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CHAPTER 1

A review: novel coronavirus (COVID-19): an evidence-based approach

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1.1 Introduction

A new coronavirus named 2019-nCoV appeared in late 2019 in Wuhan, China. As of January 30, 2020, only 98 cases were reported in china and outside china, only four countries (Japan, Unites states, Vietman, and Germany) showed eight cases by human to human transmission. Although many details of the virus' development are still unknown, such as its origin and the ability to spread among humans, the increasing number of cases has been caused by person-to-person transmission. Following the outbreak of the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002 and the outbreak of the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012, 2019-nCoV is the third coronavirus to occur in the human population in the last two decades (Rota et al., 2003), an appearance that has alerted global public health institutions (Donnelly et al., 2003).

China responded quickly by informing the World Health Organization (WHO) of the epidemic and sharing its consistency information with the international community after identifying the cause. WHO responded quickly by coordinating the development of diagnoses; issuing guidelines for monitoring, sampling, and treating patients; and providing up-to-date information on the epidemic. In several countries in the region, as well as in the United States, Wuhan travelers undergo a fever test to detect 2019-nCoV cases before the virus spreads (Jung et al., 2020). Updates from China, Thailand, Korea, and Japan show that the 2019-nCoV-related disease appears to be relatively mild compared to SARS and MERS (Li et al., 2005; J.S.M. Peiris et al., 2003).

There is currently no evidence from randomized clinical trials in which potential therapy improves the outcome of abnormal patients suspected or confirmed COVID-19. There is no clinical trial that supports prophylactic therapy. More than 300 active clinics treatment trials are ongoing. This narrative review summarizes current evidence for the proposed main treatments, redesigned or experimental, for

COVID-19, and provides a summary clinical experience and treatment guidelines for this novel epidemic coronavirus.

1.1.1 History and origin

The first coronavirus case in 1960 was reported as a cold. In a 2001 Canadian study, about 500 patients were identified with flu-like symptoms. It was confirmed that 17–18 cases were infected with a strain of coronavirus by polymerase chain reaction. Coronavirus was considered a simple nonlethal virus until 2002. In 2003 several reports were published with evidence that the coronavirus is widespread in many countries like the United States, Hong Kong, Singapore, Thailand, Vietnam, and Taiwan. In several cases, it is serious. Acute respiratory syndrome is caused by the coronavirus and more than 1000 deaths were reported in 2003. This was a black year for the microbiologist. Microbiologists began to focus on understanding these problems. Then they drew on and understood pathogenesis through in-depth study and discovered the disease pathogen to be a coronavirus. But until then a total of 8096 patients were confirmed to be infected with the coronavirus. In 2004 the WHO and the Centers for the Prevention and Control of Diseases declared an “emergency.” Another Hong Kong investigation confirmed 50 patients with severe acute respiratory syndrome, and 30 of them turned out to be infected with coronavirus. In 2012 several infected patients were reported in Saudi Arabia (J. Peiris et al., 2003; Tsang, Lai-Yin, Pak-Yin, & Lee, 2003; World Health Organization, 2003a, 2003c). COVID-19 was first identified and isolated in Wuhan, China (World Health Organization, 2020; Zhu et al., 2020).

1.2 Types

Coronaviruses belong to the Coronavirinae subfamily of the Coronaviridae family. Different types of human coronaviruses cause varying severity of the resulting disease and how far they can spread also varies. Doctors currently recognize seven types of coronaviruses that infect humans (Zaki et al., 2012).

1.2.1 Common types

- 229E (alpha coronavirus)
- NL63 (alpha coronavirus)
- OC43 (beta coronavirus)
- HKU1 (beta coronavirus)

1.2.2 Coronaviruses can spread in the following ways

Coughing and sneezing without covering your mouth can disperse the drops in the air. Touching or shaking hands with a person with a virus can transmit the

virus to the person (Holmes, 1999). Making contact with a surface or object that has a virus and then touching the nose, eyes, or mouth can aid its dispersal. Some animal coronaviruses, such as feline coronavirus (FCoV), are spreading through fecal. However, it is unclear whether this also applies to human coronaviruses. According to the National Institutes of Health, several groups of people are at the highest risk of developing complications from COVID-19 (Muniyappa & Gubbi, 2020).

These groups include:

- Young children
- People aged 65 years or older
- Women who are pregnant
- People with diabetes mellitus

1.3 COVID-19

In 2019 the Centers for Disease Control and Prevention (CDC) began monitoring the outbreak of a new coronavirus, SARS-CoV-2, which causes a respiratory disease known today as COVID-19 (Tang et al., 2020). Authorities first discovered the virus in Wuhan, China (Boldog et al., 2020).

More than 74,000 people have contracted the virus in China. Health authorities around the world have identified many other people with COVID-19, including many in the United States. On January 31, 2020, the virus was recorded as spreading from person to person in the United States (Imai, Dorigatti, Cori, Riley, & Ferguson, 2020).

The WHO has declared a public health emergency for COVID-19. The symptoms of COVID-19 can vary from person to person. It can cause few or no symptoms or it can lead to serious illness and be fatal (Lu et al., 2021).

1.3.1 Common symptoms include

- Fever
- Breathlessness
- Cough
- It may take 2–14 days for a person to notice symptoms after infection

1.3.2 Characteristics

According to a report published on January 24, 2020, patients infected with coronavirus have several characteristics in common: fever, cough, and fatigue, while diarrhea and shortness of breath are found to be rare. Many patients reported bilateral abnormalities. First Infectious virus was confirmed through RTPCR of nine active

cases which was isolated from throat samples. Until now, there have been no coronaviruses confirmed in urine samples in patients (Huang et al., 2020; Zhu, 2020).

1.4 Coronavirus life cycle

1.4.1 Steps

- Attachment and entry (Weiss & Navas-Martin, 2005a)
- Replicase protein expression
- Replication and transcription
- Assembly and release (Fig. 1.1)

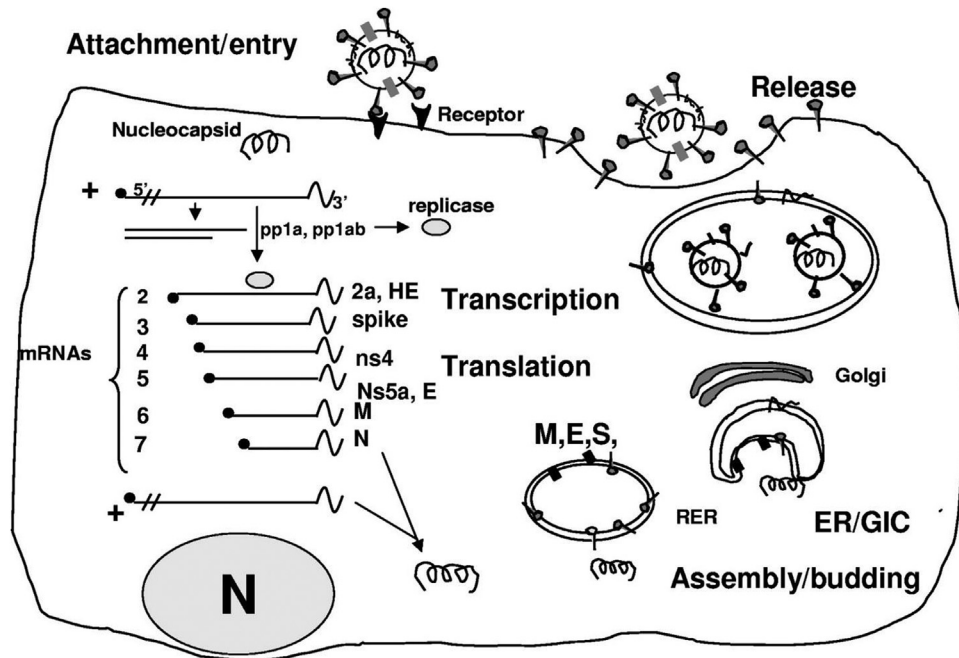


Figure 1.1 Coronavirus replication model. After receptor interaction and fusion of viral and plasma membranes, virus-specific RNA and proteins are synthesized, probably entirely in the cytoplasm. Coronavirus expression begins with the translation of two poly proteins (Weiss & Navas-Martin, 2005a), pp1a and pp1ab, which undergo cotranslational proteolytic processing to proteins that form the replicase complex (Lee et al., 1991). This complex is used for transcription. Embedded subgenomic mRNAs and a 3-cyothermic set of genomic RNAs with a common 5 "leader" sequence derived from the 5 ends the genome. Proteins were translated from the 5 ends of each mRNA. The new virions are collected by incorporation into intracellular membranes and the secretory mechanisms of cells are released through the vesicles. RER, thick endoplasmic reticulum; ER/GIC, endoplasmic reticulum/Golgi intermediate compartment (Weiss & Navas-Martin, 2005b).

1.5 Epidemiology

In December 2019, several cases of pneumonia were reported, grouped together in Wuhan City, and the source was based on the Huanan Seafood Market. The first case of COVID-19 was discovered with unexplained pneumonia on December 12, 2019, and 27 cases of viral pneumonia, seven of which were severe, were officially reported on December 31, 2019. Etiological studies were performed in hospitalized patients due to their similar medical history, confirming the probability of infection from animals to humans. On January 22, 2020, it was announced that the new CoV had come from nature. Bats and coronavirus beta 2, which contains coronavirus (SARS-CoV), are associated with severe acute respiratory syndrome (Akhmetzhanov et al., 2020).

Since December 31, 2019 and as of April 18, 2020, 2,197,593 cases of COVID-19 (in accordance with the applied case definitions and testing strategies in the affected countries) have been reported, including 153,090 deaths.

Cases have been reported from:

- *Africa*: 19,897 cases; the five countries reporting most cases are Egypt (2844), South Africa (2783), Morocco (2564), Algeria (2418), and Cameroon (1016).
- *Asia*: 354,549 cases; the five countries reporting most cases are China (83,785), Iran (79,494), Turkey (78,546), India (14,378), and Israel (12,982).
- *America*: 826,282 cases; the five countries reporting most cases are United States (702,164), Brazil (33,682), Canada (31,872), Peru (13,489), and Chile (9252).
- *Europe*: 988,295 cases; the five countries reporting most cases are Spain (188,068), Italy (172,434), Germany (137,439), France (109,252), and United Kingdom (108,692).
- *Oceania*: 7874 cases; the five countries reporting most cases are Australia (6533), New Zealand (1094), Guam (136), French Polynesia (55), and New Caledonia (18).
- *Other*: 696 cases have been reported from an international conveyance in Japan.

Deaths have been reported from:

1. *Africa*: 1016 deaths; the five countries reporting most deaths are Algeria (364), Egypt (205), Morocco (135), South Africa (50) and Tunisia (37).
2. *Asia*: 13,984 deaths; the five countries reporting most deaths are Iran (4958), China (4636), Turkey (1 769), Indonesia (520), and India (480).
3. *America*: 42,751 deaths; the five countries reporting most deaths are United States (37,054), Brazil (2141), Canada (1 309), Mexico (546), and Ecuador (421).
4. *Europe*: 95,247 deaths; the five countries reporting most deaths are Italy (22,747), Spain (19,478), France (18,681), United Kingdom (14,576), and Belgium (5163).
5. *Oceania*: 85 deaths; the five countries reporting most deaths are Australia (67), New Zealand (11), Guam (5), Northern Mariana Islands (2), and Fiji (0).

1.6 Diagnosis, treatment, and prevention

1.6.1 Therapeutic options for the treatment of 2019-novel coronavirus

Three major respiratory distress syndromes were caused by three coronaviruses (CoV) in the 21st century (World Health Organization, 2019): SARS-CoV in 2003, with the epicenter in 2003 Guangdong, China (Graham, Donaldson, & Baric, 2013); MERS-CoV in 2012 in Saudi Arabia (European Centre for Disease, 2020); and new coronavirus 2019 (2019-nCoV) or coronavirus disease (COVID-19), in Wuhan province, China. The number of deaths in cases is 2.5% (2019-nCoV) (World Health Organization, SARS (Severe Acute Respiratory Syndrome)), 10% (SARS), 35% (MERS-CoV) (World Health Organization, 2003b) Antiviral or vaccine approved for CoV infection have not yet been approved. However many agents used for SERS-CoV and MERS-CoV management are used in the treatment of 2019-nCoV (Sarma et al., 2020).

1.6.1.1 Antiviral Nucleoside analog

Ribavirin, a nucleoside analog, has antiviral activity against a CoVs animal and against SARS-CoV. Due to the epidemic, many patients were treated with ribavirin along with corticosteroids and it has become a standard SARS-CoV treatment regimen. However, the lack of a control group prevented a real estimate effect size and in vitro tests did not show efficacy of any amount of ribavirin against SARS-CoV. Ribavirin has known side effects (hemolytic anemia, hypocalcemia, and hypomagnesemia). Many subsequent studies have questioned ribavirin's efficacy. With a lot of ribavirin and the combination of corticosteroids showed an increased viral load after treatment. Therefore its use decreased for a time (Battegay et al., 2020). Other important nucleoside analogs are favipiravir and galidesivir, but these have not been evaluated so far in 2019-nCoV.

Neuraminidase inhibitors

Neuraminidase inhibitors are used for flu treatment. In a study of the MERS-CoV case in Paris between 2013 and 2016, a total of 35 patients received oseltamivir (37.6%). Of the patients positive for influenza virus ($n = 25$), 52% ($n = 13$) received oseltamivir. Oseltamivir can be started on the assumption of the empirical evidence of the MERS-CoV cases (Zumla, Chan, Azhar, Hui, & Yuen, 2016). Oseltamivir has been evaluated in several other studies on MERS-CoV (Li & De Clercq, 2020). However, strong evidence of its efficiency against COVID-19 is inadequate because there are inadequate control groups in the studies (Huang et al., 2020).

1.6.1.2 *Host-directed therapies*

Host-directed therapies are fundamentally developmentally oriented: improving host status, improving host immunity response, or addressing factors related to the host viral replication (World Health Organization, 2003b). In addition to immunomodulators, metformin, atorvastatin, nutrients, and fibrils supplements can help treat acute respiratory distress syndrome by improving immunity. Till date, there is no 100% effective therapy available for SARS-CoV or SARS and other viral diseases. (Tai, 2007). Zinc appears to have antiviral activity and inhibitory effects on CoV RNA polymerase activity and therefore inhibits its replication in cell culture experiments (Al-Abdely et al., 2019; Centers for Disease Control and Prevention, 1999). The cytokine storm shows pathognomonic property in the case of COVID-19 that can be caused by inhibition of these proinflammatory cytokines (e.g., inhibition of IL-6 by tocilizumab) (Tai, 2007).

1.6.1.3 *Immunomodulators*

Corticosteroids

Corticosteroids have been widely used in SERS-CoV and MERS-CoV and to manage the current 2019-nCoV epidemic. However, the WHO interim guidelines prohibit the routine use of corticosteroids unless indicated for other clinical reasons. The use of corticosteroids is associated with delayed virus removal RNA (for both SERS-CoV and MERS-CoV) and other steroid-related complications like psychosis (Zumla, Hui, Azhar, Memish, & Maeurer, 2020).

Interferon

Interferons (IFN) are broad-spectrum antiviral agents that are mainly used in the treatment of hepatitis B. SARS-CoV patients were compared for ribavirin or interferon (IFN) alone, and a benefit was observed at high doses of IFN- α + group of corticosteroids (Te Velthuis et al., 2010). Other observational studies support these findings, and the combined use of IFN- α and corticosteroids (corticosteroid arm $n = 13$; corticosteroid + IFN- α arm $n = 9$) showed less disease-related impairment of oxygen saturation. For the treatment of 2019-nCoV (7), IFN- α (5 million U bid inh) is recommended in combination with lopinavir + ritonavir combination (Russell, Millar, & Baillie, 2020).

1.6.1.4 *Other therapies*

Other treatment options that are rarely used or are in an experimental state are SiRNA, tumor necrosis alpha factor inhibitors, neutralizing antibodies, pentoxifylline, etc. The level of evidence is weak (Battegay et al., 2020) (Tables 1.1–1.4).

Table 1.1 Herbal medicines and pattern identification for treating mild stage patients with COVID-19.

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
1.	Da Yuan Yin*	<i>Arecae Semen</i> 10 g, <i>Amomi Tsao-ko Fructus</i> 10 g, <i>Magnoliae Officinalis Cortex</i> 10 g, <i>Anemarrhenae Rhizoma</i> 10 g, <i>Scutellariae Radix</i> 10 g, <i>Bupleuri Radix</i> 10 g, <i>Paeoniae Radix Rubra</i> 10 g, <i>Forsythiae Fructus</i> 15 g, <i>Artemisiae Annuae Herba</i> 10 g, <i>Atractylodis Rhizoma</i> 10 g, <i>Isatidis Folium</i> 10 g, <i>Glycyrrhizae Radix et Rhizoma</i> 5 g	Zhao et al. (2003)
2.	Jia Jian Zhengqi San + Da Yuan Yin + Shen Shu San	<i>Agastachis Herba</i> 10 g, <i>Atractylodis Rhizoma</i> 15 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Magnoliae Officinalis Cortex</i> 10 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Ephedrae Herba</i> 6 g, <i>Osterici seu Notopterygii Radix et Rhizoma</i> 10 g, <i>Zingiberis Rhizoma Recens</i> 10 g, <i>Arecae Semen</i> 10 g Or <i>Agastachis Herba</i> 10 g, <i>Atractylodis Rhizoma</i> 15 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Magnoliae Officinalis Cortex</i> 10 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Ephedrae Herba</i> 6 g, <i>Armeniaca Semen Amarum</i> 10 g <i>Osterici seu Notopterygii Radix et Rhizoma</i> 10 g, <i>Zingiberis Rhizoma Recens</i> 10 g, <i>Arecae Semen</i> 10 g	Loutfy et al. (2003)
3.	Jia Jian Zhengqi San* + Huo Po Xia Ling Tang	<i>Atractylodis Rhizoma</i> 15 g, <i>Citri Reticulatae Pericarpium</i> 9 g, <i>Pinelliae Rhizoma</i> 9 g, <i>Magnoliae Officinalis Cortex</i> 9 g, <i>Ephedrae Herba</i> 6 g, <i>Agastachis Herba</i> 9 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Osterici seu Notopterygii Radix et Rhizoma</i> 9 g, <i>Coptidis Rhizoma</i> 6 g, <i>Zingiberis Rhizoma Recens</i> 9 g	Jin et al. (2020)
4.	Qingwen Baidu Yin + Da Yuan Yin + Huo Po Xia Ling Tang + Sheng Jiang San	<i>Bupleuri Radix</i> 20 g, <i>Agastachis Herba</i> 10 g, <i>Atractylodis Rhizoma</i> 10 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Magnoliae Officinalis Cortex</i> 10 g, <i>Arecae Semen</i> 15 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Platycodonis Radix</i> 10 g, <i>Gypsum Fibrosum</i> 20 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g, <i>Batryticatus Bombyx</i> 10 g, <i>Cicadae Periostracum</i> 5 g	Pullano et al. (2020)

(Continued)

Table 1.1 (Continued)

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
5.	Jing Fang Baidu San	<i>Schizonepetae Spica</i> 10 g, <i>Saposhnikoviae Radix</i> 10 g, <i>Osterici seu Notopterygii Radix et Rhizoma</i> 10 g, <i>Perillae Folium</i> 10 g, <i>Atractylodis Rhizoma</i> 12 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Magnoliae Officinalis Cortex</i> 10 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Lithospermi Radix</i> 15 g, <i>Forsythiae Fructus</i> 15 g, <i>Belamcandae Rhizoma</i> 9 g, <i>Dryopteridis Crassirhizomatis Rhizoma</i> 10 g, <i>Agastachis Herba</i> 10 g	Xia et al. (2020)
6.	Jing Fang Baidu San + Jiuwei Qianghuo Pill	<i>Schizonepetae Spica</i> 15 g, <i>Saposhnikoviae Radix</i> 15 g, <i>Chuanxiong Rhizoma</i> 15 g, <i>Angelicae Dahuricae Radix</i> 15 g, <i>Menthae Herba</i> 10 g, <i>Platycodonis Radix</i> 10 g, <i>Schizonepetae Spica</i> 10 g, <i>Perillae Folium</i> 10 g, <i>Osterici seu Notopterygii Radix et Rhizoma</i> 10 g, <i>Isatidis Folium</i> 10 g, <i>Aurantii Fructus Immaturus</i> 10 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Alpiniae Katsumadai Semen</i> 10 g	Loutfy et al. (2003), Pullano et al. (2020)
7.	Jing Fang Baidu San + Huo Po Xia Ling Tang	<i>Schizonepetae Spica</i> 15 g, <i>Saposhnikoviae Radix</i> 15 g, <i>Chuanxiong Rhizoma</i> 15 g, <i>Angelicae Dahuricae Radix</i> 15 g, <i>Menthae Herba</i> 15 g, <i>Platycodonis Radix</i> 30 g, <i>Pogostemonis Herba</i> 15 g, <i>Perillae Folium</i> 15 g, <i>Magnoliae Officinalis Cortex</i> 15 g, <i>Atractylodis Macrocephalae Rhizoma</i> 30 g, <i>Pinelliae Rhizoma Praeparatum</i> 15g, <i>Massa Medicata Fermentata</i> 15g, <i>Coicis Semen</i> 30 g, <i>Poria Sclerotium</i> 30 g, <i>Myristicae Semen</i> 15 g, <i>Armeniacae Semen Amarum</i> 15 g, <i>Crataegi Fructus</i> 30 g, <i>Dolichoris Semen</i> 30 g, <i>Phragmitis Rhizoma</i> 30 g	Jin et al. (2020)

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1.6.2 Prevention

For disaster epidemic management, guidelines can help to eradicate this type of diseases; WHO and European Centre for Disease Prevention and Control posted regularly. Basically, these guidelines apply to health. Human studies have provided a lot of

Table 1.2 Herbal medicines and pattern identification for treating moderate stage patients with COVID-19.

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
1.	Ma Xing Shi Gan Tang	<i>Ephedrae Herba</i> 6 g, <i>Armeniacae Semen Amarum</i> 10 g, <i>Gypsum Fibrosum</i> 30 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g, <i>Cicadae Periostracum</i> 6 g, <i>Rhei Rhizoma Preparata cum Vinum</i> 6 g, <i>Agastachis Herba</i> 10 g	European Centre for Disease Prevention and Control ECDC (2020a)
2.	Ma Xing Shi Gan Tang + Yin Qiao San	<i>Ephedrae Herba</i> , <i>Armeniacae Semen Amarum</i> , <i>Gypsum Fibrosum</i> , <i>Mori Radicis Cortex</i> , <i>Lonicerae Flos</i> , <i>Forsythiae Fructus</i> , <i>Scutellariae Radix</i> , <i>Fritillariae Pallidiflorae Bulbus</i> , <i>Glycyrrhizae Radix et Rhizoma</i> , <i>Phragmitis Rhizoma</i>	European Centre for Disease Prevention and Control ECDC (2020b)
3.	Jia Jian Zhengqi San* + Da Yuan Yin	<i>Atractylodis Rhizoma</i> 15 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Magnoliae Cortex</i> 10 g, <i>Agastachis Herba</i> 10 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Ephedrae Herba</i> 6 g, <i>Osterici seu Notopterygii Radix et Rhizoma</i> 10 g, <i>Zingiberis Rhizoma Recens</i> 10 g, <i>Arecae Semen</i> 10 g	Xi and Gong (2017)
4.	Qianjing Weijing Tang + San Zi Yangqin Tang + Shengyang Yiwei Tang	<i>Phragmitis Rhizoma</i> 20 g, <i>Coicis Semen</i> 20 g, <i>Benincasae Pericarpium</i> 30 g, <i>Persicae Semen</i> 20 g, <i>Bupleuri Radix</i> 12 g, <i>Citri Reticulatae Pericarpium</i> 12 g, <i>Osterici seu Notopterygii Radix et Rhizoma</i> 10 g, <i>Pinelliae Rhizoma</i> 12 g, <i>Saposhnikoviae Radix</i> 15 g, <i>Astragali Radix</i> 15 g, <i>Atractylodis Macrocephalae Rhizoma</i> 15 g, <i>Panax ginseng Radix</i> 6 g, <i>Perilliae Semen</i> 8 g, <i>Raphani Semen</i> 12 g, <i>Moschus</i> 0.4 g	Hu et al. (2017)
5.	Yi Jia Jian Zhengqi San	<i>Agastachis Herba</i> 15 g, <i>Magnoliae Cortex</i> 15 g, <i>Armeniacae Semen Amarum</i> 10 g, <i>Poria Sclerotium</i> 15 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Massa Medicata Fermentata</i> 15 g, <i>Hordei Fructus Germinatus</i> 15 g, <i>Artemisiae Scopariae Herba</i> 15 g, <i>Arecae</i>	Guo et al. (2018)

(Continued)

Table 1.2 (Continued)

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
6.	Ma Xing Yi Gan Tang* + Da Yuan Yin	<i>Pericarpium</i> 10 g, <i>Dolichoris Semen</i> 30 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g, <i>Platycodonis Radix</i> 10 g, <i>Coicis Semen</i> 30 g <i>Ephedrae Herba</i> 6 g, <i>Armeniacae Semen Amarum</i> 15 g, <i>Gypsum Fibrosum</i> 30 g, <i>Coicis Semen</i> 30 g, <i>Atractylodis Rhizoma</i> 10 g, <i>Agastachis Herba</i> 15 g, <i>Artemisiae Annuae Herba</i> 12 g, <i>Polygoni Cuspidati Rhizoma et Radix</i> 20 g, <i>Verbenae Herba</i> 30 g, <i>Phragmitis Rhizoma</i> 30 g, <i>Lepidii seu Descurainiae Semen</i> 15 g, <i>Citri Grandis Rubrum Exocarpium</i> 15 g, <i>Glycyrrhizae Radix et Rhizoma</i> 10 g	Pullano et al. (2020), Hu et al. (2017)
7.	Qingwen Baidu Yin* + Sheng Jiang San	<i>Ephedrae Herba</i> 9–12 g, <i>Armeniacae Semen Amarum</i> 9 g, <i>Gypsum Fibrosum</i> 30 g, <i>Trichosanthis Fructus</i> 30 g, <i>Scutellariae Radix</i> 12 g, <i>Mori Radicis Cortex</i> 30 g, <i>Fritillariae Thunbergii Bulbus</i> 9 g, <i>Eriobotryae Folium</i> 9 g, <i>Adenophorae Radix</i> 12 g, <i>Cicadidae Periostracum</i> 6 g	Xia et al. (2020)

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evidence for human coronavirus transfer from Wuhan, China. Another study reported the spread of the virus in the air. Due to a lack of evidence of transmission health professionals were not able to present prevention guidelines (Wang & Peng, 2006; Yu, Cao, & Xiong, 2015).

WHO has published some general guidelines, for example separate the infected patient from the rest of the family in an individual room, prevent contact, air precautions etc. ECDC also published information for people: avoid contact with patients, and especially coughing; avoid visiting markets and live or dead animal handling places; wash hands with soap and water or use an alcoholic disinfectant solution before and after meals, after using the bathroom and any contact with animals; and avoid contact with animals and feces (Li & Peng, 2013; Tong, 2010).

Table 1.3 Herbal medicines and pattern identification for treating severe stage patients with COVID-19.

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
1.	Xuanbai Chengqi Tang	<i>Armeniacae Semen Amanum</i> 10 g, <i>Gypsum Fibrosum</i> 30 g, <i>Trichosanthis Fructus</i> 30 g, <i>Rhei Radix et Rhizoma</i> 6 g, <i>Ephedrae Herba</i> 6 g, <i>Lepidii seu Descurainiae Semen</i> 10 g, <i>Persicae Semen</i> 10 g, <i>Magnoliae Cortex</i> 10 g, <i>Amomi Tsao-ko Fructus</i> 6 g, <i>Atractylodis Rhizoma</i> 10 g	Zhao, Wang, Cui, and Wu (2012)
2.	Ma Xing Shi Gan Tang + Xuanbai Chengqi Tang	<i>Gypsum Fibrosum</i> 45 g, <i>Ephedrae Herba</i> 10 g, <i>Armeniacae Semen Amarum</i> 10 g, <i>Lonicerae Flos</i> 15 g, <i>Anemarrhenae Rhizoma</i> 10 g, <i>Bubali Cornu</i> 30 g, <i>Fritillariae Thunbergii Bulbus</i> 10 g, <i>Trichosanthis Fructus</i> 30 g, <i>Rhei Radix et Rhizoma</i> 10 g, <i>Magnoliae Cortex</i> 15 g, <i>Lumbricus Corpus</i> 20 g, <i>Lepidii seu Descurainiae Semen</i> 20 g, <i>Paeoniae Radix Rubra</i> 20 g, <i>Astragali Radix</i> 20 g	Zhao et al. (2003)
3.	Qingwen Baidu Yin*	<i>Gypsum Fibrosum</i> 30–60 g, <i>Anemarrhenae Rhizoma</i> 30 g, <i>Rehmanniae Radix</i> 30–60 g, <i>Bubali Cornu</i> 30 g, <i>Paeoniae Radix Rubra</i> 30 g, <i>Scrophulariae Radix</i> 30 g, <i>Forsythiae Fructus</i> 15 g, <i>Moutan Cortex Radicis</i> 15 g, <i>Coptidis Rhizoma</i> 6 g, <i>Lophatheri Herba</i> 12 g, <i>Lepidii seu Descurainiae Semen</i> 15 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g	Xi and Gong (2017), Hu et al. (2017)
4.	Xiang Sha Liu Junzi Tang + Shen Su Jiangqi Tang	<i>Ginseng Radix</i> 7 g, <i>Aucklandiae Radix</i> 6 g, <i>Magnoliae Cortex</i> 30 g, <i>Perillae Folium</i> 8 g, <i>Poria Sclerotium</i> 15 g, <i>Atractylodis Rhizoma Macrocephalae</i> 15 g, <i>Citri Reticulatae Pericarpium</i> 12 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g, <i>Panax quinquefolius Radix</i> 20 g, <i>Aurantii Fructus</i> 10 g, <i>Cynanchi Stauntonii Rhizoma et Radix</i> 15 g, <i>Panacis Quinquefolii Radix</i> 6 g, <i>Fritillariae Thunbergii Bulbus</i> 20 g, <i>Moschus</i> 0.4 g	European Centre for Disease Prevention and Control ECDC (2020a)
5.	Poge Jiuxin Tang + Gualou Xiebai Banxia	<i>Aconiti Lateralis Radix Praeparata</i> 20 g, <i>Comi Fructus</i> 20 g, <i>Ossa Draconis and Concha Ostreae</i> 20 g, <i>Magnetitum</i> 15 g, <i>Fluoritum</i> 20 g, <i>Glycyrrhizae Radix et Rhizoma</i> 12 g, <i>Ginseng Radix</i> 15 g, <i>Faeces</i>	European Centre for Disease Prevention and Control ECDC (2020b)

(Continued)

Table 1.3 (Continued)

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
	Tang + Danshen Yin	<i>Trogopteron</i> 12 g, <i>Allii Macrostemis Bulbus</i> 12 g, <i>Pinelliae Rhizoma</i> 12 g, <i>Poria Sclerotium</i> 20 g, <i>Zingiberis Rhizoma Recens</i> 5 g, <i>Dioscoreae Rhizoma</i> 20 g, <i>Lilii Bulbus</i> 15 g, <i>Zingiberis Rhizoma</i> 5 g, <i>Lycii Fructus</i> 15 g, <i>Psoraleae Fructus</i> 12 g, <i>Cuscutae Semen</i> 15 g, <i>Astragali Radix</i> 15 g, <i>Schisandrae Fructus</i> 6 g, <i>Persicae Semen</i> 15 g, <i>Armeniacae Semen Amarum</i> 15 g, <i>Asari Herba</i> 3 g, <i>Brassicae Semen</i> 15 g, <i>Bambusae Succus</i> 20 g, <i>Jujubae Fructus</i> 10 pieces, <i>Salviae Miltiorrhizae Radix</i> 10 g, <i>Santali Albi Lignum</i> 3 g	
6.	Xiao Qinglong Tang	<i>Ephedrae Herba</i> 10 g, <i>Paeoniae Radix Alba</i> 10 g, <i>Asari Herba</i> 3 g, <i>Zingiberis Rhizoma</i> 10 g, <i>Glycyrrhizae Radix et Rhizoma</i> 5 g, <i>Cinnamomi Ramulus</i> 10 g, <i>Schisandrae Fructus</i> 5 g, <i>Pinelliae Rhizoma Praeparatum</i> 10 g, <i>Lepidii seu Descurainiae Semen</i> 10 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Atractylodis Rhizoma</i> 10 g, <i>Magnoliae Cortex</i> 10 g, <i>Codonopsis Pilosulae Radix</i> 10 g	Zhao et al. (2003)
7.	Qingfei Paidu Tang	<i>Ephedrae Herba</i> 9 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g, <i>Armeniacae Semen Amarum</i> 9 g, <i>Gypsum Fibrosum</i> 15~30 g, <i>Cinnamomi Ramulus</i> 9 g, <i>Alismatis Rhizoma</i> 9 g, <i>Polyporus</i> 9 g, <i>Atractylodis Macrocephalae Rhizoma</i> 9 g, <i>Poria Sclerotium</i> 15 g, <i>Bupleuri Radix</i> 16 g, <i>Scutellariae Radix</i> 6 g, <i>Pinelliae Rhizoma</i> 9 g, <i>Zingiberis Rhizoma Recens</i> 9 g, <i>Asteris Radix</i> 9 g, <i>Farfarae Flos</i> 9 g, <i>Belamcandae Rhizoma</i> 9 g, <i>Asari Herba</i> 6 g, <i>Dioscoreae Rhizoma</i> 12 g, <i>Aurantii Fructus</i> 6 g, <i>Citri Unshius Pericarpium</i> 6 g, <i>Agastachis Herba</i> 9 g	Xi and Gong (2017), Hu et al. (2017)

*Corresponding authors.

Table 1.4 Herbal medicines and pattern identification for treating recovery stage patients with COVID-19.

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
1.	Er Chen Tang + Wang Shi Qingshu Yiqi Tang	<i>Panacis Quinquefolii Radix</i> 15 g, <i>Dendrobii Herba</i> 10 g, <i>Ophiopogonis Radix</i> 15 g, <i>Anemarrhenae Rhizoma</i> 9 g, <i>Lophatheri Herba</i> 10 g, <i>Coptidis Rhizoma</i> 6 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g, <i>Poria Sclerotium</i> 15 g, <i>Pinelliae Rhizoma Praeparatum</i> 9 g, <i>Citri Exocarpium Rubrum</i> 10 g, <i>Citri Reticulatae Pericarpium</i> 15 g, <i>Hordei Fructus Germinatus</i> 20 g	Zhao et al. (2003)
2.	Shengmai San* + ShenLing Baizhu San	<i>Codonopsis Radix</i> 10 g, <i>Poria Sclerotium</i> 15 g, <i>Atractylodis Macrocephalae Rhizoma</i> 10 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Bambusae Caulis in Taeniam</i> 10 g, <i>Glehniae Radix</i> 15 g, <i>Ophiopogonis Radix</i> 10 g, <i>Schisandrae Fructus</i> 6 g, <i>Albizziae Cortex</i> 15 g, <i>Setariae Fructus Germinatus</i> 15 g, <i>Hordei Fructus Germinatus</i> 15 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g	Loutfy et al. (2003)
3.	Shengmai San	<i>Pseudostellariae Radix</i> 15 g, <i>Ophiopogonis Radix</i> 30 g, <i>Schisandrae Fructus</i> 10 g, <i>Astragali Radix</i> 30 g, <i>Atractylodis Macrocephalae Rhizoma</i> 20 g, <i>Citri Reticulatae Pericarpium</i> 10 g, <i>Angelicae Sinensis Radix</i> 15 g, <i>Glehniae Radix</i> 15 g, <i>Armeniaca Semen Amarum</i> 10 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g	Pullano et al. (2020)
4.	Shashen Maidong Tang*	<i>Adenophorae Radix</i> 15 g, <i>Ophiopogonis Radix</i> 15 g, <i>Astragali Radix</i> 15 g, <i>Massa Medicata Fermentata</i> 20 g, <i>Paeoniae Radix Rubra</i> 15 g, <i>Mori Cortex</i> 15 g, <i>Lycii Cortex</i> 15 g, <i>Aurantii Fructus</i> 10 g, <i>Artemisiae Apiaceae Herba</i> 15 g, <i>Rehmanniae Radix Crudus</i> 15 g	Guo et al. (2018)
5.	Shashen Maidong Tang* + Zhuye Shigao Tang	<i>Adenophorae Radix</i> 10 g, <i>Glehniae Radix</i> 10 g, <i>Ophiopogonis Radix</i> 15 g, <i>Panacis Quinquefolii Radix</i> 6 g, <i>Schisandrae Fructus</i> 6 g, <i>Gypsum Fibrosum</i> 15 g, <i>Lophatheri Herba</i> 10 g, <i>Mori Folium</i> 10 g, <i>Phragmitis Rhizoma</i> 15 g, <i>Salviae Miltiorrhizae Radix</i> 15 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g	European Centre for Disease Prevention and Control ECDC (2020b)

(Continued)

Table 1.4 (Continued)

S. no.	Name of herbal formula	Composition of herbal formula (Latin name)	Reference
6.	Huangqi Liu Junzi Tang	<i>Astragali Radix praeparata cum melle</i> 30 g, <i>Amomi Fructus</i> 6 g, <i>Codonopsis Radix</i> 15 g, <i>Poria Sclerotium</i> 15 g, <i>Atractylodis</i> <i>Macrocephalae Rhizoma</i> 10 g, <i>Citri</i> <i>Reticulatae Pericarpium</i> 10 g, <i>Pinelliae</i> <i>Rhizoma</i> 9 g, <i>Agastachis Herba</i> 10 g, <i>Glycyrrhizae Radix et Rhizoma</i> 6 g	Xi and Gong (2017)
7.	Xiang Sha Liu Junzi Tang + Li Zhong Pill	<i>Pinelliae Rhizoma Praeparatum</i> 9 g, <i>Citri</i> <i>Reticulatae Pericarpium</i> 10 g, <i>Codonopsis</i> <i>Radix</i> 15 g, <i>Astragali Radix praeparata</i> <i>cum melle</i> 30 g, <i>Poria Sclerotium</i> 15 g, <i>Agastachis Herba</i> 10 g, <i>Amomi Fructus</i> 6 g	Jin et al. (2020)

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1.7 Conclusions

Over the past 50 years, a series of coronaviruses have developed that cause a wide variety of human and veterinary diseases. These viruses are likely to continue to emerge and develop and cause both human and veterinary outbreaks as they can recombine, mutate, and infect multiple species and cell types.

The COVID-19 pandemic represents the largest global public health crisis of this generation, and probably since the pandemic influenza outbreak in 1918. Both the speed and volume of clinical trials launched to explore possible therapies for COVID-19 highlight the high-quality evidence that can be produced even in the midst of an epidemic. To date, no therapeutic method has been shown to be effective.

Consent for publication

All authors consent to publication in the journal.

Availability of data and materials

All relevant data are within the paper and its supporting information files.

Ethical approval

No human participants were involved in this paper and no new data were collected; thus ethical approval was not required.

Declaration of conflicting interests

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