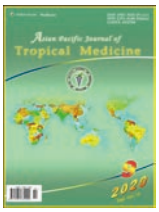

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COVID−19 and zoonosis: Control strategy through One Health approach

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Zoonosis is used to describe disease that has the potential to naturally transmit from vertebrate animal to man. This can also go vice versa whereby disease can transmit from man to animal which is known as reverse zoonosis[1]. Over the last decade, about 75% of zoonotic pathogens have been documented in human arising from animals or animal products[2]. In the developing countries, about 20% of human sickness and death are due to endemic zoonosis[3].

A subset of zoonotic infectious diseases is referred to as "neglected" zoonotic disease and mainly affects poor populations that are in close proximity with domestic or wild animals especially in situations where health and sanitary measures are poor[4]. The disease is termed neglected because in recent years especially in developing countries, attentions are focused on other diseases that are considered important such as HIV/AIDs, tuberculosis, and malaria. Moreover, ineffective diagnostic capacity and poor health care delivery systems may also attribute to underestimation of disease burden[5].

The emergence and re-emergence of zoonoses between human-animal and environmental interface are further reinforced by complex climatic and ecological changes, deforestation, animal adaptation and migration, vectors, pathogen mutation and adaptability, human behaviour and cultural factors, travel, trade, population mobility, population growth, tourism and lack of hygiene. The rapid increase in urbanization, food preferences and probable laboratory escapes are other factors responsible for the emergence or re-emergence of infectious zoonoses[6].

In late December 2019, a new "zoonotic" disease was first reported in the city of Wuhan, Hubei province of China. It is a viral disease caused by an RNA virus belonging to the group of coronaviruses that affects mammals and birds. The disease is caused by a novel coronavirus (nCoV) and has affected virtually all the continents of the world leading to a global pandemic referred to as COVID-19. The novel coronavirus is identified as SARS-CoV-2 which is structurally related to other coronaviruses like the severe acute respiratory syndrome (SARS-CoV) of 2003 and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) of 2012 respectively. The symptoms of the recent COVID-19 include fever, cough and shortness of breathe with complication such as pneumonia and acute respiratory distress symptoms among others.

1. History of animal and human coronaviruses

Coronaviruses are large, enveloped single stranded RNA viruses belonging to the order Nidovirales, family Coronaviridae, subfamily Coronavirinae and Genus Coronavirus (alpha, beta, gamma or delta) affecting human and animals. The first coronaviruses isolated were from poultry with respiratory disease (infectious bronchitis) in the 1930s caused by infectious bronchitis virus. Infectious bronchitis virus remains a worldwide problem, particularly in high-density commercial production facilities. Thereafter other coronaviruses were isolated from animals including transmissible gastroenteritis virus of pigs and mouse hepatitis virus in 1940. The first human coronaviruses (229E and OC43) were first isolated in 1960's from patient with common cold. Until 2002 human coronaviruses (HCoVs) were associated only with mild respiratory tract disease, with estimates that they caused 15%-25% of all common colds. This view was changed in 2002 when a human coronavirus was identified as the cause of an apparently new disease called SARS.

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SARS-CoV was isolated in human in 2003 while HCoV NL63 isolated in 2004, HKU1 in 2005, MERS-CoV in 2012 and recently SARS-CoV-2 in 2019. Most of these agents have been implicated in severe respiratory tract infections.

2. One Health approach as a control strategy for epidemic and pandemic

Stopping diseases in humans by preventing disease occurrence in animals underpins the concept of "One Health", an approach to public health recognising the links between animals, people and planet. Previous epidemics and pandemics have shown that the pathogens responsible in most cases are zoonotic arising from animals. For instance, the 2003 SARS-CoV, and 2012 MERS-CoV originated from animals where masked palm civets and dromedary camels respectively have been identified as intermediate hosts[7]. The virus involved in the recent COVID-19 pandemic (2019-nCoV) is closely related to coronavirus from bats[7], giving a strong indication that the virus may have an animal origin. However, while it is known that humans are the terminal hosts for 2019-nCoV, further investigations are required to determine whether the situation is similar to that of SARS-CoV and MERS-CoV because there is the possibility of the involvement of an intermediate host in the ongoing 2019-nCoV[8].

The continual multiplication of these pathogens in animals encourages the viruses to change over time thus giving room for a novel virus to emerge. RNA viruses are prone to genetic mutation or reassortment as seen in influenza viruses because the RNA genomes are quite unstable as single stranded particles. Sometimes the viruses are recognized to have emerged when they cause diseases in the animals, however in some cases the emerged pathogens may not impact the health of the animals. Examples of these are the 2009 H1N1 pandemic (H1N1-pdm09) influenza A virus that often circulate in healthy pigs, H5N2/H5N1 avian influenza viruses that is frequent in live bird markets, and the MERS-CoV that circulates in healthy camels. These animal-origin viruses have caused many human infections with considerable deaths. Given advanced notice that certain types of high-risk novel viruses have emerged in domestic livestock would give public health officials more time to prepare for their possible cause of epidemics in humans. Currently, there is sparse surveillance work for emerging viruses that cause no illness to such livestock populations. Although in July 2003, SARS-CoV was successfully controlled but not before it had infected more than 8 000 people in 37 countries, causing 774 deaths with estimated economic impact of $80-100 billion[9]. Currently as of 30th of May 2020, COVID-19 pandemic has infected approximately 5 704 736 people with at least 357 736 deaths, and potentially more cases and deaths will occur globally with attendant huge economic losses, social disruptions and psychosocial trauma[10].

There is therefore the need for closer collaborative partnerships between agricultural enterprises and human, animal and environmental health groups so that emerging viruses can be better be detected and mitigation strategies developed more timeously before many more novel viruses such as SARS-CoV-2, emerge with devastating infections and enormous impacts on humans. Often, such an interdisciplinary collaborations fall within the boundary of "One Health" approach. Many institutions have called for One Health interdisciplinary collaborations as the best approach, more effective method and cheaper option to complex health emergencies and problems such as potential viral threats. While there is intense discussion about engaging in fruitful collaborations, disciplinary and sectoral-based resistance may exist due to sectoral protections, potential interference with other areas and territoriality, hence, it becomes necessary to provide platforms for institutionalization of legal and policy frameworks that should make One Health collaborations systematic and routine nationally, regionally and globally.

The importance of the One Health approach needs not to be overemphasized in view of the ongoing COVID-19 pandemic. One Health is designed to foster and streamline communication between infectious disease professionals in human and veterinary health in cases of disease outbreaks, as well as policy makers, social scientists, behavioural scientists, communicators, health financiers, geographers and other disciplines. It has been hypothesised that COVID-19 may have association between humans and animals as evidenced by genetic relationships in coronaviruses from humans, bats and pangolins. Therefore if an "emerging" infectious disease is identified in animals early before it can be transmitted to humans, it should be a win-win situation because humans can hopefully develop vaccines and therapeutic drugs to control the disease first in animals in order to reduce transmission to humans, and also vaccines for the human populations. The primary goal is to detect diseases early in animal population before they become full-fledged pandemics. Scientists have an opportunity at communicating and sharing information a whole lot better and faster under the One Health approach.

Indeed, the US Centres for Disease Control and Prevention has defines One Health as "a collaborative, multisectoral, and transdisciplinary approach (working at the local, regional, national, and global levels) with the goal of achieving optimal health outcomes and recognizing the interconnection between people, animals, plants, and their shared environment". Therefore scientists of the various disciplines of human, veterinary, environmental sciences, as well as other related branches come together and contribute under one roof of "One Health" to find quick solutions to the spread of zoonotic diseases of epidemic or pandemic potentials. It has thus become

imperative to utilize this one health approach in the implementation of investigation and control of the ongoing COVID-19 as well as other future epidemic or pandemic[8].

Conflict of interest statement

The author declares that there is no conflict of interest.

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