Health-seeking behavior of patients with COVID-19 infection

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Abstract

Background: Corona Virus Disease 2019 (COVID-19) emerged across the world, and the disease course can be affected by health-seeking behavior of patients. This study aimed to explore the influence of the health-seeking behavior of patients with COVID-19 on disease process.

Methods: A retrospective study was conducted to analyze the health-seeking behavior of discharged patients with COVID-19 infection. Patients were categorized into three groups based on the times of visiting hospital, and the Mann-Whitney U and the Chi-square test were used to compare the difference.

Results: 138 discharged patients infected with COVID-19 were enrolled in our study as of Feb 20th, 2020. 68(49.3%) patients were male, with the median age of 40 years old. There were significant difference in contact history of being to Wuhan in last 14 days (**A**=6.799, P=0.033), contacting with confirmed case in last 14 days (**b**=9.321, P=0.009) and the type of hospital first visited (**s**=29.317, P<0.001).The health-seeking behavior can significantly affect the duration between the first hospital visit and confirmed diagnosis (**t**=6.445, P=0.002), symptoms onset and confirmed diagnosis (**r**=4.591, P=0.012), as well as symptoms onset and hospitalization (**a**=4.404, P=0.014). As the epidemic developed, the time interval from symptom onset to first hospital visit had been decreased gradually from Jan 12 to Feb 15.

Conclusions: Health-seeking behavior of patients were different as the epidemic developed and the strategies taken by government. It's necessary to improve epidemic acknowledge and awareness of citizens to contain the outbreak.

Background

COVID-19 emerged across the world since Dec, 2019[1]. So far, it has been more than 2 months since the outbreak, many patients have been discharged from the hospitals. According to the World Health Organization (WHO) report, as of March 11, 2020, 80955 accumulated confirmed cases of COVID-19 have been detected in mainland of China [2], with an estimated discharge rate of more than 50% [3]. Same as other respiratory infectious disease, COVID-19 can spread by human-to-human transmission via droplets or direct contact [4].

Currently, without specific drugs, infection prevention and control (IPC) is a major measure for COVID-19[2], and health-seeking behavior of patients at the early stage of disease is one of the important links of IPC.

Health-seeking behavior involves performance and actions of seeking medical help for people who is under potential risk of illness or have symptoms of disease [6]. For infectious disease like COVID-19, early diagnosis and treatment without any delay is important and necessary, otherwise, not only does the patient act as reservoir, increase the risk of infection transmission and spread of the disease significantly [7], but also its disease course and efficacy are affected. With the development of COVID-19 epidemic, a series of measures have been taken to ensure the timely diagnosis and treatment and to control the

spread of the disease in China. And the government reported the progress of the epidemic and popularized science through various media to raise residents' awareness of prevention and consultation. But early in the outbreak of COVID-19, in the absence of relevant research and medical evidence, the patients usually treated COVID-19 as common cold when they have symptoms such as fever or cough, which contributed to the delay of diagnosis and treatment, and in turn affected the course of the disease and prolonged the treatment time.

Up to now, existing researches mainly focused on the epidemiology and clinical characteristics of patients in more than 200 publications about COVID-19 in Chinese and English language [8-10]. As of March 12, no research has been conducted about health-seeking behavior of patients with COVID-19. Therefore, in this study, we used the full medical treatment process data of discharged patients with COVID-19 in Beijing, to analyze the influence of the health-seeking behavior on disease process.

Methods

Study design and population

This is a retrospective study. We enrolled patients with COVID-19 who were transferred to designated hospitals by Emergency Medical Service (EMS) and discharged as of Feb 20. According to the New coronavirus pneumonia diagnosis and treatment program (7th ed.) published by the National Health Commission of the People's Republic of China[11], only laboratory-confirmed COVID-19 infection was enrolled in this study, laboratory confirmation of COVID-19 was detected in the first admission hospital and verified by the local Center for Disease Control and Prevention (CDC). The criteria of discharge followed absence of fever for at least

3 days, substantial improvement in both lungs in chest CT, clinical remission of respiratory symptoms, and two throat-swab samples negative for SARS-CoV-2 RNA obtained at least 24h apart data collection [12].

The epidemiological and health-seeking data were obtained from medical record. The information of age, gender, contact history, residents et al were included. The data of health-seeking including dates of symptom onset, each hospital visit, confirmed diagnosis and discharge. The first visit time was defined as the first time to visit hospital after patients had the COVID-19 related symptoms. When a patient visited the same hospital multiple times, it counted as multiple visits, but only one hospital. The missing data needed from the transferred records were obtained by directly communicating with EMS and hospital providers. We divided patients into three groups based on the times of hospital visiting, and compared the difference.

The study was approved by Ethics Committee of Beijing Emergency Medical Center (No.2020-01) and the written informed consent was waived.

Statistical analysis

All data were checked by double entry. Continuous variables were expressed as the means and standard deviations, while the categorical variables were presented as percentages in each category. The Mann-Whitney U and the Chi-square test were used to determine differences between patients with different times of visit. All statistical analysis were performed with SPSS software version 22.0.

Results

By Feb 20, 2020, there were 138 discharged patients infected with COVID-19 enrolled in our study, 68 (49.3%) patients were male, with the median age of 40 years old. 106 (76.8%) patients were Beijing residents, while 94 (68.1%) patients were cluster cases. 127 (92.0%) patients were mild, 111 (80.4%) had fever, while 63 (45.7%) patients had cough. There were significant difference in contact history of being to Wuhan in 14 days (=6.799, P=0.033), and contact with confirmed case in 14 days (=9.321, P=0.009).

In terms of health-seeking behavior, the mean transferred times by EMS is 1.3±0.5, while the mean times of visited hospitals and the mean number of hospitals were 2.1±0.6 days, and 2.1±0.5 days. There were 9 (6.5%) patients, 107 (77.5%) patients, 18 (13.0%) patients, 3 (2.2%) patients, and 1 (0.7%) patients visited hospital one to five times respectively. All patients who visited the hospital twice were transferred from general hospital to the designated hospital by EMS for special treatment after diagnosis was confirmed. 12 patients who visited hospital three times received different levels of treatment in different designated hospitals due to changes in their condition, while the other six visited hospital twice by themselves and then were transferred to designated hospital by EMS after diagnosis. For patients who visited hospital more than three times, only 2 of them transferred to designated hospitals for special treatment after visited hospital three times by themselves. We merged patients who visited hospital more than twice for analysis. Turns that there were significant differences about the type of first visited hospital between the three groups (=29.317, P<0.001) ,with patients who visited hospital more than three times had the most proportion (20, 90.9%) of general hospital at their first time (Table 1).

The mean time from symptoms onset to discharge prolonged with the number of visited hospital from one to five times basically, which were 21.1 days, 19.3 days, 20.8 days, 24.3 days, and 27.0 days (Figure 1). There were significant differences in three time periods: symptoms onset to laboratory confirmation (=4.591, P=0.012), symptoms onset to hospital admission (=4.404, P=0.014), and first hospital visit to laboratory confirmation (=6.445, P=0.002), while the patients who visited hospital for more than three times all had the longest internal (Table 1).

The mean length of stay in hospital was 16.6±4.9 days, and there were no significant difference between gender, age, cluster, resident, contact history, fever, degree of disease, and type of first hospital visit (Table 2).

The first patient infected with COVID-19 in Beijing had symptoms onset on Jan 8, and went to hospital two days later. Then on Jan 12, the patient was admitted to hospital by EMS and was confirmed on Jan 19, with finally discharged on Jan 24. As the epidemic developed, the time from symptom onset to first consultation had been decreased gradually from Jan 12 to Feb 15. At the same period, the time from

symptom onset to laboratory confirmation and the time from symptom onset to hospitalization gradually decreased with the progress of the epidemic, but fluctuated greatly, while the time from symptom onset to discharge did not change significantly (Figure 2).

Discussion

Health-seeking behavior has a significant impact on the disease course and spread. This paper aimed to describe the health-seeking behavior of discharged patients with COVID-19 infection, with consideration of variables including how much times patients sought treatment, when and where the first sought treatment, disease course and factors affecting health-seeking behavior. Different from other similar studies about health-seeking behavior of patients with respiratory infectious disease [13-15], there were no significant difference between gender, age, and symptoms on health-seeking behaviors of patients with COVID-19. This maybe for a new Public Health Emergency of International Concern, the health-seeking behavior of patients with COVID-19 mainly depends on government policies at early stage of the outbreak.

In the aspect of epidemic management, COVID-19 was categorized into class B, but managed as class A legally on Jan 20 [16]. According to article 31 of INFECTIOUS DISEASES LAW OF THE PEOPLE'S REPUBLIC OF CHINA (2013 Revision) , when any unit or individual finds infectious victims or suspected infectious victims, they shall promptly report to the nearby institution of disease prevention and control or medical institution. This guaranteed suspected patients and close contact patients can timely visit designated hospital, which reduced the number of visits and controlled the spread of disease. Moreover, for close contacts, self-monitored quarantine and medical observation had been taken to early detection. Our research also confirmed that most close contact patients visited hospital less than three times, and many patients were hospitalized before symptoms onset.

On Jan 24, 2020, the Beijing Municipal Government announced 101 fever clinics across the city, which patients with fever or other relative symptoms would visit first for evaluation [17], and 20 designated hospitals for special treatment of patients with COVID-19 were declared later [18]. Patients with COVID-19 first visited a general hospital, would be forcibly transferred to the designated hospital for further treatment by EMS. In this study, more than 90% of the patients were monitored and treated after the first visit, and a small percentage of the population was diagnosed and treated after multiple visits, whose first consultation occurred before January 24.

The time interval from symptoms onset to first visit had been decreased gradually as the epidemic developed. Since the outbreak was declared on Jan 24, first-level public health emergency response was activated in Beijing [17]. Apart from disinfection, ventilation and body temperature monitoring in public areas, contact tracing and screening, public epidemic information and health education played an important role in containing the outbreak. Beijing Municipal Health Commission reports daily epidemic notification since Jan 20 through websites, Weibo, WeChat and other platforms, at the same time, a health campaign was deployed throughout the city to strengthen science popularization, and experts

from the disease control and prevention center were interviewed. Professional institutions used a variety of media to continuously publish scientific articles to promptly dispel rumors. This series of measures has strengthened people's awareness of supervision and seeking medical treatment in all citizens, regardless of gender, age, education, significantly shortened the time interval from symptom onset to first consultation. This proved the success of prevention and control strategies in Beijing, which were in line with other studies[19-20].

Except for the duration from symptom onset to first consultation, the other time intervals did not change significantly with the development of the epidemic. At the early stage of outbreak, due to the lack of diagnostic reagents for the disease, the duration between symptom onset to diagnosis and hospitalization is significantly longer than later period, in which these two periods were relatively stable. As for hospital day, there was no statistically significant difference, the reason may be the majority of patients in this study were mild cases. But that didn't mean that patients didn't need to seek medical treatment. Compared to SARS-CoV, MERS-CoV, SARS-CoV-2 is more contagious, with R0 varied from 2.0-4.0[21-23]. As a mobile source of infection, patients need to receive treatment in isolation, and designated hospital can provide professional isolation and protection rather than general hospital, while controlling the occurrence of nosocomial infection.

This study has some limitations. First, only discharged patients who were transferred by EMS were enrolled in our study, but it would be better to reflect the impact of medical treatment by comparing with dead patients, and covered as much patients as possible. Second, the highest qualification achieved of patient was confirmed to have significant impact on health-seeking behavior, which lacked in our study and need further research.

Conclusions

Health-seeking behavior of patients were different as the epidemic developed. The findings suggest that the importance of prevention and control strategies taken by government. It's necessary to improve epidemic acknowledge and awareness of citizens to contain the outbreak.

List Of Abbreviations

COVID-19: Corona Virus Disease 2019; WHO: World Health Organization; IPC: Infection prevention and control; EMS: Emergency Medical Service; CDC: Center for Disease Control and Prevention

Declarations

Ethics approval and consent to participate

The study was approved by Ethics Committee of Beijing Emergency Medical Center (No.2020-01) and the written informed consent was waived.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

JZ conceived and designed the study. DL, JL, SN and XK assisted in data collection. HL and LZ extracted and evaluated the eligibility of the original data. ST conducted the data analysis. ST and DL wrote the original draft, JZ reviewed and edited the manuscript. All authors read and approved the manuscript.

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Tables

Table 1 Characteristics of discharged patients based on different visit times

	Total (n=138)	Visit hospital times			Statistic value	P
		Once (n=9)	Twice (n=107)	≥ Three times (n=22)		
Male, n(%)	68(49.3)	2(22.2)	53(49.5)	13(59.1)	3.654	0.161
Age, Median (range), years	40(1-84)	42(1-65)	38(2-84)	46(30-76)	1.887	0.155
≤18	13(9.4)	1(11.1)	12(11.2)	0(0.0)	4.946	0.293*
19-64	111(80.4)	7(77.8)	85(79.4)	19(86.4)		
≥65	14(10.1)	1(11.1)	10(9.3)	3(13.6)		
Residents, n(%)					6.098	0.192*
Wuhan	24(17.4)	4(44.4)	15(14.0)	5(22.7)		
Beijing	106(76.8)	5(55.6)	86(80.4)	15(68.2)		
Other	8(5.8)	0(0.0)	6(5.6)	2(9.1)		
Cluster, n(%)	94(68.1)	8(88.9)	72(67.3)	14(63.6)	2.383	0.304
Family	73(52.9)	8(88.9)	54(50.5)	11(50.0)	5.743	0.057
other	21(15.2)	0(0.0)	18(16.8)	3(13.6)	3.223	0.200
Contact History, n(%)	131(94.9)	9(100.0)	101(94.4)	21(95.5)	1.012	0.603*
Have been to Wuhan in 14 days	80(58.0)	8(88.9)	63(58.9)	9(40.9)	6.799	0.033
Have been contacted with confirmed cases in 14 days	61(44.2)	8(88.9)	42(39.3)	11(50.0)	9.321	0.009
Type, n(%)					2.169	0.338
Mild	127(92.0)	9(100.0)	97(90.7)	21(95.5)		
Severe	11(8.0)	0(0.0)	10(9.3)	1(4.5)		
Fever, n(%)	111(80.4)	5(55.6)	87(81.3)	19(86.4)	3.452	0.178
Highest temperature, ℃					8.576	0.199
≤37.2	27(19.6)	4(44.4)	20(18.7)	3(13.6)		
37.3-38.0	53(38.4)	3(33.3)	44(41.1)	6(27.3)		
38.1-39.0	54(39.1)	2(22.2)	39(36.4)	13(59.1)		
≥39.1	4(2.9)	0(0.0)	4(3.7)	0(0.0)		
Cough, n(%)	63(45.7)	2(22.2)	49(45.8)	12(54.5)	2.837	0.242
First visit hospital, n(%)					29.317	<0.001
General hospital	104(75.4)	0(0.0)	84(78.5)	20(90.9)		
Designated hospital	34(24.6)	9(100.0)	23(21.5)	2(9.1)		
Time internal, Mean±SD, days						
From symptoms onset to first visit	2.8±3.2	2.1±3.1	2.8±3.3	3.4±3.0	0.544	0.582
From first visit to confirmed	2.3±2.1	1.1±1.2	2.1±2.0	3.6±2.7	6.445	0.002
From symptoms onset to confirmed	5.1±3.6	3.2±3.7	4.8±3.5	7.0±3.7	4.591	0.012
From symptoms onset to hospitalized	3.2±3.4	2.2±3.1	2.9±3.3	5.1±3.5	4.404	0.014
From symptoms onset to discharge	19.8±5.8	21.1±4.8	19.3±5.6	21.6±6.6	1.689	0.188
From hospitalized to discharge	16.6±5.0	18.9±3.6	16.4±5.2	16.5±4.4	1.012	0.366

*: Fisher's exact probability

Table 2 Comparative analysis of hospital day

Variables	Group	Hospital Day	Statistical Value	P
Gender	Male	17.3±5.5	1.709	0.090
	Female	15.9±4.4		
Age	≤18	15.1±4.6	0.700*	0.499
	19-64	16.8±5.0		
	≥65	16.5±5.3		
Resident	Wuhan	17.4±5.0	0.575*	0.564
	Beijing	16.4±5.1		
	Other	17.5±4.0		
Cluster	Yes	16.5±5.2	0.410	0.682
	No	16.9±4.6		
Contact history of being to Wuhan in 14 days	Yes	17.0±5.3	0.946	0.346
	No	16.1±4.6		
Contact history with confirmed case	Yes	16.7±4.6	0.236	0.814
	No	16.5±5.3		
Type	Mild	16.8±4.9	1.503	0.135
	Severe	14.5±5.2		
Fever	Yes	17.0±5.0	-1.801	0.074
	No	15.1±4.7		
First visit hospital	General Hospital	16.5±4.9	-0.606	0.545
	Designated Hospital	17.1±5.3		

*: ANOVA

Figures

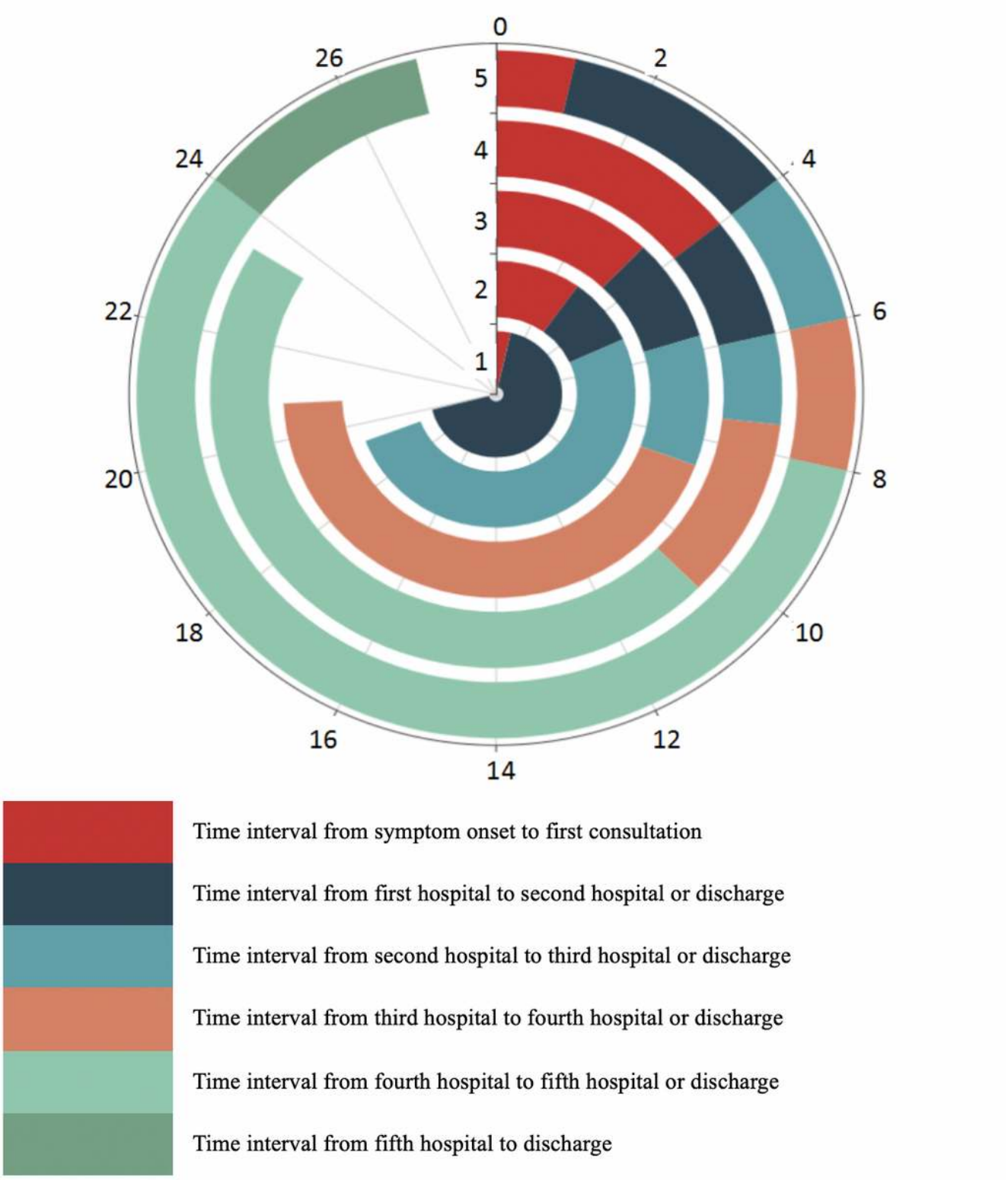

Figure 1

Medical treatment flow chart

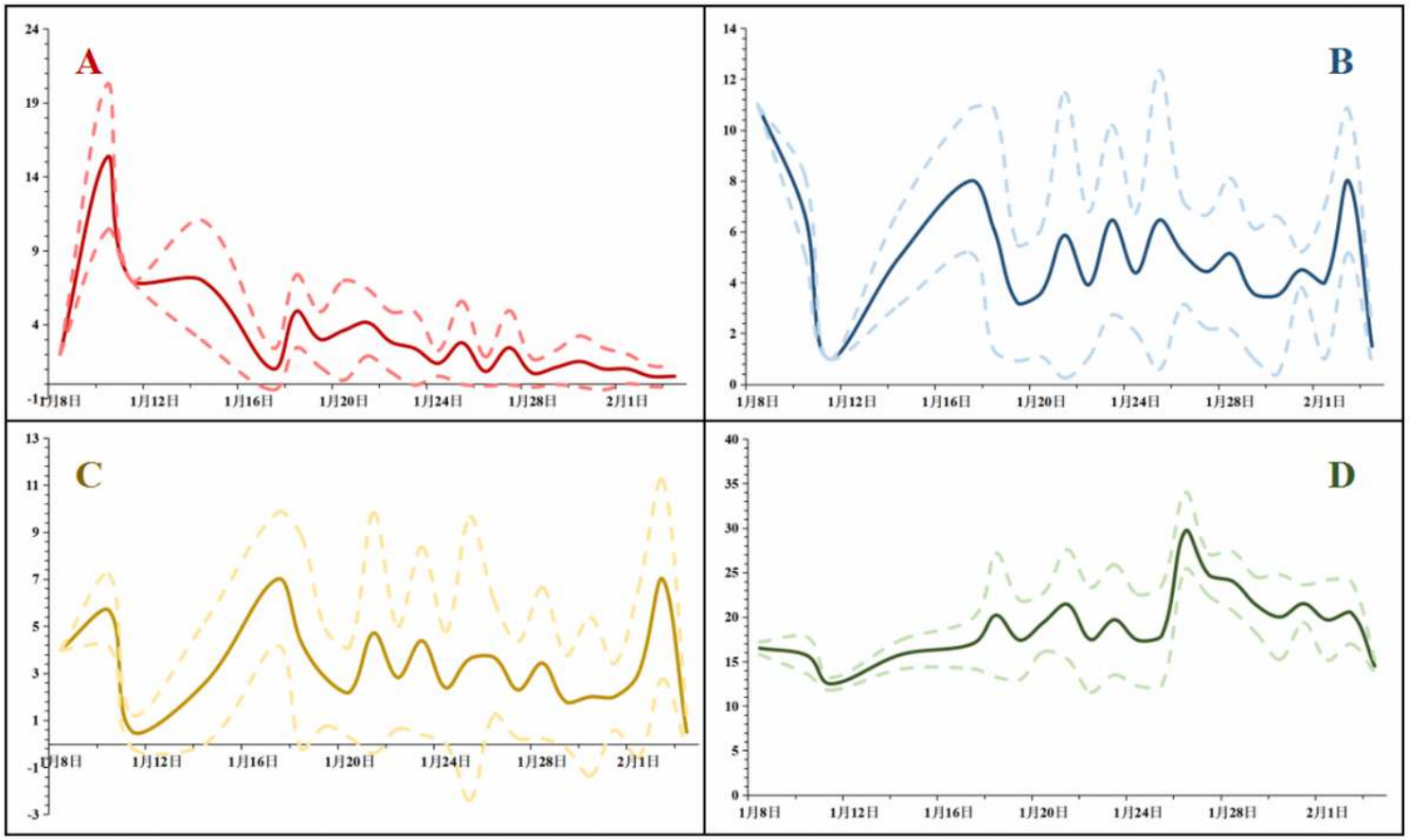

Figure 2

Curves of time interval with epidemic developed. 1) The horizontal axis of the four graphs were all the date of symptom onset. 2) The vertical axis were A: Time interval from symptom onset to first consultation; B: Time interval from symptom onset to COVID-19 confirmed; C: Time interval from symptom onset to hospitalized; D: Time interval from symptom onset to discharge.