COVID-19: PANIC VIS-A-VIS PANDEMIC

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The pandemic of COVID-19 was caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) showed an exceptional challenge to the human population over the globe. The purpose of this review is mainly to review the organism, clinical characteristics, diagnosis, and treatment of COVID-19 and also to remark concisely on the epidemiology and pathology based on the present experience in the world as well as Indian perspective. We focused in this review on the origin, epidemiology, clinical symptoms and preventive measures of the disease. This review has compiled the updated information about COVID-19 with the hope that it will be helpful to the public health professionals in their knowledge.

Key words: COVID-19, India, Public health, SARS-CoV-2

Introduction

The relatively short history of the coronaviruses (CoVs) began in the early 1930s when an acute respiratory infection of domesticated chickens was shown to be caused by a virus now known as avian infectious bronchitis virus (IBV). The term *coronavirus* was adopted for this agent and other similar agents in 1968, and in 1975 the name *Coronaviridae* was accepted for the family. Coronaviruses are pleomorphic, enveloped, positive sense and single-stranded RNA viruses with a nucleocapsid of helical symmetry, ranging from 80 nm to 160 nm in diameter. The spike like projections on its surface giving it a crown like or fringed appearance, redolent of the solar corona under the electron microscope; hence the name coronavirus. These spikes are about 20 nm in length. This virus is widespread in nature; infects a range of hosts including man with variable tissue tropisms and are highly species specific (Richman *et al.*, 2016).

Under the order *Nidovirales*, there are three families; *Arteriviridae* and the *Roniviridae* belonging pathogens are of birds and insects, respectively and the third one is *Coronaviridae* family, consist of two subfamilies, *Coronavirinae* and *Torovirinae*. *Torovirinae* containing viruses cause mainly enteric infections of horses, cattle, pigs, cats and goats. Subfamily *Coronavirinae* is subdivided into four genera *Alphacoronavirus*, *Betacoronavirus*, *Gammacoronavirus* and *Deltacoronavirus*. Members of the *Coronaviridae* are known to cause respiratory or intestinal infections in humans and other animals. Recombination rates of CoVs are very high because of continuous transcription errors and RNA Dependent RNA Polymerase (RdRp) jumps. Coronaviruses are zoonotic pathogens which produce diseases in humans and various animals with a wide range of clinical characteristics from asymptomatic progression to necessity of hospitalization in the

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intensive care unit; causing infections in respiratory, hepatic, gastrointestinal and neurologic systems (Drexler *et al.*, 2010; Woo *et al.*, 2010; Yin *et al.*, 2018). The 2019 novel coronavirus (2019-nCoV), presently it is called severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), is rapidly spreading from its origin in Wuhan City of Hubei Province of China to the rest of the world (Wang *et al.*, 2020). On February 11, 2020 it was named SARS-Cov-2 and the disease caused by this virus was named 'Coronavirus Disease 2019' (abbreviated "COVID-19").

Origin of new virus

Like the other viruses (SARS-CoV and MERS), SARS-CoV-2 has many potential natural hosts or reservoirs, intermediate hosts and final hosts which attitudes great challenges for prevention and treatment of the disease. This virus belongs to *Betacoronavirus*, a large class of viruses which are very predominant in nature. Six coronaviruses were previously known to cause diseases in humans. NL63 & 229E (*Alphacoronavirus*), OC43 & HKU1 (*Betacoronavirus*) generally cause mild respiratory disease and SARS-CoV-2 is the latest and seventh member of the coronavirus family that infects human beings after SARS-CoV in 2003 and MERS-CoV in 2012 (Zhu *et al.*, 2020). In comparison with SARS-CoV and MERS-CoV, SARS-Cov-2 virus has high infectivity and transmission ability, despite of low mortality rate as the mortality rate of SARS-CoV and MERS-CoV was about 10% and 35%, respectively (Donnelly *et al.*, 2019; Liu *et al.*, 2020). SARS-CoV and MERS-CoV are of zoonotic origins. In case of SARS-CoV outbreak in 2003, exotic mammals in wet markets, such as palm civets and raccoon dogs, were supposed to be the animal sources of the virus (Guan *et al.*, 2003) while MERS-CoV was widely distributed in dromedary camels. In Middle East countries, more than 90% of dromedary camels were reported seropositive for MERS-CoV (Hemida *et al.*, 2013; Reusken *et al.*, 2013).

Coronavirus diseases in animals

There are several animal coronaviruses which have no zoonotic importance but having the veterinary significance. In case of pigs, pig respiratory coronavirus (PRCoV) develops respiratory infection, porcine transmissible gastroenteritis virus (TGEV) infects the epithelial cells of the intestine of piglets (Doyle and Hutchins, 1995) and porcine epidemic diarrhoea virus (PEDV) causes diarrhoea due to infection in intestine and colon. Interestingly, PEDV is genetically more closely related to human CoV 229E than to the other animal alphacoronaviruses (Saif, 2004). Bovine coronavirus (BCoV) is a universal worldwide virus which causes both respiratory and enteric diseases as winter dysentery in adult cattle and diarrhoea in calves. Canine coronaviruses (CCoV) is largely prevalent in dog population and it causes enteric diseases in canine. Canine coronaviruses (CCoV) type I and type II are included under *alphacoronavirus* and CCoV-type I is genetically more similar to feline corona virus type I (FCoV type I) than to CCoV type II (Pratelli *et al.*, 2003). Two types of FCoVs have been documented which include feline infectious peritonitis virus (FIPV) and feline enteric coronavirus (FECoV). In poultry, Infectious bronchitis virus (IBV) causes a highly contagious disease which is spread by aerosol thus this plays a very important role in poultry industry in relation with economy. Different commercial vaccines are available against CCoV, FCoV and IBV.

Zoonotic connection

A direct or indirect contact must occur for the disease to emerge and spread in human. Natural synanthropic association and the multifarious relation of biology, ecology, behavior, landscape evolution, and anthropization are responsible to transmit the disease from animal to human. Bat viruses have been associated with human, livestock and wild animal diseases. The sudden occurrence of newly recognized viruses causing fatal diseases and has been shocking to the scientific and medical societies (Moratelli and

Calisher, 2015). Bats are recognized as important reservoir host of zoonotic viruses (Luis *et al.*, 2013). The large population size of bats, hunting the bats as food animal, consumption of bush meat, agricultural and livestock practices, and penetration of bat habitat by humans will likely lead to continued spillover events and outbreaks of different emerging and re-emerging diseases (Wood *et al.*, 2012).

A novel disease

In December 2019, in Wuhan, capital of Hubei province and a chief transportation hub of China, adults humans were started presenting cases to the local hospitals with severe pneumonia of unknown source. Many of those preliminary cases had a common exposure to the Huanan wholesale seafood market which was also used to trade live wild animals. The monitoring and surveillance system were augmented remembering the previous outbreak experience of SARS-CoV and respiratory samples of patients were sent to the reference laboratories for etiologic investigations. On 31st December, 2019, China notified the outbreak report to the World Health Organization and on 1st January, the Huanan sea food market was closed (Sanower *et al.*, 2020). The first unknown pneumonia case was detected on December 12, 2019, and possible influenza and other coronaviruses were ruled out by laboratory testing (Sahin *et al.*, 2020). On 22nd January, 2020, novel CoV was declared to be originated from wild bats and fixed under Group 2 of beta-coronavirus which contains Severe Acute Respiratory Syndrome Associated Coronavirus (SARS-CoV). With the similarity of SARS-CoV-2 to bat SARS-CoV-like coronaviruses, it is expected that bats assist as reservoir hosts for its progenitor while pangolins and snakes are thought to be the intermediate hosts (Li *et al.*, 2020). Although, sample from a *Rhinolophus affinis* bat (RaTG13) is found to be approximately 96% identical overall to SARS-CoV-2 and its spike diverges in the receptor binding domain, which suggests that it may not bind efficiently to human ACE2 (Angiotensin converting enzyme 2) (Wan *et al.*, 2020). Malayan pangolins (*Manis javanica*)

were unlawfully imported into Guangdong province containing coronaviruses similar to SARS-CoV-2 (Zhang *et al.*, 2020). Although the RaTG13 bat virus showed closest relationship to SARS-CoV-2 through the genome and some pangolin coronaviruses exhibited strong resemblance to SARS-CoV-2 in the RBD (receptor binding domain), including all six key RBD residues. It spreads by human-to-human transmission via droplets or direct contact, and infection has been estimated to have an average incubation period of 6.4 days (Lai *et al.*, 2020). Interestingly, for high resemblance of receptor-binding domain (RBD) in Spike-protein, several analyses reveal that SARS-CoV-2 uses angiotensin-converting enzyme 2 (ACE2) as receptor, just like as SARS-CoV (Hoffmann *et al.*, 2020). This clearly suggests that the spike protein of SARS-CoV-2 was optimized for binding to human-like ACE2 and it was occurred as a result of natural selection (Kristian *et al.*, 2020). Although the zoonotic source of SARS-CoV-2 is yet to confirm but its genome sequence has exhibited close identity (88%) with two bat-derived SARS-like coronaviruses (bat-SL-CoVZC45 and bat-SL-CoVZXC21). SARS-CoV-2 was genetically distinct from SARS-CoV and MERS-CoV as it was revealed by phylogenetic analysis (Khan *et al.*, 2020). Peking university study suggests that SARS-CoV-2 infection is probably caused by snakes (Ji *et al.*, 2020) but later it was reported that snakes are not the hosts of SARS-CoV-2 (Zhang *et al.*, 2020). Wuhan institute of virology reported that the resemblance of gene sequence between SARS-CoV-2 and bat coronavirus was as high as 96.2% (Zhou *et al.*, 2020). The resemblance between SARS-CoV-2, isolated from pangolin and the virus strains currently infecting humans is as high as 99%, which has been reported by using macrogenomic sequencing (Xu *et al.*, 2020). Although the outcomes of current research have not yet completely elucidated the potential natural host and the intermediate host of the SARS-CoV-2, adequate suggestions have demonstrated that this virus might be sourced from wild animals (Li *et al.*, 2020).

Epidemiology

The causative agent was identified as a novel coronavirus (2019-nCoV), followed by gene sequence analysis and the development of detection methods on 7th January 2020 from sea food market in Wuhan city (Wang *et al.*, 2020). The most celebratory time of the year in China is Chinese Lunar New Year holiday, was coincided with the emergence of COVID-19, during which a massive human migration took place as individuals travelled back to their hometowns. With the previous experience of SARS-CoV, social distancing has been effective in epidemics which decrease human-to-human transmission and reducing morbidity and mortality (Ferguson *et al.*, 2005). Like the SARS outbreak, this outbreak occurred during the spring festival in China, which is the most famous traditional festival in China, where nearly 3 billion people travel countrywide. These conditions instigated favorable conditions for the transmission of this highly transmissible disease and severe difficulties to prevent and control of the outbreak. The duration of the Spring Festival of China was between 17th January and 23rd February in 2003, when the SARS epidemic peaked, while the period of the present year festival was between 10th January and 18th February in 2020. Probably this could be the reason that there was a rapid

escalation of COVID-19 cases between 10th to 22nd January, 2020. The estimated number of travelers during the 2020 spring festival has ascended 1.7 times compared with the number of travelers in 2003 and reached to 3.11 billion from 1.82 billion. This large scale travel traffic has also created favorable situations for spreading of this disease which became difficult to control. On 11th March, 2020, the World Health Organization (WHO) has declared the novel coronavirus (COVID-19) outbreak as a global pandemic. As on 15th May, 2020, 213 countries and territories are affected and total 45,26,934 human SARS-CoV-2 positive cases reported from the globe where number of fatalities crossed more than 3,03,307 and continuing (www.worldometers.info). USA leads in total confirmed cases as well as death report trailed by Spain and Russia (Table 1).

Indian perspective

On 30th January, India reported its first case of COVID-19 in Kerala, which increased to three cases by 3rd February, 2020 and all were students who had returned from Wuhan, China. As on 15th May, 2020, the Ministry of Health and Family Welfare have confirmed a total of 81,970 cases, 27,920 recoveries (including 1 migration) and 2649 deaths in the country. As on 15th May, 2020, Maharashtra confirmed 25,922 cases that

Table 1. Top trending countries, reported maximum number COVID-19 cases as on 15th May 2020

Country	Total cases	Total deaths	Total recovered
USA	1,457,593	86,912	318,027
Spain	272,646	27,321	186,480
Russia	252,245	2,305	53,530
UK	233,151	33,614	N/A
Italy	223,096	31,368	115,288
Brazil	203,165	13,999	79,479
France	178,870	27,425	59,605
Germany	174,975	7,928	150,300
Turkey	144,749	4,007	104,030
Iran	114,533	6,854	90,539
China	82,933	4,633	78,209
India	82,052	2,649	27,969

is highest in the country and Kerala combated the disease excellently though the state reported the first case from the country. On 22nd March, 2020, India observed a 14 hours voluntary public curfew. On 24 March, the prime minister ordered a countrywide lockdown for 21 days, across the entire 1.3 billion population of India and subsequent lockdown has been extended up to 3rd May, 2020 and further up to 17th May, 2020, thereafter 4th phase lockdown was declared till 31st may, 2020. On 14th March, the Government of India declared the pandemic as a “notified disaster” under the Disaster Management Act, 2005, permitting the states to spend a larger part of funds from the state disaster response fund to fight against the disease. In India, the diagnostic procedure is going on across the country in more than 100 (National Accreditation Board for testing and calibration laboratories) NABL accredits virology laboratories.

Climatic correlation

Although cases of COVID-19 are reported all over the world, most outbreaks exhibit a pattern of clustering in relatively cool and dry areas (www.medrxiv.org). SARS-CoV-2 has established substantial community spread in cities and districts along a narrow east west distribution roughly along the 30-50° N' corridor at constantly similar weather patterns consisting of average temperatures of 5-11°C, combined with low specific (3-6 g/kg) and absolute humidity (4-7 g/m³). Through 10th March, 2020, significant community transmission has been occurred in a constant east and west pattern. Initially, the new epicenters of disease were all unevenly along the 30-50° N' zone; to South Korea, Japan, Iran and Northern Italy. COVID-19 failed to transmit expressively to countries closely north (such as Russia and Mongolia) and south of China. The number of patients and reported deaths in South East Asia is much fewer when compared to more temperate areas as mentioned above. The connotation between temperature and humidity in the area affected with COVID-19 needs special strategies (Sanower *et al.*, 2020).

SARS-CoV-2 in Animal

On 27th February, 2020, Hong Kong's Agriculture, Fisheries, and Conservation Department (AFCD) reported that samples collected from the nasal and oral cavities of a quarantined 17 years old Pomeranian whose owner was detected COVID-19, had found “weak positive” for SARS-CoV-2, by using a real time RT-PCR (reverse transcription-polymerase chain reaction) test. The Federal Agency for the Safety of the Food Chain (FASFC) in Belgium reported on 18th March 2020, that the Faculty of Veterinary Medicine at the University of Liege, could detect viral RNA of SARS-CoV-2 by real time RT-PCR from the faeces and vomit of a cat with digestive and respiratory clinical signs (www.avma.org). According to the Scientific Committee of the FASFC, it was not known whether the sequences of virus found in the cat and the owner were similar, although the cat owner was infected with SARS-CoV-2. On 30th March, 2020, the AFCD reported that a pet cat, lived in a residence with an individual was confirmed COVID-19 by using real time RT-PCR for SARS-CoV-2 from oral, nasal, and rectal samples (www.avma.org). On 5th April, 2020, the National Veterinary Services Laboratories of United States Department of Agriculture (USDA) confirmed SARS-CoV-2 in one tiger in a zoo in New York. This is the first case of tiger which was infected with COVID-19 (www.aphis.usda.gov).

Clinical classification

COVID-19 reveals with a wide clinical characteristics, ranging from asymptomatic to septic shock and multi organ dysfunction. COVID-19 is classified on the basis of severity of the presentation. The disease can be categorized into mild, moderate, severe, and critical. The most common clinical symptoms of the patients show fever (98.6%), fatigue (69.6%), dry cough and diarrhea (Wang *et al.*, 2020). Immunocompromised and aged patients are at the highest risk of fatality (Hassan *et al.*, 2020). On the basis of severity, China CDC classified the clinical symptoms into-1)Mild disease:81% of cases found under this class with

mild pneumonia and non-pneumonia, 2) Severe disease: 14% of cases found with dyspnea, respiration rate $\geq 30/\text{min}$, blood oxygen saturation $\leq 93\%$, P/F ratio [the ratio between the blood pressure of the oxygen (partial pressure of oxygen, PaO₂) and the percentage of oxygen supplied (fraction of inspired oxygen, FiO₂)] < 300 , and/or

lung infiltrates $> 50\%$ within 24 to 48 hours and 3) Critical disease: respiratory failure, septic shock, and/or multiple organ dysfunction (MOD) or failure (MOF); this occurred in 5% of cases (Wu and McGoogan, 2020). On 13th March 2020, WHO published clinical syndromes associated with COVID-19 (Table 2).

Table 2. Clinical syndromes associated with COVID-19

Illness	Symptoms
Mild illness	Patients uncomplicated upper respiratory tract viral infection may have non-specific symptoms such as fever, fatigue, cough (with or without sputum production), anorexia, malaise, muscle pain, sore throat, dyspnea, nasal congestion, or headache. Rarely, patients may also present with diarrhoea, nausea, and vomiting (Chen <i>et al.</i> , 2020; Guan <i>et al.</i> , 2020). The elderly and immunosuppressed may present with atypical symptoms. Symptoms due to physiologic adaptations of pregnancy or adverse pregnancy events, such as dyspnea, fever, GI-symptoms or fatigue, may overlap with COVID19 symptoms.
Acute respiratory distress syndrome (ARDS) (Force <i>et al.</i> , 2012; Khemani <i>et al.</i> , 2015; Riviello <i>et al.</i> , 2016)	Onset: within 1 week of a known clinical insult or new or worsening respiratory symptoms. Chest imaging (radiograph, CT scan, or lung ultrasound): bilateral opacities, not fully explained by volume overload, lobar or lung collapse, or nodules. Origin of pulmonary infiltrates: respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment (e.g. echocardiography) to exclude hydrostatic cause of infiltrates/oedema if no risk factor present. Oxygenation impairment in adults • Mild ARDS: $200 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$ (with PEEP or CPAP $\geq 5 \text{ cmH}_2\text{O}$, or non-ventilated) • Moderate ARDS: $100 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 200 \text{ mmHg}$ (with PEEP $\geq 5 \text{ cmH}_2\text{O}$, or non-ventilated) • Severe ARDS: $\text{PaO}_2/\text{FiO}_2 \leq 100 \text{ mmHg}$ (with PEEP $\geq 5 \text{ cmH}_2\text{O}$, or non-ventilated) • When PaO ₂ is not available, SpO ₂ /FiO ₂ ≤ 315 suggests ARDS (including in non-ventilated patients). Oxygenation impairment in children: note OI = Oxygenation Index and OSI = Oxygenation Index using SpO ₂ . Use PaO ₂ -based metric when available. If PaO ₂ not available, wean FiO ₂ to maintain SpO ₂ $\leq 97\%$ to calculate OSI or SpO ₂ /FiO ₂ ratio: • Bi level (NIV or CPAP) $\geq 5 \text{ cmH}_2\text{O}$ via full face mask: $\text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$ or $\text{SpO}_2/\text{FiO}_2 \leq 264$ • Mild ARDS (invasively ventilated): $4 \leq \text{OI} < 8$ or $5 \leq \text{OSI} < 7.5$ • Moderate ARDS (invasively ventilated): $8 \leq \text{OI} < 16$ or $7.5 \leq \text{OSI} < 12.3$ • Severe ARDS (invasively ventilated): $\text{OI} \geq 16$ or $\text{OSI} \geq 12.3$.
Sepsis (Rhodes <i>et al.</i> , 2017; Weiss <i>et al.</i> , 2020)	Adults: Life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection. Signs of organ dysfunction include: altered mental status, difficult or fast breathing, low oxygen saturation, reduced urine output, fast heart rate, weak pulse, cold extremities or low blood pressure, skin mottling, or laboratory evidence of coagulopathy, thrombocytopenia, acidosis, high lactate, or hyperbilirubinemia. Children: Suspected or proven infection and ≥ 2 age- based systemic inflammatory response syndrome criteria, of which one must be abnormal temperature or white blood cell count.

Diagnostic protocol

According to WHO guideline, laboratory diagnosis of COVID-19 is based on a positive RT-PCR test but the target gene for diagnosis may be different in different countries. The diagnostic tool is being used in India is RT-PCR with the guidelines of WHO and ICMR. Target genes are for screening and confirmatory assays by RT-PCR, e.g. ORF1ab and N in Chinese laboratory protocol, while (RNA dependent RNA polymerase) RdRp, E and N are checked in Germany. Furthermore, three targets in N gene are considered in the US protocol (WHO, 2020). Indian Council of Medical Research-National Institute of Virology (ICMR-NIV), Pune implemented a real-time RT-PCR assay for screening (E gene assay) and confirmation (RdRp, N and ORF gene) along with housekeeping Rnase P gene (Corman *et al.*, 2020). On 4th April, 2020, the Indian Council of Medical Research (ICMR) authorized the use of the Truenat beta CoV test in Truelab work station as a screening test for COVID-19. For routine viral test, BSL-2 laboratory is recommended with all precautionary measures while for research work BSL-3 laboratory is necessary because of culture, propagation and neutralization examination.

Treatment approach

In general, there are little or no treatment options for viral diseases that occur unexpectedly (Sahin *et al.*, 2020). Treatment is essentially supportive and symptomatic. There is no vaccine or effective treatment to prevent COVID-19 infection. The first step is to confirm satisfactory isolation of an individual to avoid transmission of the disease from infected persons, patients and healthcare workers. With the experience of SARS-CoV and MERS-CoV, patients treated with lopinavir/ ritonavir with ribavirin showed better result as compared to those given ribavirin alone (Chen *et al.*, 2020). Remdesivir and chloroquine displayed as highly effective drug *in vitro* for the control of 2019-nCoV infection (Wang M. *et al.*, 2020). Treatment with only remdesivir or in combination with chloroquine or beta interferon was documented effective against COVID-19 infection. Till now

this approach has not elicited any obvious adverse effects (Corman *et al.*, 2020).

Food safety and COVID-19

Many countries are following the advice from the World Health Organization (WHO) concerning the introduction of physical distancing measures as one of the ways in which transmission of the disease can be reduced (WHO, 2020). The food industry should have Food Safety Management Systems (FSMS) based on the Hazard Analysis and Critical Control Point (HACCP) principles, to succeed food safety hazards and to prevent food contamination. Although, the genetic material (RNA) of SARS-CoV-2 has been isolated from stool samples of infected patients (Ong *et al.*, 2020), but there is no report or any evidence of faecal-oral transmission. Hand-washing after using the toilet is always an important practice especially, when working with food, as it is recommended by World Health Organization. WHO also suggests for the food workers to attain training on COVID-19; normal routine health checkup and maintain the physical distancing (at least 1 metre) during working hour. Drivers and other staffs delivering food to premises should not leave their vehicles during delivery. In general, the infectivity of enveloped viruses like COVID-19 virus is reduced by using 70-80% alcohol-based disinfectants (ethanol, propan-2-ol, propan-1-ol). Quaternary ammonium compounds and chlorine also have virucidal properties which can be used as disinfectant.

Preventive measures

For the general population, the best preventive measure is to avoid being exposed to the virus. Infection preventive and control (IPC) measures that may decrease the chances of exposure by implementing the following measures; use of face masks; by covering coughs and sneezes with tissues and then safely disposed (or, if no tissues are available, use a flexed elbow to cover the cough or sneeze); frequent washing of hands with soap or disinfection with hand sanitizer containing minimum 60% alcohol (if soap and

water are not available); avoidance of contact with infected people and maintaining an appropriate distance as much as conceivable; and refraining from touching nose, eyes, and mouth with unwashed hands (CDC, 2019). World Health Organization issued complete guidelines on the use of face masks in the community, during care at home, and in the health care settings of COVID-19. Health care personnel are recommended to use particulate respirators such as certified N95 or FFP2 during aerosol generating procedures and to use medical masks while providing any care to suspected or confirmed cases. In addition to handle the COVID-19 outbreak, the guideline also suggests to eliminate panic among the general population (www.nhc.gov.cn).

Conclusion

The occurrence of several coronaviruses caused a large variety of human and veterinary diseases in last few decades. The viruses will continue to emerge and evolve both in human as well as animal outbreaks due to their ability to recombine, mutate,

and infect multiple species. On the basis of the origination history of the other coronaviruses, SARS-CoV-2 is likely to be originated from bats and reported from Wuhan, China through an unknown intermediate host. Till date, no effective treatment or prevention policies are offered to be used against COVID-19. This pandemic outbreak has challenged the economic, medical and public health infrastructure all over the world. Time alone will decide how this novel virus will influence our lives in future. Moreover, the experience gathered from this COVID-19 episode will definitely compel the planners throughout the globe to be prepared for the worst consequences posed by other similar pathogens of zoonotic origin.

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