A new challenge for Detonation of novel corona virus (2019-nCoV)

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Abstract

Background: Following the public-health emergency of international concern (PHEIC) declared by the World Health Organization (WHO) on 30 January 2020 and the recent outbreak caused by 2019 novel coronavirus (2019-nCoV) in China and 29 other countries, To estimate the serial interval of novel coronavirus (COVID-19), we aimed to summarise the clinical aspects of the novelBetacoronavirus disease (COVID-19) and its possible clinical presentations together with suggested therapeutic algorithms for patients who may require antimicrobial treatment.

Methods: We have analyzed all available data on the development of international COVID-19 cases from March 25th, 2020. COVID-19 cases with and withouttravel history to China were

divided into cohorts according to the Healthcare Access and QualityIndex (HAQ-Index) of each country.

Results: Published cases occurred mostly in males (age range, 8–92 years). Cardiovascular, digestive and endocrine system diseases were commonly reported, except previous chronic pulmonary diseases [e.g. chronic obstructive pulmonary disease (COPD), asthma, bronchiectasis] that were surprisingly underreported.

Conclusion: Human coronavirus continue to pose a threat to human health. This recent emergence of a previously unknown coronavirus in China leads to huge impacts on humans globally. Covid-19 is a challenge to global public health. Here, we discuss the COVID-19 outbreak in a one health context, highlighting the need for the implementation of one health measures and practices to improve human health and reduce the emergence of pandemic viruses.

Keywords: Coronavirus, COVID-19, PublicHealth, Humanbody, WHO.

1. Introduction

The epidemic of novel coronavirus (COVID-19) infections that began in China in late 2019 has rapidly grown and cases have been reported worldwide. An emerging infectious disease, 2019 novel coronavirus disease (COVID-19), was identified to be associated with a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was initially reported in December 2019 in Wuhan City, China [1]. An empirical estimate of the serial intervalthe time from illness onset in a primary case (infector) to illness onset in a secondary case (infectee) is needed to understand the turnover of case generations and transmissibility of the disease [2]. Estimates of the serial interval can only be obtained by linking dates of onset for infector-infectee pairs, and these links are not easily established. A recently published epidemiological study used contact tracing data from cases reported in Hubei Province early in the epidemic to estimate the mean serial interval at 7.5 days [1], Family and hospital clusters with COVID-19 cases were previously reported and person-to-person transmission has been confirmed [3]. Until now, the infectious period of the disease has not been fully explained [4, 5]. In this short report, we aimed to summarise the clinical aspects of the novel coronavirus (COVID-19) infection and its possible manifestations.

2. Materials and methods

We scanned publicly available information published in research articles and quoted from official reports of outbreak investigations to obtain our dataset. The date of illness onset was defined as the date on which a symptom relevant to COVID-19 infection appeared and was determined by the reporting governmental body. The currently available literature was reviewed for microbiologically confirmed infections by 2019-nCoV or COVID-19 at the time of writing

(25 March 2020). A literature search was performed using the PubMed database and Cochrane Library. Search terms included 'novel coronavirus' or '2019- nCoV' or 'COVID-19'. Results: Published cases occurred mostly in males (age range, 8–92 years). Cardiovascular, digestive and endocrine system diseases were commonly reported, except previous chronic pulmonary diseases [e.g. chronic obstructive pulmonary disease (COPD), asthma, bronchiectasis] that were surprisingly underreported. Fever was present in all of the case series available, flanked by cough, dyspnoea, myalgia and fatigue. Multiple bilateral lobular and subsegmental areas of consolidation or bilateral ground-glass opacities were the main reported radiological features of 2019-nCoV infection, at least in the early phases of the disease. We collected dates of illness onset for primary cases (infectors) and secondary cases (infectees) from published research articles and case investigation reports. In addition, we adjust for right truncation of the data as the epidemic is still in its growth phase.

3. Results and Discussion

Today, the world faces many complex problems, such as emerging infections, that a single discipline, institution or country cannot respond to alone. The human pulmonary system is vulnerable to infections due to contact-based inoculation of infectious material in droplets through the eyes, nose, or mouth, and airborne transmission is effective as seen e.g. in the plethora of viral respiratory diseases affecting individuals of all age groups [6]. Thus, respiratory viruses pose a continuous pandemic threat, of which coronaviruses and specifically the genus Betacoronavirus in the family Coronaviridaeis a subset. During the past decades, humans have been challenged with a number of emerging viral respiratory infections with pandemic potential including the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) which emerged in China in 2002 [7,8], swine-origin pandemic (H1N1) influenza A virus which emerged in Mexico in 2009 [9] and the Middle East Respiratory Syndrome coronavirus (MERS-CoV) which emerged in Saudi Arabia in 2012 [10]. Coronaviruses represent a continuous pandemic threat; humans have experienced two coronavirus-related health security crises since 2003. In December 2019, a previously unknown coronavirus was discovered in Wuhan city in China [11,12] which initially resulted in a cluster of viral pneumonia cases [13] and later caused an escalating number of reported infections in humans in China and globally [14–16]. The mortality of the emerging coronavirus of 2019 seems mainly to becaused by acute respiratory distress syndrome (ARDS) [17] which maybe associated with comorbidities and followed by multiple organ failureleading to death [18]. It is probable that this 2019 coronavirus outbreak is not the last one due to a coronavirus. A provisional name was initially given to this coronavirus as 2019-novel coronavirus (2019-nCoV) andwas recently designated as severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) by the CoronaviridaeStudy Group of the InternationalCommittee on Taxonomy of Viruses (ICTV) [19]. The WHOannounced that the disease caused by the SARS-CoV-2 is referred to ascoronavirus disease-2019 (COVID-19) [20]. Despite recent efforts in basic and translational influenza and coronavirusresearch, there is still no vaccine against coronaviruses for usein humans (this includes SARS and MERS) [21-24]. In addition, there isyet no universal influenza vaccine available against all influenza virussubtypes and hence seasonal influenza vaccines have to be updatedannually and vaccines for pandemic preparedness are a challenge[25–30]. The lack of preventive vaccines for clinical use in humansagainst such viruses makes emerging influenza and coronaviruses aserious global threat. Since the emergence of SARS-CoV and MERS-CoV, bats have been the suspect of harbouring emerging viruses. Several studies have recentlyreported the detection of coronaviruses of pandemic potential[31,32]. Genetic evolutionary analysis of SARS-CoV-2 revealed that this virus is genetically related to two bat coronaviruses [12,34].

Contrary toSARS-CoV and MERS-CoV, human infections due to SARS-CoV-2 havebeen reported to a quite large extent outside the epicentre of the infection. The numbers of infections due to SARS-CoV-2 continued togrow since its emergence till March 25 (Fig. 1), and as of the date of this publication, the virus has caused more than 80,000 confirmed and reported cases in humans globally [16,34]. Through rapid and frequentinternational air travel, infections due to SARS-CoV-2 have spread toover 36 countries around the world causing more than 2600 deathsincluding deaths outside China in Japan, Taiwan, the Philippines, Iran, South Korea, Italy and France have been reported as of 24 February2020 [14,34]. The epidemiological data available at the time of thispublication are summarized in Fig. 2 [15]. Infections due to SARS-CoV-2 are yet unreported at the time of this publication in South Americancountries. Except for Egypt where one travel-related case was reported on 12 February 2020, COVID-19 infections are not yet reported elsewherein Africa. As of the date of this report, approximately 97%(n = 81,848)of infections were reported in China[34], however thisnumber of infections may not reflect the true situation in China sinceadditional cases may not have been reported to health authorities at thetime of the outbreak. Since 31 December 2019 and as of 25 March 2020, 416916 cases of COVID-19 (in accordance with the applied case definitions and testing strategies in the affected countries) have been reported, including 18 565 deaths. The deaths have been reported from Italy (6 820), China (3 287), Spain (2 696), Iran (1 934), France (1 100), United States (801), United Kingdom (422), Netherlands (276), Germany (149), South Korea (126), Belgium (122), Switzerland (86), Indonesia (55), Brazil (46), Turkey (44), Japan (43), Sweden (36), Philippines (35), Portugal (33), Denmark (32), Austria (30), Canada (27), Ecuador (27), Iraq (27), San Marino (21), Greece (20), Egypt (19), Algeria (17), Malaysia (15), Romania (11), Hungary (10), Norway (10), Poland (10), India (9), Australia (8), Luxembourg (8), International conveyance in Japan (7), Ireland (7), Pakistan (7), Peru (7), Argentina (6), Dominican Republic (6), Panama (6), Albania (5), Mexico (5), Morocco (5), Bangladesh (4), Lebanon (4), Thailand (4), Bahrain (3), Bulgaria (3), Burkina Faso (3), Colombia (3), Cyprus (3), Czech Republic (3), Democratic Republic of the Congo (3), Israel (3), Paraguay (3), Slovenia (3), Tunisia (3), Ukraine (3), Bosnia and Herzegovina (2), Chile (2), Costa Rica (2), Ghana (2), Iceland (2), Lithuania (2), Mauritius (2), North Macedonia (2), Singapore (2), Taiwan (2), United Arab Emirates (2), Afghanistan (1), Azerbaijan (1), Cameroon (1), Cape Verde (1), Cayman Islands (1), Croatia (1), Cuba (1), Finland (1), Gabon (1), Gambia (1), Guam (1), Guatemala (1), Guyana (1), Jamaica (1), Kosovo** (1), Moldova (1), Niger (1), Nigeria (1), Saudi Arabia (1), Serbia (1), Sudan (1)

and Zimbabwe (1)[15,34]. The Geographic distribution of COVID-19 cases worldwide, as of 25 March 2020 as shown Fig. 3.

The case fatality rate is calculated by dividing the number of knowndeaths by the number of confirmed cases. The resulting number, however, does not represent the true case fatality rate and might be off byorders of magnitude [35]. The true case fatality rate is unknown at this stage of the outbreak, and its precise estimate is impossible at present[35,36]. The current estimates of case fatality rate of SARS-CoV-2 atany time point of analysis should be interpreted with caution since theoutcome of the emerging COVID-19 is yet unknown. There are 33 fatalities reported outside China as of the date of this report. On the contrary, the case fatality rate with SARS was 10% and the US identified eight patients with no fatalities. For MERS, the fatality is 35% and the US identified two patients with no fatalities, and sporadic MERScases are being reported mainly from the Arabian Peninsula till thisday. As a comparison, Influenza A virus infections in the current season(2018-2019) led to an estimated 490,561 hospitalizations and 34,157 deaths in the US [37]. Although the numbers for Influenza A virus infections are not obtained in the same way as for SARS-CoV-2, SARSCoV, and MERS-CoV, and thus are not directly comparable, they still serve as an important reminder of the large numbers of deaths a 'lowmortality' infection can cause when widespread in the community. Globally, the clinical picture in humans infected with SARS-CoV-2 have ranged from mild (no or minor) to severe signs and symptoms including death. It was reported that the first instance of COVID-19 related pneumonia cases, whether linked to the Huanan Seafood Market or not, occurred between 6 and 15 December 2019 [38]. Another study reported the onset of pneumonia cases related to COVID-19 between the 1st and 10th of December [13]. It is unclear whether the COVID-19 pneumonia related cases had occurred undetected in Wuhan, China prior to the 1st of December 2019 which requires further investigation. Retrospective serological investigation of pneumonia cases in Wuhan before December 2019 will determine the extent of early unreported cases. It will also help determine whether SARS-CoV-2 circulated in Wuhan before December 2019 and will help track the origin of this outbreak among Chinese populations and humans in other parts of the world who had travel history to the epicentre prior to the known start of the outbreak. It was previously reported that sensitive and specific serological detection of MERS-CoV in subclinical infection is challenging [39,40]. SARS-CoV-2 can cause asymptomatic to fatal respiratory diseases [41]. Asymptomatic to mild SARS-CoV-2 infections can go unnoticed and there may be a lack of seroconversion or crossreactivity in nucleic acid PCR-confirmed cases which requires further serosurveillance studies to help understand the antibody response of SARS-CoV-2 infections. The development of accurate and robust serological assay will help determine the accurate SARS-CoV-2 prevalence. Infections due to SARS-CoV-2 among healthcare workers and family clusters were also reported and human-to-human transmission has been confirmed [42], however further investigations are required to determine and understand the full extent of this mode of transmission. So far, there is no evidence of airborne transmission of the SARS-CoV-2, however precautionary measures are recommended due to the lack of information excluding this mode of transmission. The present COVID-19 outbreak is the third global alert of coronavirus infections.

SARSCoV-2 transmission in humans appears efficient and the virus is of pandemic potential. As of today, public health measures in China and certain affected areas are yet unable to halt the spread of human infections. There is great concern that spread of the virus may be devastating and of huge pub lic health concerns globally, especially inresource-limited countries.Based on the general definition of a pandemic as an infection thatspreads globally, COVID-19 is already a "pandemic". On January 30,2020, the International Health Regulations Emergency Committee of the World Health Organization declared COVID-19 outbreak a publichealth emergency of international concern (PHEIC) [43]. Subsequently, the US declared it a public health emergency on January 31, 2020 [44], and several travel restrictions to the epicentre of the outbreak wereimposed by the USA, Canada, UK, many countries in Europe, the Philippines, and several other countries have followed similar travel restrictions [45,46] to avoid SARS-CoV-2 infection importation by airtravel. In addition, due to an ongoing COVID-19 outbreak in Italy and Iran in February 2020, several countriers in the Arabian Peninsula haveimposed similar travel restrictions to affected areas. The current situationon COVID-19 confirmed cases in the Middle East and NorthAfrica (MENA) countries is unclear and may be escalating and of greatpublic health concern.Infections due to SARS-CoV-2 among healthcare workers and familyclusters were also reported and human-to-human transmission has been confirmed [42], however further investigations are required to determineand understand the full extent of this mode of transmission. Sofar, there is no evidence of airborne transmission of the SARS-CoV-2, however precautionary measures are recommended due to the lack of information excluding this mode of transmission. The present COVID-19 outbreak is the third global alert of coronavirus infections. SARSCoV-2 transmission in humans appears efficient and the virus is ofpandemic potential. As of today, public health measures in China andcertain affected areas are yet unable to halt the spread of human infections. There is great concern that spread of the virus may be devastatingand of huge public health concerns globally, especially inresource-limited countries. Regarding SARS-CoV-2 in particular, there are several aspects that needs a One Health approach in order to understand the outbreak, and to mitigate further outbreaks of a similar virus. SARS-CoV-2 is likely a batorigin coronavirus that was transmitted to humans through a spillover from bats or through yet undetermined intermediate animal host (avian, swine, phocine, bovine, canine, other species) or wild animals. Fig.4 depicts a transmission hypothesis of SARS-CoV-2 outbreak, the potential intermediate host is yet to be determined. The list of animals which were sold in Huanan Seafood Market in Wuhan ranged from poultry (turkey, pheasants, geese, roosters, doves) wild birds (Peacocks, swans, others species), and exotic animals, to reptiles and hedgehogs. The animal list included frogs, camels, wild rabbits, reptiles, snakes, deer, crocodiles, kangaroos, snails, civet cats, goats, centipedes, and cicades [47,48]. There are no data available in scientific literature on the detection and isolation of SARS-CoV-2 from environmental samples. However, it was recently reported that the Chinese Centers for Disease Control and Prevention isolated SARS-CoV-2 from 33 samples out of 585 environmental samples collected from Huanan Seafood Market [49].

Surprisingly, a recent study highlighted the risk of bat coronavirus outbreaks in China [50]. Therefore, further investigations using one health approaches will help predict virus hotspots and their cross-species transmission poential and the implimentation of one health policies are critical and urgently required.

The implementation of One Health measures in live animal marketsin China (where SARS-CoV-2 is suspected to have emerged), will likelyreduce the risk of emerging zoonotic viruses of pandemic potential in he future. These measures may include implementation of legislationsbut also collaborative interdisciplinary control measures between agricultural and public health sectors. Such measures include biosurveillanceof live animal markets, improved biosecurity in livestockfarms, live animal markets and during animal transportation, publiceducation on zoonotic diseases, and the importance of adopting a cooperativeapproach between agencies. The success in the containment of the current COVID-19 outbreak inChina, affected countries, and the sporadic travel related cases worldwidewill depend much on conventional public health measures, rapidclinical case identification, contact investigation, strict infection controlin healthcare facilities, patient isolation, public education and communitycontainment (quarantine) [51]. And Statistical data for Coronavirus (COVID-19) confirmed cases in different locations as shown Fig.5. The emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in December 2019 which causes coronavirus disease-2019 (COVID-19), an acute respiratory disease marked the third introduction of a highly pathogenic coronavirus into the human population in the twenty-first century.

4. RECOMMENDATIONS AND ADVICE FOR THE PUBLIC

If you are not in an area where COVID-19 is spreading or have not travelled from an area where COVID-19 is spreading or have not been in contact with an infected patient, your risk of infection is low. It is understandable that you may feel anxious about the outbreak. Get the facts from reliable sources to help you accurately determine your risks so that you can take reasonable precautions. Seek guidance from WHO, your healthcare provider, your national public health authority or your employer for accurate information on COVID-19 and whether COVID-19 is circulating where you live. It is important to be informed of the situation and take appropriate measures to protect yourself and your family (see Protection measures for everyone) [52].

If you are in an area where there are cases of COVID-19 you need to take the risk of infection seriously. Follow the advice of WHO and guidance issued by national and local health authorities. For most people, COVID-19 infection will cause mild illness however, it can make some people very ill and, in some people, it can be fatal. Older people, and those with pre-existing medical conditions (such as cardiovascular disease, chronic respiratory disease or diabetes) are at risk for severe disease (See Protection measures for persons who are in or have recently visited (past 14 days) areas where COVID-19 is spreading)[52].

Acknowledgment

The author Mounesh thankful for financially support by the University SC/ST fellowship and WHO created to Infection prevention and control during health care when COVID-19 is suspected and reproduce it.

Ethical approval: This study was based on publicly available data and did not require ethical approval.

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Figures



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Fig.1: Distribution of COVID-19 cases worldwide, as of 25 March 2020



Fig.2: Distribution of COVID-19 cases by continent (except China), as of 25 March 2020 (according to the applied case definition and testing strategies in the affected countries) [15].



Fig.3: Geographic distribution of COVID-19 cases worldwide, as of 25 March 2020



Fig.4:The emergence of SARS-CoV-2 and the outbreak of COVID-19. The figure depicts a hypothesized origin of the virus and a generalised route of transmission of the epidemic zoonotic coronavirus.



Fig.5: Statistical data for Coronavirus (COVID-19) confirmed cases in different locations