OH activities especially in HPAI and AMR has set up platform to take OH initiatives forward in Nepal [34–37]. A Performance of Veterinary Services analysis by the OIE (PVS Gap Analysis) in Nepal has been conducted, which has identified gaps in the National Veterinary Services of Nepal, with recommendations to fulfil these gaps [38].

5. Challenges for one health in Nepal

Though OH issues have gained some understanding among human

health and animal health professionals, there are several challenges at the level of implementation. One of the most important hurdles is the lack of separate institutional set up to lead OH activities. In addition, there is limited coordinated efforts among stakeholders and necessary policies for inter-sectoral collaboration [38]. Each of the sectors have their own sectoral priorities, in consequence, OH is getting less attention than it deserves. Each of the sectors conduct surveillance but cross-sectoral data sharing mechanism and combined planning is minimal. Allied agencies have their separate chains of command which sometimes creates hurdles in cross-sectoral collaboration. There is also no separate funding mechanism for OH activities. Due to the lack of funding, there have been only a few studies to generate data that justifies the promotion of OH approach in Nepal. Other challenges include low awareness among public, poor technical capability for implementation of OH at field level and poor laboratory facilities [38]. Nepal has recently undergone state re-structuring and there are three levels of independent government: federal, state and local. There is still some confusion in the roles and responsibilities of three governments. The weak regulatory capacity of government agencies is also a challenge for implementation of OH in Nepal. For example, the availability of counterfeit drugs in the market and practice of self-medication in both human and livestock farming is a challenge for combating AMR in Nepal.

6. Way forward

A clear strategy needs to be developed to take OH approach forward more efficiently. Currently, MoALD in collaboration with MoHP has drafted a “One Health Strategic Framework for Nepal”. Formal approval of this document from the concerned authorities and its implementation would provide a legal framework to promote OH approach in Nepal. An independent dedicated institutional framework is required to take forward OH initiatives in Nepal given the growing number of health challenges of multidisciplinary nature.

It might take time for these bigger institutional reforms to take place. In the meantime, coordinated approach that are being taken to tackle AMR and HPAI need to be continued for other possible OH problems. Increasing mutual understanding through continuous collaboration would be helpful. All three levels of government need to prioritize the problems where OH would be most helpful and provide funding for it. Also, it would be helpful to include OH related courses in curriculum of school and universities to raise awareness. A structure like the Center for Disease Control and Prevention (CDC) of the USA, where interdisciplinary human resources from human health, animal health, environment and other relevant stakeholders can work together under the same umbrella to tackle multi-sectoral problems, would be helpful in Nepal also.

7. Conclusions

One Health approach has been practiced in Nepal in some selected diseases such as rabies since past few decades and has been rapidly growing since avian influenza outbreak in 2009. This concept has been further strengthened to tackle AMR problem in Nepal. However, there are several gaps in implementation and coordination at times. This is primarily due to the lack of institutional and legal framework to promote OH. It is necessary to clearly define roles and responsibilities of all levels of government to take OH initiative forward. We suggest GoN to provide legal and institutional framework by involving all relevant stakeholders and establish interdisciplinary organization like CDC which can really take OH activities forward and contribute in preventing and controlling zoonotic diseases in Nepal.

Authors' contributions

KPA conceived the original paper and provided a rough draft. SK extensively revised the manuscript and provided his inputs. KS and KK read the manuscript and provided their feedback. All authors read and approved the final version.

Declaration of Competing Interests

There are no competing interests.

Ethics approval and consent to participate

Not applicable.

Funding

No external funding was used in the preparation of this paper.

Acknowledgements

Authors are thankful to Amy Weissman and Dr. Janet Robinson from FHI 360 for their feedback to restructure the paper and anonymous reviewers for their constructive comments.

References

[1] OIE, Biological Threat Reduction Strategy Strengthening Global Biological Security, (2015), pp. 6–7. Available from *https://www.oie.int/scientific-expertise/biological-threat-reduction/*.
[2] FAO, OIE, OMS, The FAO-OIE-WHO collaboration: a tripartite concept note, A Tripart. Concept Note. (2010) 1–8. Available from *https://www.who.int/influenza/resources/documents/tripartite_concept_note_hanoi_042011_en.pdf?ua=1*.
[3] P. Trinh, J.R. Zaneveld, S. Safranek, P.M. Rabinowitz, One health relationships between human, animal, and environmental microbiomes: a mini-review, Front. Public Health 6 (2018) 1–9.
[4] E.D. Belay, J.C. Kile, A.J. Hall, C. Barton-Behravesh, M.B. Parsons, S. Salyer, H. Walke, Zoonotic disease programs for enhancing global health security, Emerg. Infect. Dis. 23 (13) (2017) 1–6.
[5] S.Y. Essack, Environment: the neglected component of the one health triad, Lancet Planet. Heal. 2 (6) (2018) e238–e239.
[6] O.H. Commission, What is One Health? - One Health Commission, (n.d.), Available from *https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/*.
[7] G. Gongal, One health approach in the south East Asia region: opportunities and challenges, Curr. Top. Microbiol. Immunol. 366 (2013) 113–122.
[8] I.P. Dhakal, One health activities in Nepal, The Blue Cross. 14 (2017) 50–53.
[9] P.W. Horby, D. Pfeiffer, H. Oshitani, Prospects for emerging infections in East and Southeast Asia 10 years after severe acute respiratory syndrome, Emerg. Infect. Dis. 19 (6) (2013) 1–8.
[10] E.P.J. Gibbs, The evolution of one health: a decade of progress and challenges for the future, Vet. Rec. 174 (4) (2014) 85–91.
[11] J. Zinsstag, J.S. MacKenzie, M. Jeggo, D.L. Heymann, J.A. Patz, P. Daszak, Mainstreaming one health, Ecohealth. 9 (2) (2012) 107–110.
[12] H. Xia, Y. Wang, E. Atoni, B. Zhang, Z. Yuan, Mosquito-associated viruses in China, Virol. Sin. 33 (1) (2018) 5–20.
[13] Dayaraj Cecilia, Current status of dengue and chikungunya in India, WHO South-East Asia J. Public Heal. 3 (1) (2014) 22–27.
[14] R. Laxminarayan, M. Kakkar, P. Horby, G.N. Malavige, B. Basnyat, Emerging and re-emerging infectious disease threats in South Asia: Status, vulnerability, preparedness, and outlook, BMJ 357 (2017) 1447.
[15] D.T. Mourya, P. Shil, G.N. Sapkal, P.D. Yadav, Zika virus: Indian perspectives, Indian J. Med. Res. 143 (5) (2016) 553–564.
[16] R. Dahal, A. Upadhyay, B. Ewald, One health in South Asia and its challenges in implementation from stakeholder perspective, Vet. Rec. 181 (23) (2017) 1–5.
[17] OHHub, Functions and founding organisations of the Nepal One Health Hub _ One Health Network South Asia, (2012) Available from http://www.onehealthnetwork.asia/node/71.
[18] J. Khan, R.P. Acharya, One Health Approach in Action_A Pilot Project to Reduce Risk of Zoonoses in Nepal, Proceedings of 12th National Veterinary Conference, Kathmandu, Nepal, (2016), p. 6.
[19] Massey, Nepal One Health Symposium _ One Health Network South Asia, Available from, 2014. *http://www.onehealthnetwork.asia/node/461*.
[20] Relief, Nepal, Relief International, (2019) Available from *https://www.ri.org/programs/one-health-asia-program-nepal* ..
[21] EcoHealth Alliance, One Health Alliance of South Asia (OHASA), Available from, 2014. http://www.ecohealthalliance.org/programs/24-one_health_alliance_of_south_asia_ohasa.
[22] I. Dhakal, The One Health Concept, Available from, 2013. http://www.oie.int/fileadmin/Home/eng/Media_Center/img/Infographies/A4-EN-WEB.pdf.
[23] K.S. Bisht, One health approach and antimicrobial resistance as candidates for OH operationalization, International Poultry Symposium-2018, Chitwan, Nepal, 2018,

pp. 9–11.
[24] B.N. Adhikari, Role of veterinary public health and one health strategy of Nepal, Proceedings of 12th National Veterinary Conference, Kathmandu, Nepal, 2016, p. 8.
[25] ANSAB, One Health Asia Programme (OHAP) – Fighting Zoonoses in Afghanistan, Bangladesh and Nepal _ Asia Network for Sustainable Agriculture and Bioresources (ANSAB), Available from, 2014. *http://www.ansab.org/publication/one-health-asia-programme-ohap-fighting-zoonoses-in-afghanistan-bangladesh-and-nepal/*.
[26] B. Devleesschauwer, A. Ale, P. Torgerson, N. Praet, C. Maertens de Noordhout, B. Dev Pandey, S.B. Pun, R. Lake, J. Vercruysse, D. Datt Joshi, A.H. Havelaar, L. Duchateau, P. Dorny, N. Speybroeck, The burden of parasitic Zoonoses in Nepal: a systematic review, PLoS Negl. Trop. Dis. 8 (1) (2014) 1–13.
[27] S. Karki, Effects of highly pathogenic avian influenza H5N1 outbreak in Nepal from financial and social perspectives: a case study, Nepal, Vet. J. 34 (2017) 1–10.
[28] S. Karki, C.M. Budke, J. Rushton, B. Lupiani, N.P.S. Karki, R. Ivanek, Cost–benefit analysis of avian influenza control in Nepal, Rev. Sci. Tech. l'OIE. 34 (3) (2016) 813–827, https://doi.org/10.20506/rst.34.3.2397.
[29] S. Karki, B. Lupiani, C.M. Budke, S. Manandhar, R. Ivanek, Cross-sectional Serosurvey of avian influenza antibodies presence in domestic ducks of Kathmandu, Nepal, Zoonoses Public Health 61 (6) (2014) 442–448.
[30] B. Devleesschauwer, A. Aryal, B.K. Sharma, A. Ale, A. Declercq, S. Depraz, T.N. Gaire, G. Gongal, S. Karki, B.D. Pandey, S.B. Pun, L. Duchateau, P. Dorny, N. Speybroeck, Epidemiology, impact and control of rabies in Nepal: a systematic review, PLoS Negl. Trop. Dis. 10 (2) (2016) e0004461.
[31] B. Basnyat, P.K. Pokharel, S. Mani Dixit, A. Karkey, B. Shrestha, S. Thapaliya, A. Professor, S. Kumar, S. Giri, GARP-Nepal National Working Group (NWG) GARP-Nepal staff, Nepal Public Heal. Found. (2015) 1–20. Available from https://cddep.org/wp-content/uploads/2017/06/garp_nepal_sitan_execsum-1.pdf.
[32] K.P. Acharya, R.T. Wilson, Antimicrobial resistance in Nepal, Front. Med. 6 (2019) 1–10.
[33] One Health Strategic Framework, OH-Strategic Framework-Nepal-Final Draft (Unpublished), (2015).
[34] Ministry of Health, Antimicrobial Resistance (AMR) Surveillance Programme Monthly Bulletin, April 2017, Available from, 2017. https://www.nphl.gov.np/images/post-pictures/1495344122-amr-bulletin-april.PDF.
[35] R.K. Khatiwada, Country Report- Nepal Antimicrobial Resistance Surveillance Department of Livestock Services Outline of Presentation, Available from, 2012. http://cdn.aphca.org/dmdocuments/Events/36th_APHCA_Session/Papers/Country%20Report_Nepal%20F.pdf.
[36] World Health Organization, Resource Mobilisation for Antimicrobial Resistance (AMR): Getting AMR into Plans and Budgets of Government and Development Partners Nepal Country Level Report, (2018), pp. 1–46. Available from *https://www.who.int/antimicrobial-resistance/national-action-plans/Nepal-AMR-integration-Report-WHO-Sept-2018.pdf?ua=1*.
[37] B. Basnyat, P. Pokharel, S. Dixit, S. Giri, Antibiotic use, its resistance in Nepal and recommendations for action: a situation analysis global antibiotic resistance partnership (GARP)-Nepal, J Nepal Health Res Counc 13 (2015) 102–111.
[38] OIE, PVS Gap Analysis Report-Nepal, Available from, 2011. *http://www.fao.org/tempref/AG/Reserved/PVS/GAP/Asia/GAP%20-%20Nepal%202011.pdf*.