ONE HEATLH: The need for a robust framework

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One Health approach emphasises the interconnection between human, animal, and environmental health, advocating for a collaborative and multi-disciplinary strategy to address global health challenges. In the wake of the COVID-19 pandemic, the importance of such an integrated approach has never been clearer. We explore how the One Health framework can enhance our preparedness for future pandemics. In addition to roles of surveillance, early detection, policy development, we highlight the impact of noncommunicable diseases and economy addressing future pandemics. We conclude that integrating advanced technologies, enhancing surveillance systems, and fostering inter-disciplinary collaboration between private and public, national and international, are essential to ensuring resilient, sustainable and equitable health system.

INTRODUCTION

The sudden and rapid escalation of the COVID-19 pandemic in 2019 have appeared to be the most serious threat to global health security in the modern human history, causing inevitable disruption to global economy and resetting our new normal. This event, along with other outbreaks such as Ebola, Zika, Middle Eastern Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS), and Nipah virus over the past several decades, has underscored the emerging and re-emerging of infectious diseases.[1] As rightfully quoted by the Microsoft founder-turned-philanthropist Bill Gates, one lesson that we could learn from this crisis, is that it will not be our last pandemic, and we could be more prepared to overcome future pandemics through strengthening of resilient healthcare systems to cope with and respond to such crisis more effectively. (https://www.ted.com/talks/bill_gates_the_next_outbreak_we_re_not_ready?language=en&subtitle=en).

The One Health concept, which integrates human, animal, and environmental health, provides a comprehensive framework to address this challenge. It emphasises the importance of technological advancement, as well as global collaboration in monitoring and controlling disease threats at the boundary between these domains.[2] To materialise this holistic approach, long-term and close partnership from various stakeholders locally and globally in sharing data and information, alongside global governance with capacity building, hence requires the contribution of health economics.

ONE HEALTH

One Health is a collaborative, multi-sectoral, and trans-disciplinary idea that works at local, regional, national, and global levels with the goal of achieving the best possible health outcomes, taking into account the balance and inter-connections among people, animals, ecosystems, and their shared environment (https://www.who.int/news-room/q-a-detail/one-health).[3–5] This idea was initially proposed in 2004 by the World Health Organization (WHO), the World Organization for Animal Health (OIE), and the Food and Agriculture Organization of the United Nations (FAO), meant to focus on human health, food and environment, and animal health, but was then expanded to include a fourth institution, the UN Environment Program (UNEP). This newly expanded alliance focuses on a joint action on: (i) One Health capacities for health systems, (ii) emerging and

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re-emerging zoonotic diseases, (iii) neglected tropical and vector-borne diseases, (iv) food safety risks, (v) antimicrobial resistance and (vi) the environment.[3]

SURVEILLANCE

A robust surveillance system is critical for responding an outbreak. COVID-19, being the first pandemic in the post-genomic era, the technology advancement of genomics and bioinformatics has contributed significantly in responding to this global health threat.

Genomics surveillance effectively tracks the origin of the outbreak and infectious agents, early identification and characterisation of circulating variants and additionally for keeping track of the genetic makeup and evolution of pathogens and novel strains.[6,7] For instance, the Global Initiative on Sharing All Influenza Data (GISAID) (https://gisaid.org/) allows the global exchange of genomic surveillance data and related information for all influenza viruses, including Respiratory Syncytial Virus (RSV), and SARS-CoV-2.[8] The exchange and sharing of information and updates have sped the dissemination of the initial SARS-CoV-2 whole genome sequencing of the earliest samples collected, igniting an unprecedented global response.

Additionally, in recognition of the need for global collaboration in strengthening genomic surveillance, WHO has initiated the development of the 10-year global genomic surveillance strategy for pathogens with pandemic and epidemic potential 2022–2032. The initiative is powered by a vision to unite, inform and strengthen genomic surveillance efforts at country, regional and global levels (https://www.who.int/initiatives/genomic-surveillance-strategy). Notably, it highlights the needs and commitments from countries, partners and WHO, to leverage existing capacities, address barriers and strengthen the use of genomic surveillance in the detection, monitoring and response to public health threats.

EARLY WARNING SYSTEM

Benefiting from the advancement of genomic technologies, availability of entire sequence of micro-organisms and how they evolve in response to an outbreak can be identified almost instantly, allowing timely action to mitigate the spread of disease through development of diagnostic and effective therapeutic strategies.[9]

Prior to the COVID-19 pandemic, real-time genomic monitoring was progressing in a snail pace towards public health and clinical diagnosis. We learnt from the experience of the lightning spread of SARS-CoV-2 that it is crucial to achieve diagnostic times of minutes rather than days or weeks given the exponential growth rates, high transmission potential, and frequent occurrence of drug resistance in causative pathogens.[10] Whilst sequencing and polymerase chain reaction have been routinely used in established diagnostic laboratories, a faster, more affordable, and more user-friendly rapid diagnostic test-kit is made available to the public.

VETERINARY HEALTH

Majority of the emerging infectious diseases of significant threat to public health have a zoonotic origin, and almost three-quarters originate in wild animals[11] – SARS-CoV-2, Nipah, H1N1, MERS-COV,

SARS, or the deadly Ebola, to name a few. Further, the emergence of simian malaria[12] is continuously posing challenges to the never-ending battle between human and plasmodium.

A strong foundation of science is crucial, and action plans should be mapped to minimise the impact of veterinary-human contact public health: (i) to build strong governance between multi-sectorial stake-holders and industries, as per recommended by WHO in the Operational Tool on Multisectoral Coordination Mechanisms (MCM OT)[13]; (ii) building the capacity and strengthening of biosafety and biosecurity competency among the healthcare and veterinary workforce when handling animals and infectious agents; (iii) persistent surveillance in animal populations for early detection of pathogens, which may involve regular health monitoring and endemic zoonosis control programmes; (iv) established investment mechanisms to increase One Health capacities to save significant costs and avoid losses associated with disease outbreaks, such as healthcare expenditures, animal losses and trade restrictions[14]; (v) encouraging participation from health services from both public and private sectors in interventions.[15]

ECOLOGICAL HEALTH

Environmental surveillance involves the monitoring of ecosystems for changes that might indicate the emergence or spread of pathogens. This includes water and soil testing for contaminants, monitoring air quality, and tracking changes in biodiversity. Habitat destruction and fragmentation, environmental pollution, and climate change alter the habitats of disease vectors and wildlife, thus catalysed the occurrence and geographic distribution of infectious agents.[16,17] Recent examples of epizootics, particularly destructive epidemics or zoonoses (bird flu, coronavirus, Ebola, chikungunya, dengue, and Zika) indicate that the increased risk of pathogen spillover to humans is in many cases attributed to climate change.

On the same note, globalisation and the industrialisation have occurred and advanced very rapidly when viewed on an evolutionary scale (https://www.investopedia.com/terms/g/globalization.asp).[4,18,19] These trends have increased movement of humans, plants, and animals with their accompanying infectious agents, who have been able to colonise new territories. Industrialisation, which has fostered intensive breeding and farming practices, has also generated stress in organisms, which in turn has created an environment that is conducive to the spread of infectious agents.[4]

Toxic risk is another concern because of direct harmful effects of contaminants and their impact on the physiology, immune, and endocrine responses of organisms, biodiversity, and the transmission of pathogens. The recent incidence of food poison resulting in fatalities due to the green-lipped mussels contaminated by biotoxin produced the microalgae in Port Dickson is a classic example the environmental health and climate change impacting on human health https://www.thestar.com.my/news/nation/2024/04/04/mussels-in-pd-contaminated-by-biotoxins-unsafe-for-consumption-says-fisheries-dept).

The WHO recognises that "environmental factors that could be avoided and/or eliminated, cause 1.4 million deaths per year" (https://www.who.int/europe/news/item/05-07-2023-clean-air---green-planet---good-health-for-all), indicating how critical the environmental health could impact human health. The underlying notion is that the health and well-being of the human population will be more and more difficult to maintain on a polluted planet suffering from social or political instability and ever-diminishing resources.

On this matter, we wish to urge our community to rediscover the invaluable wisdom from indigenous people in environmental conservations and resilience.[20]

NON-COMMUNICABLE DISEASES

When the "One Health" concept was proposed, the initial intention between human medicine and veterinary medicine resulted in an inevitable research bias toward zoonotic diseases (https://www.who.int/news-room/q-a-detail/one-health)[4]; yet we had intentionally or unintentionally ignored, the crucial need to address chronic non-communicable diseases (NCDs), which are the leading cause of global human mortality, especially countries from the global south (https://www.cdc.gov/globalhealth/healthprotection/ncd/global-ncd-overview.html). [21,22]

Urbanisation and industrialisation leading to the change of lifestyle and habits, to be more sedentary. Climate change and environmental pollutions, for instance, exposure to toxic substances like microplastics, heavy metals and endocrine disruptive compound, were shown to play an important role in the development of numerous NCDs.[23]

On the same note, evidence has shown that chronic NCDs are attributed to increased susceptibility and more severe manifestations of infectious diseases,[24–27] and long-term sequelae due to COVID-19 has been recognised.[28,29] Therefore, the immediate response to mitigate the burden of future pandemic (if any), is to reduce the burden of NCDs, notably, cancer and cardio-metabolic related diseases.

HEALTH ECONOMICS AND HEALTHY ECONOMY

Wealth and economy are a crucial component of which its impact is often being under-estimated in the One Health Concept. Since 2003, the world lost more than 15 million human life and US$ 4 trillion in economic losses due to disease and pandemics, as well as immense losses from food and water safety hazards, which are One Health related threats (https://www.who.int/news-room/fact-sheets/detail/one-health).

More importantly, a growing body of evidence supports the notion that lower socio-economic status is more prone to infectious diseases and attributed to adverse health outcomes. As a matter of fact, unlike the rural poor, the urban poor is a complex and multi-dimensional group, extending from vulnerability on account of their inadequacy in diet intake, household and personal hygiene, lifestyle, exposure to environmental pollutants, education and health facilities, infrastructures, etc. As a result, they are highly stressed. According to the UN-HABITAT, 60% of the world's total poor live in Asia, and many

more live in poverty-like conditions in urban areas (https://www.adb.org/publications/urban-poverty-asia). Therefore, building a healthcare system that emphasises on the urban poor may help respond so as meet their needs and avoid such disasters. Yet, how to elevate the socio-economic status of the urban poor remains a challenge especially those from the global south.

Whilst sustainable growth of economy is essential for human civilisation, we must not compromise our environmental health, hence should not over exploit natural resources and the environment. The human nature of "greed" needs to be addressed and managed to reach a balance between human development and environmental sustainability.

NATIONAL AND LOCAL POLICIES

Governments must invest in health infrastructure, support inter-disciplinary research, and promote data sharing, notably integration of electronic health records between public and private healthcare service. Policies should also address the ethical, legal, and social implications of health interventions, ensuring they are used responsibly and equitably.

Primarily owing to our continuous destructive relationship with the environment and our highly connected societal organisation, very likely the COVID-19 is but the first in a long line of viral epidemics. Therefore, there is a need to think about the policy responses that promote social and economic resilience and pandemic preparedness. Resilience is about ensuring that society maintains the capability to adequately respond to the sudden shock of a viral pandemic. Resilient policies will ensure that urgent human needs continue to be met during the pandemic crisis in a manner that reflects key social values – compassion, fairness, solidarity. Increased trust and solidarity would also be a critical feature for building resilience into political systems.

CONCLUSION

The One Health approach provides a robust framework for preparing for future pandemics by recognising the interconnectedness of human, animal, and environmental health. By integrating advanced technologies, enhancing surveillance systems, and fostering inter-disciplinary collaboration between private and public, national and international, we can build a more resilient health system. Effective policies and ethical considerations are essential to ensure these efforts are sustainable and equitable. In the face of inevitable future pandemics, One Health offers a comprehensive strategy to safeguard global health.

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