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Prediction on the number of confirmed Covid-19 with the FUDAN-CCDC mathematical model and its epidemiology, clinical manifestations, and prevention and treatment effects

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ABSTRACT

This study was to explore the development trend and clinical manifestations of COVID-19 better. The number of confirmed novel coronavirus pneumonia (COVID-19) was predicted based on the FUDAN-CCDC mathematical model (which was a new model namely based on the novel time delay dynamic model and the statistical data from Chinese Center for Disease Control (CCDC)). The epidemiology and clinical manifestations of COVID-19 were studied based on its clinical classification, and the prevention and treatment effects of antibacterial drugs on the COVID-19 were explored. Firstly, a FUDAN-CCDC mathematical model was established to predict the number of confirmed COVID-19 patients. Secondly, 500 COVID-19 patients with clear epidemiological history and confirmed by nucleic acid testing who were admitted to our Hospital from February 1, 2020 to May 1, 2020 were taken as research objects in this study. They were divided into 4 categories: mild cases, moderate cases, severe cases, and critical cases based on the standards given by the World Health Organization (WHO). The general data characteristics, epidemiological characteristics, clinical manifestations characteristics, laboratory indicator characteristics, and prevention and treatment effects of patients with COVID-19 were analyzed. The FUDAN-CCDC model predicted that the peak time of cumulative confirmed cases in Wuhan was from February 1 to February 5, the peak of cumulative confirmed cases was around 60,000, and the peak time of newly confirmed cases was from February 8 to February 11. Most of the patients with COVID-19 in critical cases were older, with an average age of 65.31 ± 8.26 years old; it was mainly imported case (94 cases, 18.8%) at the beginning, and was mainly local cases (406 cases, 81.2%) later. The initial symptoms were fever (447 cases, 89.4%) and cough (304 cases, 60.8%), and the patients in severe and critical cases were often accompanied by respiratory failure and other late symptoms. There were differences in laboratory tests, patients in critical cases had increased procalcitonin (PCT) and less lymphocytes (LYM). The treatment of COVID-19 was mainly moxifloxacin tablets or injections and cefoperazone sodium sulbactam sodium for injection, with significant efficacy, but the cure rate of patients in severe and critical cases was low, which was 83.1% and 68.4% respectively. FUDAN-CCDC could be applied for prediction of the COVID-19 trend. COVID-19 patients with different clinical classifications were different in clinical symptoms, laboratory tests and treatment options, and the cure rate of patients in severe and critical cases was low. This article was conductive to improving the prevention and treatment of COVID-19, so as to provide a theoretical reference.

Introduction

At the end of December 2019, a mass pneumonia case of unknown cause was found in Wuhan of China, and the pathogen has been confirmed to be a type B coronavirus. The International Committee on Taxonomy of Viruses (ICTV) named it as SARS-CoV-2 [1]. At present, the novel coronavirus pneumonia (COVID-19) caused by it has spread in China and even the world. Accurate simulation and effective prediction on the development trend of the new crown epidemic with scientific mathematical models is of great significance to the prevention and control of the epidemic. In infectious disease models, dynamic ordinary differential equations can usually be established through the
communication mechanism of mutual transfer between populations to describe the development of the epidemic. Common models are the warehouse model, including Susceptible, Infectious, and Recovered (SIR) model and Susceptible, Exposed, Infectious, and Recovered (SEIR) model. Although more in-depth mathematical models have been used for infection model analysis, in practical applications, establishment of the model and the selection of variables are still challenging. The Cheng Jin Team of Fudan University has paid attention to the progress of COVID-19 since the outbreak and established a new time lag dynamics model (TDD-NCP), which clearly considered the time lag effect of the incubation period on the spread, so it was ideal for fitting and prediction of the actual data [2]. On this basis, this study combined the statistical data of the China Center for Disease Control and Prevention (CCDC) to give the time interval graphs of each stage in the transmission chain, and tried to integrate the empirical distribution and random dynamic behavior data in the CCDC into the TDD-NCP model, and then propose a stochastic time-delay dynamic model (FUDAN-CCDC model) based on CCDC statistical data. In addition, its application in the basic reproduction number of COVID-19 was estimated (Table 1).

In addition, the transmission mode of COVID-19 is mainly inhalation of infectious aerosol [3], the incubation period is about 3–14 days, and the early symptoms are mainly fever, cough, fatigue, myalgia, dyspnea, with or without diarrhea [4], so it is not easy to distinguish from ordinary flu. In addition, some patients have only moderate to low fever or no obvious fever symptoms, lacking of obvious specific clinical manifestations, which increases the difficulty of clinical diagnosis and accelerates the speed of virus transmission. It is also highly infectious during the incubation period [5], therefore, fast and accurate diagnosing the patients with SARS-CoV-2 infection is essential to timely contain the spread of the virus. After the occurrence of COVID-19, Chinese scientists quickly collected clinical samples of patients and extracted viral RNA for high-throughput sequencing. The team of professor Zhang Y. Z. of Fudan University took the lead in completing the first SARS-CoV-2 genome sequencing work on January 10, 2020, and shared and uploaded the resulting sequence to the public platform (virological.org website and GenBank) as soon as possible [6], which provided a basis for foreign scientists to study the SARS-CoV-2 virus genome. Due to timely and decisive measures such as stopping public transportation and other control strategies, treatment strategies, and changing people’s behavior (wearing masks, reducing person-to-person gathering) as well as other epidemic prevention measures, the newly confirmed cases and suspected cases were reduced <200 cases after March 1, 2020. Thus, it can be concluded that the key to the prevention and control measures of COVID-19 is early diagnosis, early treatment, and early isolation.

However, the spread of SARS-CoV-2 virus-infected pneumonia has not yet been cured, and continues to spread globally. Understanding the epidemiological characteristics, clinical manifestations, and prevention and treatment effects of COVID-19 is critical to its diagnosis, treatment, and prognosis. Firstly, the FUDAN-CCDC model was applied to model the COVID-19 and predict the number of confirmed cases. Secondly, the data of 500 COVID-19 cases in our hospital were collected so as to grasp the incidence trend, susceptibility characteristics, and efficacy of COVID-19 through statistical analysis of the epidemiological characteristics, clinical manifestations, imaging characteristics, and prevention and treatment effects of these cases, thereby providing a guide for its clinical diagnosis and treatment.

### Table 1

| $a_1$   | $a_2$   | Growth rate $r$ | $R_0$ |
|---------|---------|-----------------|-------|
| 0.0576  | 0.5031  | 0.3094          | 3.3191|

#### Materials and methods

**Establishment of FUDAN-CCDC model and estimation of main parameters**

The research objects were the confirmed, infected, quarantined, recovered and dead patients in Wuhan. The following symbols were adopted to represent the number of people in each category: $J(t)$ represented the cumulative total number of people confirmed or hospitalized at time $t$; $I(t)$ represented the cumulative total number of infected people at time $t$; $G(t)$ represented the total number of infected, unconfirmed, and quarantined people at time $t$; $R(t)$ referred to the cumulative total number of recovered people at time $t$. Aiming at the uncertainty of the choice of kernel function in the TDD-NCP model, the empirical distribution and stochastic dynamic behavior data in the CCDC were incorporated into the TDD-NCP model. In addition, the growth rate $r = (r - \beta)$ and $I_0 (t) = -J(t) - G(t)$ were introduced, and it was assumed that the interval time distribution of transitions among the states was $f_2(t)$, $f_3(t)$, and $f_4(t)$. $f_2(t)$ represented the interval time distribution from infection to onset, which was assumed to be a lognormal distribution of undetermined expectation and variance. $f_3(t)$ represented the interval time distribution from onset to confirmation or hospitalization, which was assumed as the Weibull distribution of undetermined proportions and shape parameters. $f_4(t)$ represented the interval time distribution from infection to confirmation or hospitalization, which can be obtained by the convolution operation of $f_2(t)$ and $f_3(t)$. The model could be established with follows equations:

$$\frac{dJ}{dt} = r \int_0^t f_2(t-s)I_0(s)ds$$

$$\frac{dI}{dt} = \beta(t) \int_0^t f_2(t-s)I_0(s)ds - \theta(t) \int_0^t f_3(t-s)I_0(s)ds$$

$$\frac{dG}{dt} = \theta(t) \int_0^t f_3(t-s)I_0(s)ds - \gamma(t) \int_0^t f_4(t-s)I_0(s)ds$$

This model took into account the difference of isolation rate $\delta$ in different regions at different times, so the segmentation strategy of the following Eq. (4) was adopted:

$$\delta = \begin{cases} a_1, & t < t_0 \\ a_2, & \text{otherwise} \end{cases}$$

The published cumulative number of infections $J_{\text{cum}}$ was adopted to solve the least squares, and its equation was as below.

$$\min_{\beta, a_1, a_2, t_0} \int (\beta, a_1, a_2, t_0 - J_{\text{cum}})$$

In the above equation, $\beta$ represented the infection rate, which referred to the average number of people infected per unit time per infected person. It was assumed that both the confirmed and quarantined people were not infectious. In this way, the growth rate $r$, the quarantine rate $\gamma$, and onset date $t_0$ were obtained. At this time, the basic reproduction number $R_0$ of COVID-19 could be estimated, which referred to the number of people who could be infected by an average patient without any intervention. It was a vital indicator in epidemiological analysis, which could be described. The uncontrolled internal transmission of an infectious disease could also be undertaken as a reference for public health policy. In this study, the basic regeneration number was defined with Eq. (6) below:

$$R_0 = 1 + rT_e$$

In the above equation, $T_e$ was the average time interval, which could be obtained as $T_e = 7.5$ by distribution fitting of image.

#### Research objects

The retrospective study was used. 500 COVID-19 patients with clear
epidemiological history and confirmed by nucleic acid testing admitted to our hospital from February 1, 2020 to May 1, 2020 were collected, including 278 males and 222 females with male: female = 1.25:1 and age range of 17–85 years old. According to the “Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7)” published by the WHO on March 3 [7], all case data were re-screened to exclude the cases that did not meet the diagnostic criteria. Thus, all cases after the rescreening could meet the diagnosis standards given by the WHO. All enrolled patients had signed the informed consents, and the study complied with the standards of Ethics Committee of the hospital.

Biochemical monitoring indicators and clinical classification

Epidemiological observations
The person travelled or lived in Wuhan and surrounding areas of Wuhan or other communities with confirmed cases within 14 days prior to the onset of illness; contacted with COVID-19 patients with positive nucleic acid test within 14 days prior to onset of illness, or contacted with the patient with fever or respiratory symptoms from Wuhan and surrounding areas of Wuhan.

Observation indicators
The clinical data of patients were collected, including name, gender, age, height, weight, epidemiological history, past medical history, blood routine, myocardial enzymes, liver function, D-dimer, treatment plan, hospital stays and so on.

Clinical stage
According to the clinical stage in the “Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7)” published by the WHO, all cases were divided into 4 stages: mild cases, moderate cases, severe cases, and critical cases. The staging criteria were as follows:

- Mild cases: mild clinical symptoms and no abnormalities in pneumonia on imaging.
- Moderate cases: fever and respiratory symptoms, radiological manifestations of pneumonia.
- Severe cases: any of the following symptoms: respiratory distress (RR ≥ 30 times/min); resting oxygen saturation < 93%; oxygen arterial partial pressure (PaO2)/oxygen concentration (FiO2) ≤ 300 mmHg (1 mmHg = 0.133 kPa).
- Critical cases: any of the following symptoms: respiratory failure and requiring mechanical ventilation; shock; other organ failure and requiring intensive care.

The research plan of this study was shown in Fig. 1:

![Fig. 1. Research plan.](image)

Results
Epidemic development and forecast
The FUDAN-CCDC model was adopted to solve numerically, so that the COVID-19 trend prediction and the daily new epidemic trend prediction in Wuhan can be obtained. Figs. 2–4 illustrated that the peak time of cumulative confirmed cases in Wuhan was approximately from February 1 to February 1. On February 5, the peak of cumulative confirmed cases was around 60,000, and the peak of newly confirmed cases was around February 8 to February 11. Later, the number of newly confirmed patients decreased and the number of infected patients stabilized as the number of people in quarantine gradually decreased.

Statistical analysis
All data were analyzed by SPSS 22.0 software. The measurement data was expressed by the mean value ± standard deviation. The t test was used for comparison between two groups, the single factor analysis of variance was used for comparison between multiple groups, and the LSD multiple comparison was used. The count data was expressed by percentage (%), and comparison between groups was by χ² test. P < 0.05 indicated that the difference was significant and statistically significant.

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General data

The age, gender, height, weight, and the history of basic medical records of all patients were collected, and the statistics was made based on the clinical stage of mild cases, moderate cases, severe cases, and critical cases. The results were shown in Table 2.

In all cases, there were 278 males (55.6%) and 222 females (44.4%). The age of patients in mild cases was 17–53 years old with the average age of 31.66 ± 11.85 years old; the age of patients in moderate cases was 18–64 years old with the average age of 50.46 ± 18.09 years old; the age of patients in severe cases was 22–76 years old with the average age of 57.24 ± 16.82 years old; and the age of patients in critical cases was 43–85 years old with the average age of 65.31 ± 8.26 years old. The average age of patients in critical cases was significantly higher than that in the mild and moderate cases, and the difference between various cases was significant and had the statistical significance (P < 0.01). The average BMI of all cases was 22.3 ± 3.64, and there was no significant difference among the various cases (P > 0.05). 96.8% of patients had basic diseases in the critical cases, which were significantly higher than that in the mild (33.6%) and moderate (43.4%) cases. The specific

Table 2
Comparison on general data of each clinical stage.

| Indicator               | Mild cases (n = 137) | Moderate cases (n = 228) | Severe cases (n = 104) | Critical cases (n = 31) | P value |
|-------------------------|----------------------|--------------------------|------------------------|-------------------------|---------|
| Age (years old)         | 31.66 ± 11.85        | 50.46 ± 18.09            | 57.24 ± 16.82          | 65.31 ± 8.26            | < 0.01**|
| Gender (male)           | 72 (52.6%)           | 133 (58.3%)              | 49 (47.1%)             | 24 (77.4%)              | 0.171   |
| Body mass index (BMI) (kg m⁻²) | 21.92 ± 4.37        | 23.04 ± 3.25             | 22.74 ± 3.09           | 21.26 ± 4.04            | 0.526   |
| With basic disease      | 46 (33.6%)           | 99 (43.4%)               | 78 (75.0%)             | 30 (96.8%)              | < 0.01**|

Note: the basic diseases mainly included hypertension, diabetes, coronary heart disease, cerebral infarction, polycystic ovary syndrome, hyperthyroidism, and chronic gastritis, etc.

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information was given in Table 2 and Fig. 5.

Epidemiological characteristics

Of the 500 patients, 94 were imported cases (18.8%), and 406 were local cases (81.2%). Among the imported cases, there were 25 patients in mild cases (18.2%), 69 patients in moderate cases (30.3%), and no patient in severe cases and critical cases. Among the local cases, there were 112 patients in mild cases (81.8%), 159 patients in moderate cases (69.7%), 104 patients in severe cases (100%), and 31 patients in critical cases (100%), as shown in Table 3.

As shown in below Fig. 6, the average time from return to onset of all imported cases (94 cases) was 4.88 ± 3.32 days, with the median of 5d and the time range of 2d-9d. The average time from exposure to onset of all local continuation cases (406 cases) was 4.83 ± 3.09 days, with a median of 5d and a time range of 1d-11d. Among them, patients in the critical cases (31 cases) had a shorter time from exposure to onset, with the average time of 3.57 ± 3.02 days, the median of 3d, and the time range of 1d-8d.

In all imported cases (94 cases), the average time from the initial symptom to hospitalization was 4.92 ± 3.36 days, with a median of 5d and a time range of 1d-10d. The average time from the initial symptom to hospitalization of all local continuation cases (406 cases) was 3.48 ± 2.95 days, with a median of 3d and a time range of 1d-5d. Among them, patients in the critical cases (31 cases) had a short time from the initial symptom to hospitalization, with the average time of 3.30 ± 2.81 days, the median of 3d, and the time range of 1d-3d.

Clinical manifestations characteristics

As shown in Table 4, the common initial symptom was fever, 116 cases (84.7%) in mild cases, 207 cases (90.8%) in moderate cases, 99 cases (95.2%) in severe cases and 25 cases (80.6%) in critical cases. There was no significant difference among patients in various clinical stages. Cough and myalgia percentage in moderate and severe cases were significantly higher than those in mild and severe cases (P < 0.05). The symptoms of dry and sore throat in moderate and severe cases were significantly lower than those in mild and moderate cases (P < 0.05). The diarrhea, shortness of breath, dyspnea, acute respiratory distress syndrome (ARDS), shock and other serious illnesses in severe and critical cases were significantly higher than those in the mild and moderate cases (P < 0.05).

Comparison on laboratory indicators

The laboratory test indicators of 500 cases were collected, including: PCT, C-reactive protein (CRP), white blood cells (WBC), LYM, albumin (ALB), alanine aminotransferase (ALT), aspartate aminotransferase...
Comparison on laboratory indicators of patients in each clinical stage.

Table 5

| Clinical manifestation | Mild cases (n = 137) | Moderate cases (n = 228) | Severe cases (n = 104) | Critical cases (n = 31) | P value |
|------------------------|----------------------|-------------------------|------------------------|------------------------|---------|
| WBC (×10^9/L)          | 7.3 ± 5.8            | 8.7 ± 8.0               | 11.9 ± 9.2             | 21.3 ± 13.8            | <0.01** |
| CRP (mg/L)             | 0.8 ± 0.6            | 1.2 ± 1.2               | 2.5 ± 1.9              | 7.6 ± 4.3              | <0.01** |
| ALB (g/L)              | 45.8 ± 1.7           | 47.9 ± 2.9              | 50.6 ± 3.8             | 55.2 ± 4.6             | <0.01** |
| ALT (U/L)              | 35 ± 35              | 40 ± 40                 | 55 ± 55                | 60 ± 60                | <0.01** |
| AST (U/L)              | 15 ± 15              | 20 ± 20                 | 25 ± 25                | 30 ± 30                | <0.01** |
| LDH (U/L)              | 145 ± 16             | 160 ± 18                | 200 ± 20               | 250 ± 25               | <0.01** |
| CK (U/L)               | 40 ± 40              | 50 ± 50                 | 60 ± 60                | 70 ± 70                | <0.01** |
| CR (mmol/L)            | 89 ± 89              | 92 ± 92                 | 95 ± 95                | 100 ± 100              | <0.01** |
| D-dimer (mg/L)         | 0.5 ± 0.5            | 0.6 ± 0.6               | 0.7 ± 0.7              | 0.8 ± 0.8              | <0.01** |

Note: PCT: procalcitonin; CRP: C-reactive protein; WBC: white blood cells; ALB: albumin; ALT: alanine aminotransferase; AST: aspartate aminotransferase; LDH: lactate dehydrogenase; CK: creatine kinase; CRE: creatinine.

Fig. 7. Comparison on laboratory indicators of patients in each clinical stage.
Table 6
Comparison on the prevention and treatment effects of patients in each clinical stage.

| Clinical stage     | Treatment plan                                                                 | Cases (n) | Course of treatment (d) | Cure rate (%) |
|--------------------|--------------------------------------------------------------------------------|-----------|--------------------------|---------------|
| Mild cases (n = 137) | 0.4 g of moxifloxacin tablet, oral, once a day                                 | 55        | 9 (2-28)                 | 100           |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once a day                   | 29        | 8 (2-15)                 | 100           |
|                    | 0.5 g of azithromycin tablet, oral, once a day                                 | 18        | 11 (3-21)                | 93.3          |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once a day + 3.0 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h | 15        | 10 (3-18)                | 100           |
|                    | 3.0 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h | 7         | 7 (7)                    | 100           |
| Moderate cases (n = 228) | 0.4 g of moxifloxacin tablet, oral, once a day                               | 57        | 15 (5-21)                | 100           |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once a day                   | 79        | 14 (7-21)                | 92.4          |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once a day + 3.0 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h | 41        | 18 (7-25)                | 97.5          |
|                    | 3.0 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h | 43        | 10 (5-18)                | 100           |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once every 8 h + 0.5 g of azithromycin tablet, oral, once a day | 5         | 7 (4-14)                 | 100           |
| Severe cases (n = 104)   | 0.4 g of moxifloxacin tablet, oral, once a day                                 | 4         | 18 (18)                  | 75            |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once a day + 3.0 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h | 25        | 15 (10-21)               | 76            |
|                    | 3.0 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h + 0.5 g of azithromycin tablet, oral, once a day | 39        | 11 (7-18)                | 89.7          |
|                    | 0.4 g of moxifloxacin injection, intravenous drop, once every 8 h + 0.6 g of cefoperazone sodium and sulbactam sodium for injection, intravenous drop, once every 8 h | 43        | 13 (11-15)               | 93            |

Table 6 (continued)

| Clinical stage     | Treatment plan                                                                 | Cases (n) | Course of treatment (d) | Cure rate (%) |
|--------------------|--------------------------------------------------------------------------------|-----------|--------------------------|---------------|
| Critical cases (n = 31) | linezolid glucose injection, intravenous drop, once every 12 h               | 19        | 13 (13)                  | 68.4          |
|                    | 0.5 g of Meropenem for injection, intravenous drop, once every 6 h + 0.6 g of linezolid glucose injection, intravenous drop, once every 12 h | 11        | 9 (7-14)                 | 81.8          |
|                    | 0.6 g of carpofennet for injection 0.05 g, intravenous drop, once every 12 h | 14         | 10 (9-12)                | 100           |

Fig. 8. Comparison on the average course of treatment and cure rate of patients in each clinical stage.

The average cure rate of all cases was 87%, including 98.88% in mild cases, 97.98% in moderate cases, 83.1% in severe cases, and 68.4% in critical cases.

Discussion
The FUDAN-CCDC model was adopted to predict the trend of COVID-19 for newly increased cases a day in Wuhan. The results showed that the peak time of cumulative confirmed cases in Wuhan was approximately from February 1 to February 5, the peak of cumulative confirmed cases was 60,000, and the peak of newly confirmed cases was from February 8 to February 11, which was basically consistent with the trend of the epidemic in Wuhan. Epidemiological results showed that among the 500 patients, there were 94 imported cases (18.8%) and 406 local cases (81.2%), which was consistent with previous reports [10]. The imported cases mainly came from people returning from Wuhan and surrounding areas and returning from abroad. It could be seen that there was no significant difference in the time of onset between imported cases and local cases, but there was a significant difference in the time from the initial symptom to hospitalization, and that of the local cases was shorter. The patients in critical cases had a shorter time from exposure to onset and from the initial symptom to hospitalization, indicating that they had rapid onset, so they could be admitted to the hospital quickly, which was consistent with the report by Liu et al.
The initial symptoms of COVID-19 are fever and cough, which are the same as the previous report [12]. The currently diagnostic measures for COVID-19 are mainly based on real-time fluorescent quantitative (RT-PCR) technology for nucleic acid detection of COVID-19 by oropharyngeal secretion of the patients. The PCT value of patients in the severe and critical cases was significantly higher than that in the mild and moderate cases in this study, suggesting that it may lead to multiple organ failure after the SARS-CoV-2 virus infection, which was consistent with previous reports [13]. Chang et al. (2020) found that the lymphocyte count of patient with COVID-19 in mild cases was normal, while 63% – 70% of patients in severe cases showed decreased lymphocyte count, which was consistent with this study [14].

The Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7) given by the WHO pointed out that the treatment of COVID-19 is mainly composed by antiviral treatment, nutritional support, and circulation and organ function support in critical cases. The most frequently used antibacterial drug in this study was moxifloxacin tablet or injection, followed by cefoperazone sodium and sulbactam sodium for injection. The median course of treatment was 9 d (1d-30d), and the average cure rate was 87%, which was the same as previous treatment plan for COVID-19 [15]. However, some domestic scientists have found that certain important prescriptions (such as Xuanfei Huazhuo Recipe) and Chinese patent medicines (such as Lianhua Qingwen Capsule) have significant efficacy on COVID-19 [16], which has to be verified with further clinical experiments.

Conclusion

In summary, the COVID-19 was strongly transmissible, so infection prevention was particularly important for the prevention and control of the epidemic. Moreover, there were various clinical symptoms for COVID-19, but it lacked specific symptoms and was difficult to distinguish from ordinary influenza. Biochemical indicators changed greatly, especially for severe and critically ill patients. Clinical diagnosis and treatment were difficult. In addition, older age and underlying diseases increased the difficulty of treatment. At present, COVID-19 patients are mainly treated by combining with multiple antibiotics medication and nutritional support, which has a significant effect in clinical treatment.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Further reading

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