Short report

Equitable One Health based approach in health care systems: Low- and Middle-Income Country (LMIC) perspectives

Madhumita Dobe[1], Indranil Samanta[2], Arista Lahiri[3], Ayesha Mukhopadhyay[4], Sweety Suman Jha[5]

[1]Chairperson, FAITH (Foundation for Actions and Innovations Towards Health Promotion). Former Dean, Director-Professor and Head of Department of Health Promotion and Education, AIIHPH; India
[2]Professor and Head, Department of Veterinary Microbiology, West Bengal University of Animal and Fishery Sciences; India
[3]Assistant Professor (Community Medicine), Dr. B C Roy Multi-Specialty Medical Research Center, Indian Institute of Technology; India
[4]Assistant Professor, Department of Public Health, John C. Martin Center for Liver Research and Innovations; India
[5]Research Scientist, FAITH (Foundation for Actions and Innovations Towards Health Promotion); India

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Correspondence: Dr. Ayesha Mukhopadhyay, Assistant Professor, Department of Public Health, John C. Martin Center for Liver Research and Innovations, Sonarpur, West Bengal, India Email: ayesha.mukhopadhyay061986@gmail.com

Abstract

One Health approach needs to address the interconnectedness of human, animal, and environmental health equitably. There is however an absence of a clear and concise definition of equity in terms of implementing One Health practices. The suppression of traditional ecological knowledge and imposition of Western medical paradigms excludes the needs of diverse populations in countries like India, with consequent inequitable One Health practices that are exacerbated by regional, gender, and anthropocentric differences. For public health systems in LMICs, promoting equity and inclusion through advocacy is urgently needed along with increased value and visibility of One Health challenges through community involvement.

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The United Nations agenda for sustainable development to transform our world by 2030 has been articulated in the 17 Sustainable Development Goals (SDGs). SDG 10 aims to "*reduce inequality within and among countries*" (1).

Equitable human-animal-environment interfaces in LMICs

Absence of a clear and concise definition of equity in terms of One Health specific practices across the globe makes it hard to establish well-designed and structured approaches to understand and address inequities in human-animal-environment interfaces in LMICs.

Key drivers of inequality

Consequences of colonization and its legacies have been important drivers of inequitable practices in healthcare delivery. Addressing and dismantling existing colonial legacies needs critical examination in context of global power imbalance. This can lead to effective decolonization and moving away from Western practices towards building an inclusive and culturally appropriate One Health approach.

One significant barrier in promoting local culture sensitive and context specific approaches for equity in One Health is the suppression of traditional ecological knowledge (TEK) and traditional healing methods. The influence and forced imposition of Western medical paradigms has led to significant loss of cultural knowledge. In the absence of policies and systems that seek to prevent this knowledge loss, disconnect between human, animal, and environmental health systems is an unfortunate reality of local communities across the globe.

The current One Health approach is rooted in the context of Western healthcare delivery methods, which results in the exclusion and acknowledgement of the needs of a diverse global population. The western healthcare system is rooted in human 'ego' as the superior life form on Earth, having natural right to control over other life forms. Embracing and inculcating local practices while keeping the basic pillars of One Health intact is suitable for addressing equity in country specific contexts (2). Over the centuries, traditional medical and healing practices based on observation and practical experiences using local herbs, plants, and minerals have provided health and wellness to humans. These are cost-effective and eco-friendly methods for protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting and reversing land degradation, and halting biodiversity loss.

To ensure that communities and nations have justice in health, it is necessary to promote individual and national control over health research, policy evaluation, and strategic implementation. Cultural preservation, equitable access to healthcare, and finding novel methods to address challenges of inequity through interdisciplinary integration are necessary to promote sustainable One Health approaches. Integrating traditional medical practices with modern scientific evidence through interdisciplinary approaches provides immense potential for improving population health outcomes and expands our understanding of the essence of One Health.

Understanding the uniqueness of flora and fauna that surround communities is essential to address the interconnectedness of human-animal-environmental health as knowledge of local species and their unique interactions can lead to discovery of novel therapeutic measures, validate long-standing practices, and develop sustainable methods (3). As essential ecosystem practices like pollination, water sanitation, and climate regulation heavily influence agriculture, forestry, and other industries, it becomes increasingly important to understand the local biodiversity. However, inequitable interconnectedness of One Health approaches leads to deficiencies in the involvement of important stakeholders in the existing policy and program planning in LMICs.

Other than pandemics, zoonoses receiving attention from global health agencies and sufficient funding for control are a subset of endemic zoonoses (brucellosis, leptospirosis, anthrax, echinococcosis etc.). These diseases exist in low-resource settings of LMICs and are 'neglected' in true sense of receiving the attention of policy makers. Several aspects of disease control are limited in neglected zoonoses. Examples include limited diagnostic tools, treatment options, and research. These infections disproportionately affect marginalized populations who are intertwined with local animals and often have less access to formal health care systems, education, sanitation, clean water, and additionally miss political voice. Although a large research gap exists in the healing role of traditional medical practices for neglected zoonoses, attention must be provided with incorporation of such system in local One Health based approach for disease mitigation. A collaborative and multi-sectoral approach in addressing complex zoonotic health challenges is the need of the hour and the veterinary sector has not been involved as an important stakeholder to roll out One Health approaches in most LMICs.

Less attention has also been given to traditional practices that prevent transmission and promote treatment of zoonoses. With the advent of drugs like broad-spectrum antibiotics, antivirals, and antifungals, managing zoonoses has become simpler. Yet, even with recent therapeutic advances, zoonotic diseases like coronavirus-19 (COVID-19), Ebola, and Zika cause significant morbidity and mortality, worldwide. Also, there is an ever-present potential for new zoonotic diseases to spill into human population and cause devastating consequences.

Using traditional Knowledge and Practices to build resilient and sustainable solutions

In India, Tamil Nadu's Nilgiri Biosphere Reserve and local tribal communities (like Irula, Kattunaickan, and Paniya) who are considered as "Particularly Vulnerable Tribal Groups" have started community-led surveillance for Kyasanur Forest Disease (KFD) to timely update health officials about potential outbreaks. Similarly, the Bhil tribe from Rajasthan have engaged in tailoring culturally appropriate messages to control local scrub typhus population through vector-control measures. The Siddi tribe of Karnataka are well-known in the scientific community for genetic diversity. Their keen knowledge about traditional herbs and local flora helps treat several ailments. Other examples include the Bodo community using medicinal herbs to treat malaria, Gond community incorporating primary healthcare services within local cultures, Rabaris of

Kachchh utilizing ethnoveterinary medicines, and Warlis from Maharashtra integrating local medicinal herbs into mainstream malaria prevention programs.

In Rigveda, an ancient knowledge resource in India, first literary evidence of animal health care using traditional medicine was detected. Sage Shalihotra (1800 BC) is the first known veterinarian in the world who practiced in Northern India during the Vedic era. Ancient books such as Ashvushastra by Shalihotra, Ashvachikitsa by Jayadeva, Nakul Samhita, and Hasti-Ayurveda are considered as traditional sources of knowledge for animal health care. Different local plants or herbs were documented to be used for treatment of animal diseases throughout the country. For example, tribals use catechu for treating constipation/diarrhea; garlic for fever, cough, and heavy metal toxicity; onion for uterine prolapse and induction of heat; Ghritakumari as a laxative; custard apple as anthelmintic; neem as antiseptic; and astringent in animals. Using this traditional knowledge and practice can help build resilient and sustainable solutions to address inequity.

Redefining One Health Equity

Regional inequity:

At the global level, colonial structures and hierarchy are present and maintained to create divisions between the global North and South. Higher-income countries have more resources and are thus capable of capacity and policy building for lower-income countries to follow. Global health agendas, funding, and research planning are imposed on LMICs with limited agency and decision-making capability. At the national and sub-national levels, it is observed that voices of the vulnerable and marginalized communities are unheard. Historically, communities marginalized by systems of power are excluded from conversations about the problems they face. Researchers, policymakers, and legislators have an air of superiority about themselves and thus their preconceived notion of entitlement makes communities feel less important.

Understanding and consequent evidence driven policy formulation is essential for addressing power dynamics to reduce inequities. While considering neglected infections within the policy purview, countries should not only focus on catering fundamental justice to the marginalized populations, but also maintain justice in the so-called upgraded population, as emerging and re-emerging infections can flare and spread like a suddenly risen volcano from hibernation.

Gender inequity:

Gender inequities have significant impact on One Health specific outcomes. Women across the world play key roles in food production, animal rearing, and natural resource management. Integrating gender considerations into One Health specific practices is crucial to achieving equity (4). Inadequate access to resources and impaired decision-making capacity make women vulnerable to the ill-effects of various zoonoses and environmental toxins related diseases. Their limited access to information, education, and economic resources further exacerbates vulnerabilities. Ignoring gender inequality in One Health makes health programs less effective, leaves out vulnerable groups, and keeps unfair systems in place. Thus, gender responsive

initiatives, especially about biosecurity measures for rearing domestic animals and birds, need to be implemented at individual, community, and organizational levels.

Inequity due to anthropocentric approach:

An anthropocentric approach in One Health prioritizes human health while ignoring animal and environmental well-being. Change in land use, deforestation, and forest fragmentation have exponentially increased human contact with animals and incidences of emerging and remerging zoonoses (5). India is particularly vulnerable to several forest-originated diseases. In the country, there are approximately 3,000 villages inside and 170,000 around forests. 220 million Indians depend on forests for food production, agriculture, and livelihood. Deforestation has severe economic consequences among the poor and marginalized communities as they are heavily dependent on forests for survival. The anthropocentric approach to implementing One Health thus overlooks broader social, economic, and systemic factors that exemplify health inequities. Tailored education encompassing the precautionary measures for zoonoses and environment associated menaces without disturbing the wildlife habitat is crucial for communities residing in and around forest areas.

Advocacy for making inequities in One Health Visible

Advocacy for One Health is a key step towards promoting holistic human, animal and environmental health. At the community level this entails outreach initiatives and instructional efforts to provide information about existing inequities. This helps to foster community engagement towards comprehension and support effective prevention and control measures. Capacity-building of frontline health workers on One Health is essential to strengthen early detection, prevention, and response to health threats that cross human, animal, and environmental boundaries (6). Involving communities in design, implementation, and analysis of research projects can shift societal perspectives towards sustainable practices in place of selfish anthropogenic ones. Integrating gender into One Health policies by ensuring that all strategies recognize and address how gender roles and inequalities influence health risks and outcomes across human, animal, and environmental systems is necessary.

At government levels, evidence driven advocacy for relevant policy is essential in promoting and enhancing One Health initiatives (7). It is time to re-evaluate policies and practices critically to identify and address inequities. Policymakers should invest in joint surveillance, research, public awareness, and international collaboration to effectively prevent and respond to health threats like zoonoses and antimicrobial resistance. Strong advocacy efforts are needed to create and enforce regulations that influence public health practices and implement policies that promote collaboration among different sectors (8). Advocacy is also needed to facilitate the advancement of the One Health initiative by allocating financial resources to research and surveillance programs to understand the issues of inequity.

An illustrative case of Rabies inequity in India is described below:

Rabies is a classic example where the One Health approach is not only beneficial, but essential for effective disease control and elimination.

Rabies remains a significant public health concern in India and according to the World Health Organization (WHO), 36% of the global rabies deaths happen in the country. Despite the availability of vaccines for humans and animals, lack of awareness, low vaccine coverage, and difficulties in accessing timely post-exposure prophylaxis are major factors that contribute to the high disease burden.

Prompt and correct post-exposure prophylaxis (PEP) is crucial for rabies prevention. PEP consists of three important steps – wound washing, rabies immunoglobulin (RIG), and rabies vaccine. In all these three areas, wrong practices abound due to lack of advocacy at the community level among both providers and beneficiaries.

Inadequate wound management like insufficient washing, applying caustic substances like acid, alkali, or traditional remedies cause skin damage that fail to neutralize the virus. Incorrect RIG administration like skipping infiltration for severe wounds, incorrect dosage, failure to infiltrate all wound sites, and late administration fail to build passive immunity against the virus. Incorrect vaccine administration including reduced dosage, incomplete schedule, and incorrect route of administration fails to prevent rabies after bites.

In developing countries like India delay in seeking PEP due to lack of awareness, significant financial constraints, and distance to healthcare facilities are other common challenges. Mis- and disinformation among patients and healthcare providers about rabies, PEP, and transmission risks are significant errors in PEP administration. These are more pronounced among disadvantaged and marginalized populations, thus, highlighting inequity.

Inequities in access to care and PEP are major drivers of the global rabies burden. In India, Uttarakhand and Chattisgarh have higher rabies estimated death rates per 100,000 population compared to other states. States like Delhi, Uttar Pradesh, Bihar, Orissa, and Andhra Pradesh have moderate-high death rates than other states. Thus, there are significant variations in PEP availability across states and regions. Rural areas in India often lack access to RIG and vaccines and though urban centers may have better access they still face challenges. Remote and rural areas have fewer equipped health centers and providers who lack training in administering PEP. Longer travel distance and time leads to delays in initiating PEP in certain areas of the country.

Additionally, there are significant socioeconomic barriers to PEP access. Even though anti-rabies clinics provide free PEP, the indirect costs of treatment are significant for individuals from low socio-economic status. Patients and their accompanying family members often travel significant distances to access PEP and lose multiple days of work; daily wage earners thus face significant loss of income. This is a major reason for non-compliance, especially among the poor. Additionally, those living in remote and rural areas have major travel expenses to access RIG and vaccines. Among the rural marginalized communities, there is also limited awareness about rabies and PEP.

Healthcare infrastructure and delivery systems in India face significant challenges, which directly impact effective implementation of PEP. Rural and remote areas of the country face an

acute shortage of trained healthcare professionals. The lack of proper healthcare facilities often forces victims with animal bites to travel long distances to access PEP. This causes significant delay in administering timely dosages of RIG and vaccines. On the contrary, even though there are more healthcare facilities in the urban and sub-urban Indian cities, the primary and secondary facilities often do not provide 24x7 services, thus prolonging wait times for bite victims.
In both rural and urban public health facilities across the country, there are limited availability of RIG and vaccines. Even though India produces its own RIG and anti-rabies vaccines, inadequate supply due to logistic and supply chain issues remains a recurring problem. There is also a lack of standardized rabies management protocol that hinders effective planning and resource allocation.

The impact of inequities in rabies PEP access have devastating consequences for the Indian society. The most tragic consequence of the persistent inequities in PEP access is the human cost of life. The burden of rabies deaths among rural and low-income Indian populations is high. It is estimated that 17,000-20,000 individuals in the country die from rabies and associated complications. There are also significant economic losses due to lost productivity and healthcare costs secondary to the disease.

In addition, there is often increased emotional distress and fear among the affected individuals and their families. Children and individuals from lower socio-economic status are more vulnerable due to lack of awareness and resources. The impact of inequities in India thus perpetuates the cycle of preventable deaths from the disease complications.

Conclusion

Inequities affect the health and well-being of populations globally, regionally, and at country level. An inclusive approach is a potential way to have all stakeholders onboard. Addressing inequities requires a comprehensive and multipronged approach, targeting social, economic, and systemic challenges. Strengthening the infrastructure of all sectors at grassroot level for adopting One Health approach, increasing public health awareness, and improving education about One Health is crucial. Collaborative efforts with coordination, convergence, and proper communication across sectors and disciplines are necessary to undertake joint unravelling of inequity issues and their underlying causes.

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