

# Clinical Characteristics of Non-Pneumonia COVID-19 Adults in Shanghai, China

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## Research

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# Abstract

**Background:** Since December 2019, coronavirus disease 2019 (COVID-19) rapidly spread throughout the whole world, data have been needed on the clinical characteristics of the affected patients.

**Objectives:** A total of 579 adult COVID-19 cases were enrolled in Shanghai from Jan 20 to Apr 15, 2020, in which 95 cases (16.41%) showed non-pneumonia on CT when confirmed. The characteristics of non-pneumonia cases have not been clearly described previously, and this might provide guidance to prevent and treatment of COVID-19.

**Method:** We retrospectively collected the patient clinical dataset including demography, epidemiology, clinical manifestation, laboratory test results, diagnostic classification, treatment and clinical outcomes.

**Results:** The average age of 95 COVID-19 cases was  $31.45 \pm 12.89$  years old and 95.79% of them were less than 60 years old. They had mild clinical symptoms and/or laboratory abnormalities. 20 of the 95 cases occurred mild pneumonia during hospitalization, accompanied with lower lymphocyte counts, in which 60% cases were complicated with underlying condition and 15% cases were over 60 years old. All cases were cured. 16 of the 95 cases were local residents with clear epidemiological history and long incubation time, and mainly discovered as fever and respiratory symptoms. Other 79 cases were overseas imported, some had initial symptoms of diarrhea, smell or taste disorders and so on. They were mainly found at port of entry.

**Conclusions:** Non-pneumonia COVID-19 predominantly occurred among young adults with mild clinical symptoms and possible long incubation time. The patients with underlying condition or at older age more likely developed mild pneumonia after diagnosis. Thereby, it is very important to pay attention to these patients and make reasonable diagnostic classification towards better prevention and treatment of COVID-19.

## Introduction

Novel coronavirus-2019 (2019-nCoV) was discovered among patients with unexplained viral pneumonia in Wuhan by the end of 2019, and was initially named as SARS-CoV-2 by Coronaviridae Study Group (CSG) of the International Committee on Taxonomy of Viruses (ICTV) on MAR 2th [1]. The global pandemic of 2019-nCoV was catastrophic, a total of 627 cases have been confirmed in Shanghai by April 15th 2020, in which 579 cases were adults, 95 cases had non-pneumonia CT imaging manifestations on admission. Although the patients with mild clinical symptoms and no evidences of pneumonia on imaging were classified mild type, according to the guidelines for the diagnosis and treatment of novel coronavirus (2019-nCoV) infection by the national health commission (Trial Version 5) (in Chinese). [2] on February 8, 2020, a lot of cases were still misdiagnosed in clinic, that may lead to delayed treatment, virus transmission, and increasing the difficulties in disease prevention. The clinical outcomes of these patients were not clear, so it is necessary to further define whether they will progress to severe type of COVID-19.

At present, the international epidemic situation tends to get better, it is of great significance to explore the characteristics of mild type patients to better guide physicians in the treatment of patients and implementation of international prevention.

## Patients And Methods

This was a retrospective study. Patients were confirmed COVID-19 positive by nucleic acid tests of pharyngeal swab samples. A total of 579 adult COVID-19 cases were enrolled in Shanghai Public Health Clinical Center from Jan 20 to Apr 15, 2020 and included in this study.

## Statistical analysis

Statistical description and analysis were carried out according to the collected data. The relative number was presented as the constituent ratio.

## Results

### Patient characteristics

On the day of admission, 95 cases ( $95/579 = 16.41\%$ ) showed non-pneumonia on CT imaging, including 45 females (47.37%) and 50 males (52.63%). The age ranged from 18 to 64 years old (average  $31.45 \pm 12.89$  years old), including 91 patients (95.79%) less than 60 years old. The patients were discharged after virus nucleic acid test negative for 2 times at 24 hours interval, according to the COVID-19 pneumonia Diagnosis and Treatment Program (the seventh edition) [3].

### A. Epidemiologic Features

Among the 95 cases, 16 cases were local residents and had a clear epidemiological history. 8 (50%) cases came to Shanghai from Hubei, including 7 cases from Wuhan and 1 case from Xianning, Hubei province. Among the patients living outside Hubei, 4 (25%) cases had a history of contact with Hubei residents, 3 of whom had been to Wuhan. 4 non-Hubei residents (25%) had neither been to Hubei nor had contact with Hubei residents, but they had contacted with other confirmed patients. 12 (75%) cases were familial clusters. They all had no contact with wild animals. Among the patients of this group (see Table 1), 12 cases had the average incubation time of  $15.25 \pm 4.88$  days. 8 cases had over 14 days of incubation period, ranging from 15–23 days. All of them were familial clusters. Other 4 (25%) cases had no clear incubation period because of uncertain exposure history.

Table 1  
Comparison of local cases and overseas imported cases

	local cases	imported cases
Male	3	48
Female	13	31
Age	37.00 ± 12.75	30.90 ± 12.71*
WBC (10 <sup>9</sup> /L)	6.20 ± 1.70	5.81 ± 2.06
LYMPH(10 <sup>9</sup> /L)	1.96 ± 0.60	1.66 ± 0.65
CRP (mg/L)	0.94 ± 1.38	2.73 ± 9.05*
PCT (ng/ml)	0.04 ± 0.03	0.03 ± 0.04
ESR (mm/h)	23.63 ± 21.04	32.06 ± 30.99*
ALT (U/L)	20.88 ± 15.95	25.73 ± 21.60
AST (U/L)	20.63 ± 8.94	21.42 ± 9.78
Hospitalization days	16.44 ± 6.62	16.26 ± 5.54
* P < 0.05 compared with local cases group		
The normal range for WBC is 3.50 × 10 <sup>9</sup> /L to 9.50 × 10 <sup>9</sup> /L; the normal range for LYMPH is 1.10 × 10 <sup>9</sup> /L to 3.20 × 10 <sup>9</sup> /L; the normal range for CRP is 0 to 10.00 mg/L; the normal range for PCT is 0 to 0.05 ng/ml; the normal range for ESR is 0 to 15 mm/h; the normal range for ALT is 9.00 to 50.00 U/L; the normal range for AST is 15.00 to 40.00 U/L.		

79 cases came from overseas, 11.4% of them had contact history, 52.8% of them had history residing in the epidemic areas, and 36.6% of them had no clear contact history or living in the epidemic areas.

## B. Underlying Condition

In the local cases, 4 (25%) cases had clear underlying condition, including 1 case of hashimoto thyroiditis, 1 case of hypertension and diabetes with a history of percutaneous coronary intervention, 1 case of diabetes with right breast intraductal tumor, and 1 case of chronic renal failure with hypertension.

In the overseas imported cases, 10 (12.66%) cases had clear underlying condition, including 3 cases (3.8%) of hypertension, 1 case (1.27%) of diabetes, 4 cases (5.06%) of asthma, 2 cases of hepatitis.

## C. Clinical Manifestations

In the 16 local cases, 8(50%) cases were manifested with fever, accompanied by cough, headache, fatigue, and nasal congestion in 1 case each. All of them visited the fever center of major hospitals for

treatment. They were suspected for COVID-19 infection according to guidelines of the Diagnosis and Treatment of Novel Coronavirus (2019-nCoV) Infection by the National Health Commission [3] and confirmed positive later on by nucleic acid test. 6 (37.5%) cases began with cough. All of the cases were familial clusters. Thus, all of their family members were isolated and observed as close contacts after first family member was diagnosed. 2 cases were asymptomatic when they initially visited clinic due to close contact with the confirmed cases of their family member.

In the 79 overseas imported cases group, 16 cases were asymptomatic, 23 cases began with fever, 24 cases began with respiratory symptom (cough, phlegm, nasal obstruction, running nose and chest pain), 9 cases began with digestive symptom (diarrhea, abdominal pain, nausea, vomiting, inappetence), 6 cases began with neurological symptoms (dysosmia, dysgeusia, headache), and 1 case began with muscular soreness.

Compared with the local patients, the overseas imported patients had lower prevalence of fever and respiratory symptoms, but were more often manifested with non-respiratory symptoms, such as diarrhea, smell or taste disorders and headache during early stage of disease. (see Table 2).

Table 2  
Comparison of initial symptom between local cases and imported cases

Initial symptom	local cases	imported cases
asymptomatic	2 (12.5%)	16 (20.25%)
fever	8 (50%)	23 (29.11%)
respiratory symptom	6 (37.5%)	24 (30.38%)
digestive symptom	0	9 (11.39%)
neurological symptoms	0	6 (7.59%)
muscular soreness	0	1 (1.27%)

## Laboratory results

On the day of admission, the levels of platelets, creatine kinase levels and arterial blood gas were normal in all cases. Some cases had only slight laboratory abnormalities, in which 2 cases had increased leucocytes, 12 cases had lymphocytopenia, 4 cases had elevated alanine aminotransferase and aspartate aminotransferase, 2 cases had elevated D-dimer, 3 cases had increased CRP, and 42 cases had increased erythrocyte sedimentation rate.

There were comparable levels of laboratory tests between the local and overseas imported cases (see Table 1), except for CRP and ESR levels, in which statistically significant differences were observed, though the difference was minimal. However, CRP was in the normal range.

# Radiological data

On the day of admission, there were no pneumonia among 95 cases after chest CT examination. 67 (70.53%) cases showed no abnormality. 14 (14.74%) cases showed pulmonary nodules. 10 (10.53%) cases had obsolete lung lesions and 4 (4.21%) cases had emphysema and bullae with obsolete lung lesions.

## Inpatient changes and Clinical outcomes

All cases were recovered after supportive treatment and discharged from hospital. The length of hospitalization was 6–36 days (average  $16.36 \pm 5.77$  days). There were no statistical differences in the average length of hospitalization between local cases and overseas imported cases (see Table 1). During the hospitalization, 75 cases (79%) never had pneumonia on chest CT re-examination, 2 cases (2.67%) had underlying condition, and 1 case (1.33%) was older than 60 years old. Other 20 cases had pneumonia on chest CT re-examination, 12 cases (60%) had underlying condition, and 3 cases (15%) were older than 60 years old (see Table 3). Compared with the patients without manifestation of pneumonia, the patients with pneumonia had statistically older age with the reduced number of lymphocytes and higher levels of CRP ( $P < 0.05$ ) (see Table 3). Among the 20 cases with pneumonia, 3 were local cases, they all had a history of underlying condition; 2 cases were older than 60 years old. 17 cases were overseas imported, in which 9 cases had a history of underlying condition, 1 case was older than 60 years old (see Table 4). 12 (60%) of total 20 cases had underlying condition and 3 (15%) cases were older than 60 years old. The cases who had developed pneumonia in at follow-up were significantly older and complicated with more underlying condition than the cases without pneumonia ( $P < 0.05$ , see Table 3). However, the clinical symptoms were very mild and arterial blood gas hypoxemia did not exist in the cases with pneumonia.

Table 3  
Comparison of patients with non-pneumonia and pneumonia during the course of disease

	<b>non-pneumonia in the course of disease (n = 75)</b>	<b>Pneumonia at follow-up (n = 20)</b>
Male	38	12
Female	37	8
Age	27.60 ± 10.05	34.40 ± 14.94*
WBC (10 <sup>9</sup> /L)	6.47 ± 1.73	5.09 ± 1.76
LYMPH(10 <sup>9</sup> /L)	1.94 ± 0.69	1.48 ± 0.50*
CRP (mg/L)	1.23 ± 3.86	3.29 ± 8.88*
PCT (ng/ml)	0.02 ± 0.01	0.03 ± 0.01
ESR (mm/h)	23.36 ± 24.38	29.15 ± 29.13
ALT (U/L)	19.52 ± 13.14	27.20 ± 19.41
AST (U/L)	18.39 ± 5.34	22.45 ± 7.07
Hospitalization days	15.96 ± 5.64	20.50 ± 6.24*
With underlying condition	2 (2.67%)	12 (60%) *
> 60 years old	1 (1.33)	3 (15%) *
* P < 0.05 compared with non-pneumonia in the course of disease		

Table 4  
Comparison of patients developed pneumonia at follow-up between local cases and imported cases

	<b>Imported cases developed pneumonia</b>	<b>Local cases developed pneumonia</b>
Numbers (n)	17	3
With underlying condition (% n)	9(52.94%)	3 (100%)
% all with underlying Condition in each group	90% (9/10)	75% (3/4)
> 60 years(% n)	1 (5.88%)	2 (66.67%)
% all > 60 years in each group	100% (1/1)	66.67% (2/3)

## Discussion

In this study, 95 adult cases were confirmed COVID-19 positive by nucleic acid test in Shanghai, but they had normal chest CT imaging at the early stage of the disease. The majority of these patients were young and middle-aged, had no underlying condition. They were obviously different from the severe cases, and majority of them were old and had underlying condition [4].

The COVID-19 patients with non-pneumonia or mild symptoms are moving sources of virus, and they were always difficult to be recognized. Without timely diagnosis and isolation of these patients, the virus will infect other close contacts and cause the spread of COVID-19. Because it is not clear whether these patients with mild syndromes will progress to severe type, early identification and management of the infected people with non-pneumonia are one of the important measures to prevent disease exacerbation and spread of COVID-19.

50% of local cases were admitted to the fever emergency department due to fever. Chest CT scans showed no pneumonia. However, all of the patients had clear epidemiological history. Combined with the results of routine blood tests, COVID-19 infection could not be excluded. The patients were immediately isolated in a single compartment and received nucleic acid test for SARS-CoV-2. It is a key to have a detailed and comprehensive epidemiological history for early identification of COVID-19 infected patients. After diagnosis, the close contacts of these patients were immediately screened for COVID-19 infection. In addition, the close contacts of family cluster should be isolated and observed after their family member was initially diagnosed. In this study, we found 2 asymptomatic patients who were infected with COVID-19. Therefore, it was highly recommended that high-risk close contacts should be screened for nucleic acid of SARS-CoV-2 to avoid delay and misdiagnosis.

There were limited number of local cases in this study. They had clear epidemiological history and 8 cases (50%) had incubation period of more than 14 days, quite different from the incubation period in large samples, as recently reported in China and other countries. The research group of Zhong Nanshan recently reported that 1099 cases had median incubation period of 4 days; 13 cases had over 14 days of median incubation period in China [5]. It was also pointed out that the disease incubation period was estimated in 291 cases by the research group of Zhong Nanshan, due to the uncertainty of exact infection date. A biased retrospective estimate may exist during evaluation. In addition, the patients who had recovered by symptom relief treatment or were in mild condition and treated at home may be missed out during early diagnosis and statistical analysis. Therefore, the subjects who had been exposed to these patients should be subject to rigorous epidemiological investigation.

Because there are high proportion of patients with incubation period over 14 days, that may cause potential difficulties in the prevention of COVID-19 spread. In addition, the COVID-19 infected patients with non-pneumonia, mild symptoms also become potential sources of virus spread. If the prevention and management are inappropriately exerted among these patients, widespread of the virus may occur. Due to a clear epidemiological history, the patients in this study were immediately isolated and observed and followed by nucleic acid test for SARS-CoV-2. They were admitted into hospital after the diagnosis was confirmed. The family members and other close contacts were also isolated and observed for a

certain period, so that transmission to others may be prevented. In this group, fever and respiratory symptoms were the main symptoms at early phase of the disease. Thus, we should be highly vigilant on the high-risk patients with such symptoms.

Among the imported cases, clear epidemiological history cannot be determined among some patients (36.6%), due to the difficulties in the investigation of infectious chain. However, since they were all inbound by flight, nucleic acid test was carried out in place by the center of disease prevention and control. Meanwhile, other flight passengers were isolated for observation to prevent further spread of COVID-19. Some patients with clinical symptoms during quarantine was diagnosed by virus nucleic acid test. In addition to fever and respiratory symptoms, non-respiratory symptoms are more frequent initial symptoms among these patients, mainly manifested as diarrhea, taste or smell disorders. Therefore, attention should be paid to the high-risk population with such symptoms.

With the increasing cases with the long incubation period [6] and reversed positive test of SARS-CoV-2 after discharged from hospital, it is necessary to continue the follow-up of their health status for 14 days, require them to wear masks, stay in a single compartment and avoid outdoor activities, according to the Guidelines for the Diagnosis and Treatment of Novel Coronavirus (2019-nCoV) Infection by the National Health Commission (the sixth edition) [7]. After these measures were taken, new local cases were not reported in Shanghai so far.

In local cases, 4 cases had underlying health condition and 3 of them had mild pneumonia during follow-up; 3 cases were older than 60 years old and 2 of them had pneumonia. In the overseas imported cases, 10 had underlying diseases and 9 of them had mild pneumonia during follow-up; one case was over 60 years old and had pneumonia during follow-up. It was widely reported that age and underlying health condition are major high risk factors in the severity of COVID-19 infected cases [8]. Based on our study, age was the highest risk factor in developing severe COVID-19 pneumonia, that was consistent with the previously reported results [9]. Our data also showed that young adult patients without underlying health condition always had mild respiratory symptoms without pneumonia during follow-up. People with underlying condition or the elderly are prone to gradually developing mild pneumonia. During clinical observation, we observed that the peak period was between 7th and 10th day after COVID-19 infection. Symptoms and imaging findings of these patients were often aggravated during the peak period, but 20 cases with pneumonia were under stable condition during hospitalization. They were recovered by supportive care and finally discharged from hospital. These characteristics showed that regardless of the local or overseas imported cases, the pathogenicity of COVID-19 was gradually decreased after multiple generations. More attention and care should be given to those patients with underlying condition and older patients. Because 20 of 95 cases developed pneumonia at the peak of disease, the number was limited and more sample size was required to better understand prognosis of the non-pneumonia patients.

It was noted that most of the local cases occurred before Mid-March and were initially manifested with fever and/or respiratory symptoms (87.5%); but majority of the overseas imported cases occurred after

Mid-March, and had symptoms of diarrhea, smell or taste disorder, headache, in addition to fever and respiratory symptoms at early phase. The results showed that virus from different areas had different pathogenic characteristics, though similar laboratory results were obtained among these cases. In addition, the similar duration of hospital stay, the exacerbation and recovery rate were quite comparable between the local and overseas imported patients, suggesting their similar disease severity. They are all treated with supportive care.

This disease was constantly renamed after the disease was recognized further. Initially, the disease was temporarily named by Chinese health commission as "pneumonia caused by new coronavirus infection " and renamed as "Novel coronavirus pneumonia " (NCP) on February 8, 2020 [10]. Due to the involvement of multiple system and organ after novel coronavirus infection, the diseases was formally named by WHO as Coronavirus Disease 2019 (COVID-19) on February 11, 2020 [11]. So far the most common type of COVID-19 is pneumonia. However, it is necessary to scientifically classify COVID-19 into different subtypes after COVID-19 was more well understood. The detailed classification of COVID-19 would provide patients with targeted treatment. For example, patients with bronchitis alone should be diagnosed as novel coronavirus bronchitis, and treated with cough relief pills and expectorant. The patients with only upper respiratory tract infection symptoms should be diagnosed as novel coronavirus cold, and advised for lower physical activities and rest. Those COVID-19 infected patients without symptoms and pneumonia by CT scan should be called as novel coronavirus asymptomatic carriers, and treatment is not recommended among these patients. Because multiple systems were probably involved after novel coronavirus infection, more study is required to define the characteristics, immunological mechanisms of the disease in the future.

In conclusion, there is high proportion of non-pneumonia young adult patients among COVID-19 adult patients. These young patients had mild clinical symptom and/or slight laboratory abnormalities. The most common symptoms were fever, headache, respiratory symptoms, diarrhea, lost/lower smell or taste. Some of them had prolonged incubation period and characteristics of familial cluster. During the follow-up, the patients with underlying condition or elderly were prone to developing mild pneumonia. It suggested that the pathogenicity of the virus maybe gradually reduced after multiple passages, but the virus is still highly infective and contagious to close contacts. All cases in this study were under stable health condition and quickly recovered after supportive treatment. Thus, the strict home isolation and symptomatic therapy for a certain time point was appropriate approach in non-pneumonia patients. But the patients with underlying condition and at older age should be closely monitored for at least 1 week after COVID-19 test positive. The patient should be hospitalized for supportive care if the health condition of patients was deteriorated. It is also important to clearly identify the different characteristics of local and overseas imported cases. Local residents should voluntarily report their health condition and potential COVID-19 exposure history to the local center of prevention and control. Those suspected cases and individuals coming from high-risk area via airline or other public transportation should be centrally isolated and under close observation. Following global epidemic tends to ease, it become more important to focusing on the hard-to-find patients without pneumonia and paying attention to their clinical characteristics. The targeted prevention of COVID-19 would greatly improve the quality of life, reduce

social and economic burden. We in this study reported the clinical characteristics of non-pneumonia COVID-19 adults in Shanghai, that would provide useful information for researchers and clinicians in this field.

## Abbreviations

ALT

alanine aminotransferase

AST

Aspartate aminotransferase

CRP

C-reactive protein

CSG

Coronaviridae Study Group

ESR

erythrocyte sedimentation rate

ICTV

International Committee on Taxonomy of Viruses

LYMPH

Lymphocyte

NCP

Novel coronavirus pneumonia

PCT

Procalcitonin

WBC

white blood cell

## Declarations

### **Ethical Approval and Consent to participate**

Ethical approval for this study was reviewed and approved by the Ethics Committee of Zhongshan Hospital, Fudan University (Shanghai, China).

### **Consent for publication**

Not applicable

### **Authors' contributions**

LZ and ZLJ conceived the study idea. LZ, LJH, HYJ and TL participated in the study design.

LJG and QJS gathered the data and performed the data analyses. All authors interpreted the data analyses. All authors co-wrote and revised the manuscript for intellectual content.

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### **Conflict of interest**

The authors declare no conflict of interest. All the authors listed have approved the manuscript.

### **Data Availability**

The data used to support the findings of this study are available from the corresponding author upon request.

## **References**

1. Gorbalenya A. Severe acute respiratory syndrome-related coronavirus – The species and its viruses, a statement of the Coronavirus Study Group, 2020.
2. Guidelines for the Diagnosis and Treatment of Novel Coronavirus. (2019-nCoV) Infection by the National Health Commission (Trial Version 5) (in Chinese). <http://www.nhc.gov.cn/yzygj/s7653p/202002/3b09b894ac9b4204a79db5b8912d4440.shtml>.
3. Guidelines for the Diagnosis and Treatment of Novel Coronavirus. (2019-nCoV) Infection by the National Health Commission (Trial Version 7) (in Chinese). <http://www.nhc.gov.cn/yzygj/s7653p/202003/46c9294a7dfe4cef80dc7f5912eb1989.shtml>.
4. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J,

- Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *LANCET*. 2020;395(10223):497–506.
5. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, Liu L, Shan H, Lei C, Hui DSC, Du B, Li L, Zeng G, Yuen K, Chen R, Tang C, Wang T, Chen P, Xiang J, Li S, Wang J, Liang Z, Peng Y, Wei L, Liu Y, Hu Y, Peng P, Wang J, Liu J, Chen Z, Li G, Zheng Z, Qiu S, Luo J, Ye C, Zhu S, Zhong N. Clinical Characteristics of Coronavirus Disease 2019 in China. *NEW ENGL J MED*. 2020;382(18):1708–20.
  6. Wang Y, Wang Y, Chen Y, Qin Q. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. *J MED VIROL* 2020.
  7. Guidelines for the Diagnosis and Treatment of Novel Coronavirus. (2019-nCoV) Infection by the National Health Commission (Version 6) (in Chinese). <http://www.nhc.gov.cn/yzygj/s7653p/202002/8334a8326dd94d329df351d7da8aefc2.shtml>.
  8. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Xia J, Yu T, Zhang X, Zhang L. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *LANCET*. 2020;395(10223):507–13.
  9. Wang Z, Yang B, Li Q, Wen L, Zhang R. Clinical Features of 69 Cases with Coronavirus Disease 2019 in Wuhan, China. *CLIN INFECT DIS* 2020.
  10. China National Health Commission. February 10, 2020 Notification of the national health commission on the provisional designation of new coronavirus pneumonia. 2020.<http://www.nhc.gov.cn/yzygj/s7653p/202002/18c1bb43965a4492907957875de02ae7.shtml>.
  11. WHO. WHO Director-General's remarks at the media briefing on 2019-nCoV. on 11 February 2020 <https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020>.