The epidemic characteristics, guidelines and policies: A compared analysis of literature between COVID-19 and SARS

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Abstract

Background: COVID-19 broke out in Wuhan, and rapidly spread to other province of China and other countries. To understand epidemic characteristics, guidelines and policies of COVID-19 compared to SARS, and further explore the gap of health system facing with major outbreaks for improvement in China.

Methods: A systematic review was performed using China academic literature (CNKI), Wan Fang, PubMed, medRxiv, bioRxiv, official website of World Health Organization, National Health Commission of the People's Republic of China, the Hubei Province Health Commission, and Wuhan City Health Commission for literature of epidemiological and clinical characteristics, guidelines and policies of COVID-19 and SARS from 2003 to 2020. Two dataset were obtained from the National Health Commission's open data information, and daily SARS epidemic section authorized by the State Council's Information Office.

Results: The 113 related studies finally entered final analysis, among which 63 were Chinese articles. Severe acute respiratory syndrome-associated coronavirus (SARS-CoV) and 2019 novel coronavirus (SARS-CoV-2) caused outbreak in 2002 and 2019 in China called SARS and 2019 coronavirus disease (COVID-19). Both belong to Beta Coronavirus (β -CoV). Their original cluster confirmed cases had contact history to wild animals, and clinical symptoms are similar. However, COVID-19 has a high human-to-human transmission capability, and more rapidly spread from Hubei province (97.9% cases) across China and over the world. R_0 was estimated around 2.2 (1.4-3.8), and incubation period of COVID-19 is 1-14 days. Transmission routes predominantly have respiratory droplets, close contact and even air transmission by aerosols. A fatality rate was 2.70% (2004/74185) with the highest of 14.8% at over 80 years old, and cases mainly were males in the middle and elder ages. For prevention and control, strategies and policies consecutively were issued. Compared to those of SARS, responsiveness for COVID-19 is more prompt. Policy priorities tend to multi-sectors of cooperation, strong action to cut off source of infection (sealed Wuhan city), strengthening community prevention and mental health.

Conclusions: The major gap facing with epidemic outbreak exists in the weak health system especially public health system, although we already made a great progress and improvement in our preventive awareness. Therefore, we forcefully appeal to a strong public health system by government for continuous investment and improvement. An advanced public health system stands by us in times of peace, and while fights for us during epidemic outbreak period.

Background

Emerging infectious diseases predominantly threaten human health worldwide [1, 2]. Coronavirus (CoV) is a large family of zoonotic viruses that exist widely in nature. CoV belongs to the coronavirus family (Coronaviridae) with four genera from Alpha Coronavirus (α -CoV) to Delta Coronavirus (δ -CoV). Among them, Beta Coronavirus (β -CoV) is the most harmful to human beings [3, 4]. β genus is divided into four subgroups A to D. Each of them has a different strain [5], which infects humans and animals causing host symptoms of respiratory, intestinal, liver and nervous system ranging from mild to severe. Three of severe acute respiratory syndrome-associated coronavirus (SARS-CoV), Middle East respiratory syndrome-associated coronavirus (MERS-CoV) and 2019 novel coronavirus (2019-nCoV) totally cause pneumonia of humans. Among them, two of them caused outbreak in 2002 and 2019 in China called SARS and 2019 coronavirus disease (COVID-19).

COVID-19 emerged in 12th December 2019 in Wuhan; it promptly broke out in Wuhan in the early of January 2020; At the end of January 2020, it rapidly spread to other province of China and other countries. WHO announced that the novel coronavirus epidemic was listed as a public health emergency of international concern. Novel coronavirus was temporarily named as 2019-nCoV by World Health Organization (WHO) on 12nd January. After one month, WHO officially named novel coronavirus as SARS-CoV-2, and novel coronavirus pneumonia as COVID-19[6]. In China, COVID-19 was restricted into Class B infectious diseases, and prevented and controlled following with clauses of Class A infectious diseases in the Law [7] on January 20, 2020. Meanwhile, Chinese Center for Disease Control and Prevention (CCDC) carried out epidemic surveys at hierarchical levels across the country since 31th December 2019. Other researches and development of SARS-CoV-2 vaccine are imperatively accelerated, separately. However, there is no specific anti-novel coronavirus drug, supportive treatments and molecular chemical drugs were provided into COVID-19 patients such as β -interferon Lopinavir and Ritonavir [8], GS-5734 and chloroquine [9], and targeted drugs related to angiotensin converting enzyme-2 (ACE2) [10]. The epidemic condition last, and there are still 72 532 confirmed cases, 6 242 suspected cases, 1 872 deaths, 12 972 recovery all over China at 18th February 2020 [11]. Undoubtedly, it is more important to understand epidemic characteristics, guidelines and policies of COVID-19 compared to SARS for rapid response at the early epidemic stage. The purpose of this study is to comprehensively understand epidemic characteristics, guidelines and policies of COVID-19 compared to SARS, and further explore the gap of health system facing with outbreaks to close the gap in China.

Methods

Research design

A systematic review was performed from three aspects: epidemic characteristics, guidelines and policies among COVID-19 and SARS. The first part review was carried out using China academic literature (CNKI), Wan Fang, PubMed, medRxiv, bioRxiv and National Health Commission of the People's Republic of China for literature of epidemiological and clinical characteristics of COVID-19 and SARS from 2003 to 2020. The second part review was executed using official website of World Health Organization, National Health Commission of the People's Republic of China, the Hubei Province Health Commission, Wuhan City Health Commission for literature about guidelines, strategies and policies of COVID-19 and SARS from 2003 to 2020. Thirdly, data of new cases of COVID-19 and SARS by date were collected for improvement and further understanding the nature of two diseases in our systematic review.

Searching strategy and data sources

Web of Science databases above across the period 2003–2020 were used to identify relevant researches. Search terms used either singularly or in combination were “2019-nCoV”, “Novel Coronavirus Pneumonia”, “SARS”, “NCP”, “SARS-CoV-2”, “SARS-CoV”, “COVID-19”, “guideline”, “policy” and “notice” in the thesaurus and index lists of the relevant databases in both Chinese and English words. Similarly, Manual searches of the bibliographies of searched articles and reviews in the field were also conducted. We included review, editorial, or methodological articles, news and comments related to our search terms. Additionally, data of COVID-19 were obtained from the National Health Commission's open data information, and SARS data from daily SARS epidemic section authorized by the State Council's Information Office. Figure 1 showed the details of search and data collection strategy.

Data management and Data analysis

Data about new cases of COVID-19 and SARS were entered in Excel 2019. Data of COVID-19 was from 20th January to 20th February in 2020, and SARS from 20th April 2003 to 27th June 2003. Histograms were graphed by Excel 2019, and textboxes with codes of policies were finished in Word 2019. Then, textboxes were put into histograms, and finally saved as pictures. For literature review parts, thematic analysis of the content was undertaken using Ethnograph V6 software to assist with data management. Content analysis is the systematic examination of text and field notes by identifying and grouping themes.

Results

Propagation sources of SARS-CoV-2 compared to SARS-CoV

SARS-CoV-2 and SARS-CoV belong to the virus group β -coronavirus. SARS-CoV-2 has 78% nucleotide homology with human SARS virus, about 50% homology with MERS virus [12, 13] and more than 85% homology with bat-SL-CoVZC45 based on the phylogenetic tree of coronavirus [14]. Studies have shown that bats are natural hosts of more than 100 kinds highly pathogenic viruses, among which SARS-CoV is hosted in Chinese chrysanthemum-headed bat [15]. Maybe, it spreads from bat to humans due to evolutionary mutation [16] by intermediate hosts like pangolin [17]. The evidence about the transmission source came from original cluster confirmed cases with contact history to Seafood Market of Wuhan South China [18-21]. While, transmission pathway includes initial zoonotic (animal-to-human) transmission [22, 23] to secondary human-to-human transmission supported by increasing exportation cases of Wuhan across China fueled by human migration [24, 25]. Moreover, patients with asymptomatic infection and incubation infection maybe were potential important risk factors resulting in rapid spread [13]. Other study found that convalescent patients maybe also were contagious detected with SARS-CoV-2 [18]. We need further evidence on infectivity of latent and convalescent patients. In contrast, SARS might be an animal-borne infectious disease due to contact history with wild animal for the first case of SARS [26] and bats as a food ingredient for business transaction in Guangdong [26, 27]. Additionally, SARS-CoV emerged with high human-to-human transmission capability, characterized by family and medical staff infections [7]. Moreover, evidence about being capability of multiple and continuous human-to-human transmission of SARS-CoV came from one original patient resulting in at least four generations of cases. [28]

Certainly, both exist initial zoonotic transmission to secondary human-to-human transmission. There was evidence of SARS that a few cases highly had the ability of over-transmission with high contagiousness called “first” cases. However, there is lack of evidence about “first” case in outbreak of COVID-19, which suggests that 2019-nCoV is too insidious and fierce to difficultly track the chain of transmission. Additionally, there are two risk factors in COVID-19 for asymptomatic infection and incubation infection accelerating its rapid transmission (Table 1). Thus, the fight of prevention and control for COVID-19 should be tougher than SARS due to unclear propagation chain.

Transmission route of COVID-19 compared to SARS

Transmission routes of COVID-19 predominantly have respiratory droplets, close contact and even air transmission by aerosols [29]. Recently, SARS-CoV-2 was detected in the feces of confirmed cases in Wuhan, Shenzhen and the United States, indicating possibility of fecal-oral transmission [30, 31] due to virus replication and existence in digestive tract. Moreover, mother-to-child vertical transmission was supported by reports showed that cases presented positive nucleic acid in pharyngeal swabs 30 hours after birth [32]. At present, no evidence of virus mutation has been found [33]. Amounts of clinical isolates unrelated to time and geography are needed to assess the extent of viral mutations and whether these mutations indicate adaptability to human hosts [34]. People are generally susceptible to COVID-19 especially those who are low immune function, and children are no exception. In contrast, the route transmission of SARS includes respiratory transmission by close droplets and aerosols, and contact transmission through contaminated hands or even objects [35, 36]. SARS leads to outbreaks in hospitals and families due to close contact in a confined space [35, 37]. While, nosocomial infection is prominent. Additionally, possibility of digestive tract transmission was found by indirect evidence that coronavirus RNA could be detected in the feces of patients with SARS [38]. Different nationalities are generally susceptible. In a word, transmission routes of both include droplets, close contact and even air transmission by aerosols, but mother-to-child vertical transmission was merely supported in COVID-19. Thus, COVID-19 almost covers all kinds of transmission routes, which has higher probability of propagation than SARS (Table 1).

Dynamics of COVID-19 compared to SARS

SARS-CoV-2 were highly contagious than SARS-CoV supported by estimated data of basic reproduction number (R_0) ranging from 2 to 6.5[39-42]. Julien Riou et al found that R_0 was around 2.2 (1.4-3.8) indicating the potential for sustained human-to-human transmission [43]. Additionally, there were growing evidence of human-to-human transmission to support higher contagiousness than SARS-CoV and MERS-CoV [20, 44-47]. Generally, incubation period of COVID-19 is 1 -14 days [29]. At the early epidemic stage, mean incubation period was 5.2 days [48]. Other study showed that median incubation period was 4.75 days based on 4 021 confirmed patients survey [49]. Contrastingly, there is limited literature to estimate dynamics of SARS, but one study showed that R_0

was estimated from 2 to 4[50]. Although these evidences are based on different sample sizes, COVID-19 obviously has higher probability of propagation than SARS (Table 1).

Incidence and fatality rate of COVID-19 compared to SARS

Based on available data, fatality rate of COVID-19 in China was lower than SARS about 9.6% (774/8 098) [50]. Incidence line of COVID-19 was dynamic by time in the research with 72 314 cases. Initially, new cases remained low and sporadic until 1st January; there was an abrupt jump followed by an exponential growth until 23 January, and reached first incidence peak during 24th and 28th January, and then declined slowly [51]. During this period, an abnormal high value of one-day onset occurred on 1st February. Since 3rd February, the number of new cases has dropped for 15 consecutive days in China except Hubei Province [52]. Until 12nd February, 15 152 new confirmed cases were reported nationwide (Figure 2). Among them, 97.9% came from Hubei province [53]. For this incidence peak, the reason maybe was improvement of diagnosis standards, because *Pneumonia Diagnosis and Treatment Program of Novel Coronavirus Infection (trial Fifth Edition)* was issued adding clinical diagnosis to the case diagnosis classification in Hubei Province. Therefore, the number of clinical diagnosed cases was contributed into confirmed cases [54]. Crude fatality rate is the highest of 14.8% at over 80 years old group with higher fatality rate of males than females (2.8 vs. 1.7%), followed by middle-aged group. Majority of them died due to complications. The infection risk possibly increased associated with the elder with underlying diseases such as asthma, diabetes and heart disease. Among children, the age range were from 30 hours to 17 years old [55]. Medical staff and family members of patients were at high risk of infection due to close contact [56, 57]. Supporting Data showed that the proportion of medical staff was 2.09% among 1 099 COVID-19 cases from 552 hospitals in 31 provinces [58].

In contrast, more than 95% cases among 8 273 were Chinese with fatality rate of nearly 10% among 775 deaths that clustered in those over 40 years old or with underlying diseases [5]. SARS stroked in winter and spring, and morbidity peak occurred in early February in Guangzhou and late April in other cities [59]. Based on the official issued data [60], new cases reached at the peak on 29th April 2003, then consecutively decreased till to zero new case on 1st June 2003 (Figure 2). In summary, incidence of COVID-19 is significantly higher than that of SARS, and while fatality rate across age groups of COVID-19 is lower than SARS based on cut-off study date. However, at over 80 years old group the fatality rate is the highest of 14.8%. Thus, COVID-19 is characterized by higher incidence and moderate fatality rate than SARS.

Gender and age distribution of COVID-19 compared to SARS

Cases of COVID-19 mainly were males in the middle and elder ages. Among the first 425 COVID-19 patients, 56% were male with median age of 59 years old [48]. Another study on 2nd January showed that 73% (30/41) cases confirmed by laboratory also were men with median age of 49 (IQR: 41.0-58.0) years old [46]. Yang Yang et al study across China on 26th January [49] suggested that people at all ages were generally susceptible, and those who were aged 30 to 65 years old accounted for 71.45% and children (<10 years) for 0.35%. While, incidence of male was higher than female (0.31 vs. 0.27 per 100 000, P<0.001) among 4 021 confirmed patients [49]. A study of 72 314 cases [51] further confirmed that population is generally susceptible. 86.6% and 31.2% were those aged 30-79 and over 60 years old, separately. The ratio of diagnosed male to female was 1.06.

In contrast, medical workers and retirees are highly at risk. While, proportion of medical staff reached 24.5% without gender difference [35]. Hospitals and families became the predominantly areas [61]. SARS occurred in any age groups focused on young and middle-aged group accounting for 80%. However, elderly death cases accounted for 40% at the early stage of SARS, and fatality rate of the elder was significantly higher than other groups [62]. Severities of SARS were proportional to the amount and time of detoxification [62]. Those who had close contacts with patients were at the higher risk. Therefore, the attacked population of COVID-19 focused on males in the middle and elder ages with those who had underlying diseases; while, SARS mainly attacked young and middle-aged group without significant sex difference. Both entirely put retirees and healthcare providers at the highest risk (Table 1).

Region distribution of COVID-19 compared to SARS

A total of 74 185 confirmed cases and 2 004 deaths of COVID-19 have been reported with a fatality rate of about 2.70% [11] in China on 18th February 2020. Majority of them were imported cases from Wuhan, and others were related to Wuhan [57]. Wuhan is one of the major transportation hubs in China with a population of more than 11 million. The spread of 2019-nCoV was accelerated due to population movement during the Spring Festival transportation. Promptly, COVID-19 disseminated across China. There was a positive correlation between numbers of confirmed cases and population mobility in Wuhan [10]. On January 15, 2020, CCDC confirmed the first known exported case of 2019-nCoV in the US state of Washington, who had recently returned from Wuhan City [63]. While, COVID-19 rapidly spread over the world. A total of 804 confirmed cases and 3 deaths have been reported in 25 countries except China with a case fatality rate of about 0.37% [64]. Contrastingly, SARS firstly was reported in 2002 in Shenzhen Guangdong Province. It last for almost eight months, and spread from Guangdong into 29 countries and regions around the world [19]. Summarily, Wuhan is the starting place of CoVID-19, and for SARS is Shenzhen. Both of two cities had history of contact with wild animals (Table 1).

Clinical characteristics of COVID-19 compared to SARS

Common clinical symptoms of COVID-19 were fever, fatigue and dry cough, and majority of severe cases developed into dyspnea or hypoxemia after one week and further rapid progression of acute respiratory distress syndrome, septic shock, and refractory metabolic [29]. Generally, symptoms of children are relatively mild. One study showed that severe and mild pneumonia accounted for 25.5% and 69.9%, respectively. However, others suggested that majority of cases were mild to moderate reaching 80.9% [51]. There are partially different symptoms and chest imaging between severe/critical and mild patients. Moderate and low

fever or even no obvious fever occurred among severe/critical patients; low fever and mild fatigue without pneumonia among mild cases. In chest imaging, there were multiple small plaques and interstitial changes in the extra pulmonary zone at the early stage, and then multiple ground glass and infiltration shadow in both lungs for mild cases; In severe cases, lung consolidation is possible but pleural effusion were rare. Contrastingly, SARS outbreak characterized by atypical pneumonia with symptoms of fever, cough, headache, muscle pain, and respiratory infection [65]. Therefore, fever mainly is the starting symptom of both, and while severe and mild pneumonia is the predominant symptom with changes in lung imaging. However, symptoms of SARS was obviously severe than COVID-19 resulting in difficult diagnosis of COVID-19 (Table 1).

Diagnosis criteria of COVID-19 compared to SARS

Based on *Diagnosis and treatment protocol of novel coronavirus pneumonia (Trial Version 6)* [29], diagnosis criteria included suspected case and confirmed case. Criteria of suspected cases are those who have 1) COVID-19 epidemiological history, clinical manifestations with moderate or low fever and respiratory symptoms; 2) pulmonary imaging changes with small plaques shadow and interstitial changes or ground glass density shadows and infiltration shadow; 3) and blood routine changes with the total number of leukocytes in the early stage normal or decreased and lymphoid cells decreased. Meanwhile, diagnosis of confirmed case included that 1) detection of 2019-nCoV RNA was positive by photoluminescence RT-PCR technique of breath traces; or 2) blood samples and the gene sequence of detected virus in repertory tract or blood sample was highly homologous with the known gene of 2019-nCoV based on the diagnosis of suspected case. Totally, there are six versions of diagnosis and treatment protocol of NCP issued by National Health Commission of the People's Republic of China (NHC, PRC) as of 19th February 2020. Among them, diagnosis criteria of the 5th edition was different between Hubei province and other provinces in China, which added clinical diagnosis criteria. Fluorescence PCR technology has become the preferred screening method; however, the sensitivity of the existing novel coronavirus fluorescence PCR detection kit was low, and the detection rate was only 30-40% [66].

In contrast, based on *Diagnosis and treatment protocol of Severe Acute Respiratory Syndrome(SARS) (2004 Edition)*, clinical diagnosis of SARS included those who 1) had SARS epidemiological features, corresponding clinical manifestations with fever exceeding 38°C; 2) respiratory symptoms and pulmonary X-ray changes with ground glass density shadows and lung consolidation shadows; and 3) ruled out the diagnosis of other diseases. Laboratory diagnosis included that the secretion was positive for SARS-CoV RNA detection, or the serum (or plasma) SARS-CoV specific antigen N protein was positive, or the serum SARS-CoV antibody was from negative to positive, or the antibody titer was increased more than four times.

Compared to the two diagnosis criteria, both of clinical diagnosis were supported by epidemiological history, clinical manifestations, and pulmonary imaging changes. While, the technique of laboratory diagnosis is significantly developed and advanced in COVID-19. However, early diagnosis rate of COVID-19 keeps low especially among asymptomatic infection patients and suspected cases during incubation period. It is more important to develop rapid and accurate differential diagnosis technique.

Comparison of guidelines between COVID-19 and SARS

Table 2 showed that there are 7 guidelines issued at the global level by WHO from 17th to 31st January [67-73], and while 23 guidelines at the Chinese national level from 20th January to 22nd February [74-95], and 13 ones at the local level from 26th January to 20th February during the period of prevention and control of COVID-19[96-108]. The first document named *2019 temporary guidance document for laboratory testing of suspected cases of new coronavirus infection* focused on testing of NCP among suspected cases on 17th January [73]. After three days, another document from WHO paid attention to home care and contact management for 2019-nCoV [72]. At the national level, Chinese government issued two documents in the laws on 20th January, and they focused on health quarantine and management of infectious diseases [95]. After that, guidelines issued involved in prevention and control [74,83,89,94], diagnosis and treatment [75,76,81,84,90,93], laboratory biosafety [91], public transport [88], and psychological assistance hotline aspects [82]. Moreover, documents focused on the elderly key population and public areas [78,79,80,86]. In the local level, documents focused on technical guidance [97,98,104,108], measures [96,105,106], command and notice about prevention and control of COVID-19[99,100,101,102,103,107].

Comparison of policies between COVID-19 and SARS

Figure 2 and Table 3 showed the similarities and differences among strategies and policies between COVID-19 and SARS. Similarities between them reflected in 12 aspects, which involved in outbreak notification [109,110], laws and regulations [95,111], Ministry of Education Notice, leader adjustments, outbreak report, disposal of patients' remains [85], notice about medical staff, public health emergency, and laboratory management [91,112,113]. The first case of COVID-19 found on 16th November was reported on 31st December [109]. While, the first SARS case was reported after four months [110]. In the outbreak of SARS, technical guideline was issued, and the whole preventive and control plan was implemented which acted by multi-sectoral cooperation. Moreover, both were included in *the People's Republic of China on the Prevention and Control of Infectious Diseases*. Outbreaks are reported one day at a time, but it started after near five months from the first case on 20th April 2003 for SARS and already carried out on 21st January 2020 after two months. Meanwhile, all country entered in the state of public health emergency on 9th May 2003 for SARS and on 20th January 2020 for COVID-19, separately. Furthermore, multi-sectors of cooperation mainly involved in CDC, Health commission, Ministry of Transport, Ministry of Education, and even People's Liberation Army of China. Faced with outbreaks, our whole country was united fighting COVID-19.

Discussion

Both of 2019-nCoV and SARS-CoV belong to Beta Coronavirus (β -CoV), and exist initial zoonotic transmission to secondary human-to-human transmission. However, SARS-CoV had the clear the chain of transmission, and while 2019-nCoV is too insidious and fierce to difficultly track the chain of transmission.

Additionally, R_0 of 2019-nCoV estimated was higher than that of SARS-CoV, and there are symptomatic infection patients and incubation infection in COVID-19. The two had the similar transmission routes, predominantly including respiratory droplets, close contact and even air transmission by aerosols. COVID-19 still have mother-to-child vertical transmission route. Therefore, 2019-nCoV obviously has higher probability of propagation than SARS-CoV. While, COVID-19 rapidly spread to whole country even over the world.

COVID-19 is characterized by higher incidence than SARS; while the fatality rate of SARS was higher than COVID-19 nearly reaching 10%. Additionally, the population of COVID-19 focused on males in the middle and elder ages with those who had underlying diseases; while, SARS mainly attacked young and middle-aged group without significant sex difference. Both entirely put retirees and healthcare providers at the highest risk. Moreover, Wuhan is the starting place of CoVID-19, and for SARS is Shenzhen. Their original cluster confirmed cases had contact history to wild animals. Clinical symptoms are similar, but symptoms of SARS are more serious than COVID-19. Fever mainly is the starting symptom of both, and while severe and mild pneumonia is the predominant symptom with changes in lung imaging. Thus, symptoms of COVID-19 obviously was not typical than SARS resulting in difficult diagnosis of COVID-19. Compared to the two diagnosis criteria, both of clinical diagnosis were supported by epidemiological history, clinical manifestations, and pulmonary imaging changes. While, the technique of laboratory diagnosis is significantly developed and advanced in COVID-19. However, early diagnosis rate of COVID-19 keeps low especially among asymptomatic infection patients and suspected cases during incubation period. It is more important to develop rapid and accurate differential diagnosis technique. Finally, we faced with great challenge about COVID-19 in epidemic characters, clinical diagnosis and laboratory diagnosis. The fight of prevention and control for COVID-19 should be tougher than SARS.

Among guidelines, both of diagnosis and prevention are as the same as important when outbreak comes at the WHO level. At the national level, our government rapidly respond to prevention and control of COVID-19 in all aspects such as prevention and control, diagnosis and treatment, laboratory biosafety, public transport, and psychological assistance hotline aspects. Besides these, local governments issued documents that focused on technical guidance, measures, command and notice about prevention and control of COVID-19. For SARS, majorities of guidelines were issued at the national level focusing on laboratory diagnosis, prevention and control on hospital. There are lack of prevention and control of community, and more details of guidance. Obviously, we made a great progress in our awareness of health.

Certainly, guidelines are not enough because all of them need strong policies to support. When COVID-19 and SARS outbreak in China, majorities of policies were carried out separately. However, days from the first case of COVID-19 were obviously shorter than that of SARS indicating an obvious progress in public health system. Certainly, it was associated with epidemic characteristics of diseases because of COVID-19 with high contagiousness and outbreak period moved forward. While, responsiveness is more prompt faced with COVID-19 outbreak. It was supported by more policies and strategies just implemented in outbreak of COVID-19 such as national health commission acted with other departments, sealed Wuhan city as strong action, strengthening community management, and caring about mental health. Faced with outbreaks, our whole country was united fighting COVID-19. Therefore, there is a great progress and improvement in our health system. However, we invested amount of healthcare sources, activated emergency plans and fight it by multi-sections, COVID-19 is still pandemic in China and even in the world. It suggested that the epidemic condition of COVID-19 is enormously serious than SARS. More importantly, a titanic gap exists in our health system especially public health system.

Conclusion

Certainly, COVID-19 is extremely similar to SARS in 2003. Knowledge, epidemic patterns, lessons and even policies of SARS outbreak are appropriately valuable for responsiveness to COVID-19. Regretfully, majority of policies and strategies issued during SARS period cannot consecutively be implemented or carried out. Therefore, fragmented management patterns resulted in the weak public health system, which had no enough capability of rapid response to outbreaks at the early stage. Thus, COVID-19 is pandemic over a whole country even the whole world.

We already made a great progress for our public health system, and improvement in our preventive awareness. However, the major gap facing with epidemic outbreak exists in the weak health system especially public health system. Therefore, we forcefully appeal to a strong public health system by government for continuous investment and improvement. Undoubtedly, an advanced public health system stands by us in peaceful times, while and fights for us during epidemic outbreak period.

List Of Abbreviations

CoV: Coronavirus

β -CoV: Beta Coronavirus

SARS-CoV: severe acute respiratory syndrome-associated coronavirus

MERS-CoV: Middle East respiratory syndrome-associated coronavirus

2019-nCoV or SARS-CoV-2: 2019 novel coronavirus

COVID-19: 2019 coronavirus disease

Declarations

Ethic approval and consent to participate

The study was approved by Kunming Medical University. The study belongs to literature review, and it does not involve in consent to participate.

Consent for publication

Not applicable.

Availability of data and materials

The dataset without personal identification came from official website. The details are available in the Methods part.

Competing Interests

All authors declare that they have no conflicts of interest statement.

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Authors' Contributions

JL conceived and designed the study; JL, JY and KW reviewed the literatures; each author interpreted the papers and contributed to writing the manuscript.

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Tables

Table 1 Comparisons of epidemic characteristics between COVID-19 and SARS

Characteristics		COVID-19	SARS
Epidemic	Lineage	β -coronavirus Group, with 78% genetic similarity	
	Source	Bat (<i>Rhinolophus sinicus</i>)	Bat
	Age	30-79(86.6%)	20-60(85%)
	Latent period	1-14 days	2-10 days
	Case-fatality rate	3.06%	9.60%
	R0	1.4-2.5	2-4
	Human-to-human transmission	Confirmed	
	Transmission speed	Faster	Slower
	Severity of illness	Milder	Severer
Propagation	Source of transmission	Patient and invisible infected person	
	Route of transmission	Droplet, aerosol and contact	
	Population susceptibility	People generally susceptible	
Clinic	Fever and associated symptoms	Middle and low fever, even no fever.	Exceeding 38°C and lasting for 1-2 weeks.
		Weak, diarrhea in a few patients	Headache, muscular soreness, malaise and diarrhea
	Respiratory symptoms	Dry cough	Dry cough and less phlegm
		Dyspnea or hypoxemia (about 1 week later)	Dyspnea or hypoxemia (6-12d later)
		Severe cases accompanied with ARDS, septic shock, refractory metabolic acidosis and bleeding and coagulation dysfunction.	Severe cases accompanied with hyperventilation, polypnea and respiratory distress
Imaging	Early stage	Multiple small plaques shadow and interstitial changes, especially in the extra pulmonary zone.	Single small ground glass density shadow, especially in the inferior lobes of bilateral lungs
	Progressive stage	Multiple ground glass density shadow and infiltration shadow in both lungs	Multiple large ground glass density shadows, accompanied with lung consolidation shadows

Table 2 Guidelines between COVID-19 and SARS

Date	COVID-19	Date	SARS
WHO			
2020/1/17	2019 temporary guidance document for laboratory testing of suspected cases of new coronavirus infection		
2020/1/20	Interim Guidance Document for Home Care and Contact Management for Suspected New Coronavirus (nCoV) Infectors		
2020/1/25	Interim Guidance Document on Infection Prevention and Control in Medical Institutions When Suspected of New Coronavirus Infection		
2020/1/26	Risk Communication and Community Participation in the Preparation and Response to New Coronavirus (2019-nCoV) 2019		
2020/1/28	Interim Guidance Document for Clinical Management of Suspected Severe Acute Respiratory Infections Caused by New Coronavirus in 2019		
2020/1/29	Temporary guidance document on the use of masks in communities, home care and health care settings during an outbreak of the new coronavirus (2019-nCoV)		
2020/1/31	Third edition of Interim Guidance Document on Global Surveillance of Humans Infected with New Coronavirus 2019		
Country			
2020/1/20	New coronavirus-infected pneumonia is included in the management of quarantine infectious diseases prescribed by the Frontier Health and Quarantine Law of the People's Republic of China	2003/5/12	Administrative Measures for the Research Laboratory of Infectious Atypical Pneumonia Virus
2020/1/20	New coronavirus-infected pneumonia is included in the Class B infectious diseases specified in the Law of the People's Republic of China on the Prevention and Control of Infectious Diseases, and measures for the prevention and control of Class A infectious diseases	2003/5/12	"Administrative Measures for the Prevention and Control of Infectious Atypical Pneumonia"
2020/1/22	New Coronavirus Infection Control Plan (Second Edition)	2003/5/14	"Architecture Design Guidelines for Hospitals Treating Patients with Infectious Atypical Pneumonia"
2020/1/23	Diagnosis and treatment of pneumonitis caused by new coronavirus (trial version 3)	2003/11/5	Technical Guidelines for Hospital Prevention and Control of Nosocomial Infectious Atypical Pneumonia (SARS)
2020/1/23	Guide to New Coronavirus Infection Prevention and Control in Medical Institutions (First Edition)	2003/11/21	"Laboratory diagnostic procedures for infectious atypical pneumonia and influenza and other respiratory infectious diseases"
2020/1/23	New Coronavirus Laboratory Biosafety Guide (Second Edition)		
2020/1/27	Diagnosis and treatment of pneumonitis caused by new coronavirus (trial version 4)		
2020/1/28	New Coronavirus Pneumonia Prevention and Control Plan (Third Edition)		
2020/1/29	Technical guide for disinfection operation of public transport		
2020/1/31	Guidelines for the protection of people with different risks of new coronavirus infection and guidelines for the use of pneumonia masks to prevent new coronavirus infection		
2020/1/31	Guidelines for the health protection of pneumonia caused by new coronavirus infections in public places		
2020/2/1	Guidelines for the health protection of pneumonia caused by new coronavirus infections in public places		
2020/2/5	Diagnosis and treatment of pneumonitis caused by new coronavirus (trial version 5)		
2020/2/7	New Coronavirus Pneumonia Prevention and Control Program (Fourth Edition)		
2020/2/7	Guidelines for psychological assistance hotline during prevention and control of new coronavirus pneumonia		
2020/2/8	New Coronavirus Pneumonia Diagnosis and Treatment Plan (Trial Version 5 Revised)		
2020/2/12	Guidelines for the operation and management of air-conditioning and ventilation systems in offices and public places during the new crown pneumonia epidemic		
2020/2/15	Guidelines for health protection in shopping malls and supermarkets during the epidemic of new coronavirus pneumonia		
2020/2/17	Guidelines for the elderly in elderly care institutions during the prevention and control of new coronavirus pneumonia		
2020/2/19	Disinfectant Use Guide		
2020/2/19	New coronavirus pneumonia diagnosis and treatment plan (trial version 6)		
2020/2/21	New Coronavirus Pneumonia Prevention and Control Plan (Fifth Edition)		
2020/2/22	"Guidelines for the Prevention and Control of Epidemic Situations in the Resumption of Work and Production in Enterprises and Institutions"		
Local			
2020/1/26	"Technical Plan for Prevention and Control of Pneumonia Infected by New Coronavirus in Gansu Province"		
2020/1/28	Order of Command of the Leading Group for the Prevention and Control of Pneumonia of New		

Coronavirus Infection in Guangxi Zhuang Autonomous Region

2020/1/30	Interim Measures for the Prevention and Control of Pneumonia of New Coronavirus Infection in Wuhan City, Hubei Province
2020/2/7	Hubei Province Improves Wartime Command Mechanism and Implements Prevention and Control Measures
2020/2/11	Jilin Province "Several Measures on Further Supporting the Fight Against the Pneumonia Epidemic of New Coronavirus Infection"
2020/2/14	Inner Mongolia Autonomous Region New Coronavirus Infection Pneumonia Prevention and Control Command Notice
2020/2/16	Notice of the People's Government of Hubei Province on Further Strengthening the Prevention and Control of Epidemic Situation of New Coronary Pneumonia
2020/2/16	Notice of Hubei Provincial New Coronavirus Infectious Pneumonia Prevention and Control Headquarters on Strengthening Closed Management of Urban Communities
2020/2/17	Circular of the New Crown Pneumonia Epidemic Prevention and Control Headquarters of Wuhan City, Hubei Province on Strict Prevention and Control Measures of Epidemic Situation in Public Places
2020/2/18	Several measures of Tianjin to ensure and care for frontline medical staff in the prevention and control of new crown pneumonia
2020/2/19	Guidance issued by Guangdong Province
2020/2/19	Guangdong Province formulates a series of special medical insurance reimbursement policies
2020/2/20	Shaanxi Province implements district and hierarchical management for epidemic prevention and control

Table 3 Policies between COVID-19 and SARS

	Items	Issued Date	Days	Strategies/policies of COVID-19	Issued Date	Days	Strategies/policies of SARS	
Similarities	First case				2002/11/16			
	National level	2019/12/31	19	S1: Wuhan Municipal Health Commission notified the epidemic	2003/3/31	136	S1: Ministry of Health announced the first outbreak	
	Outbreak notification						S2: SARS listed in statutory infectious diseases of the Law of the People's Republic of China on Prevention and Control of Infectious Diseases	
	Related laws and regulations	2020/1/20	39	S2: The novel coronavirus pneumonia was included in the Class B infectious diseases stipulated in the Law of the People's Republic of China on the Prevention and Control of Infectious Diseases, and measures for prevention and control of Class A infectious diseases were adopted. Besides, novel coronavirus pneumonia was incorporated into the management of quarantine infectious diseases as stipulated in the Frontier Health and Quarantine Law of the People's Republic of China.	2003/4/13	149		
	Public health emergency	2020/1/20	39	S3: National public health emergencies nationwide	2003/5/9	175	S3: State Council announced implementation of "Emergency Regulations on Public Health Emergencies"	
	Laboratory Management Measures	2020/1/23	42	S4: Notice on Issuing Biosafety Guidelines of Laboratory for Novel Coronavirus (Version 2)	2003/5/12	178	S4: Administrative Measures for the Research Laboratory of Infectious Atypical Pneumonia Virus	
	Related Leader Adjustments	2020/2/13	63	S5: Ying Yong served as Secretary of the Hubei Provincial Party Committee and Wang Zhonglin served as Secretary of the Wuhan Municipal Party Committee	2003/4/20	156	S5: Wang Qishan was Acting Mayor of Beijing, Gao Qiang was Party Secretary of the Ministry of Health, and Wu Yi was Minister of Health	
	Social dimension	Outbreak report	2020/1/21	40	S6: Novel coronavirus pneumonia outbreak began to report daily	2003/4/20	156	S6: Daily SARS outbreak began to report
		Notice to Medical Staff	2020/1/23	42		2003/5/6	172	S7: "Injury Insurance Regulations" promulgated, and medical staff should be treated with occupational injury during the treatment of patients
		Ministry of Education Notice	2020/1/27	46	S7: Notice of Ministry of Human Resources and Social Security and Ministry of Finance and National Health Commission on the protection of medical staff and related staff infected with novel coronavirus pneumonia due to performance of their duties S8: Notice of the Ministry of Education on the postponement of the spring semester of 2020	2003/4/18	154	S8: Postponed postgraduate re-examination until the end of May, and all foreign students cannot leave school during May Day
	Disposal of patient's remains	2020/2/1	51	S9: Notice on Issuing Guidelines for the Disposal of Remains of Patients with Pneumonia Infected by Novel Coronavirus (Trial)	2003/4/26	162	S9: The Ministry of Civil Affairs and the Ministry of Health issued a joint notice: requiring the remains of patients who died of infectious atypical pneumonia to be cremated on the spot in time	
Differences				Strategies/policies of COVID-19				
National level		2020/1/21	40	D1: National Health Commission and relevant departments jointly prevent and control the epidemic of novel coronavirus pneumonia				
		2020/1/23	42	D2: Take the Wuhan closure				
		2020/1/30	49	D3: Urgent Notice of General Office of the State Council on Organizing the Resumption of Production and Scheduling of Key Material Production Enterprises for D11 Epidemic Prevention and Control				
Social dimension		2020/1/22	41	D4: Prevention and Control Protocol for Novel Coronavirus Pneumonia (Version 2)				
		2020/1/23	42	D5: Notice on Issuing Technical Guidelines of Prevention and Control for Novel Coronavirus Pneumonia (Version 1) in Medical Institutions				
		2020/1/27	46	D6: Notice of General Office of National Health Commission on Issuing the Guidelines for the Use of Common Medical Protective Products in the Prevention and Control of Pneumonia Infected by New Coronavirus (Trial)				
		2020/1/28	47	D7: Notice on prevention and control of epidemic situation of novel coronavirus infection in the elderly				
		2020/1/29	48	D8: Notice on Issuing Technical Guidelines for Disinfection Operation of Public Transport				
		2020/1/31	50	D9: Notice on Issuing Guidance for Protecting People at Different Risks of New Coronavirus Infection and Guidelines for Using Masks to Prevent Novel Coronavirus Pneumonia				

Community level	2020/1/31	50	D10: Notice on Issuing Guidelines for Health Protection of Novel Coronavirus Pneumonia in Public Places
	2020/2/2	52	D11: Notice on prevention and control of pneumonia in children and pregnant women with new coronavirus infection
	2020/2/8	58	D12: Notice on strengthening maternal disease treatment and safe midwifery during the prevention and control of novel coronavirus pneumonia
	2020/2/18	68	D13: Notice on Strengthening the Treatment and Management of Patients with Severe Mental Disorders during the Novel Coronavirus Pneumonia Outbreak
	2020/1/25	44	D14: Notice on strengthening community prevention and control of pneumonia outbreaks of novel coronavirus
	2020/2/15	65	D15: Notice regarding the guidelines for health prevention and protection in shopping malls and supermarkets during the epidemic of novel coronavirus Pneumonia.

Figures

Figure 1

Flow chats of search and data collection strategy

Figure 2

New cases and issued policies of COVID-19 and SARS by time