Epidemiological and clinical characteristics of COVID-19 pneumonia in Zhejiang province, China: a description of early stage

Caixia Gong
Zhejiang University School of Medicine First Affiliated Hospital

Cheng Ma
Zhejiang University

Shumin Li
Zhejiang University School of Medicine First Affiliated Hospital

Yunmei Yang
Zhejiang University School of Medicine First Affiliated Hospital

Qin Zhang (zhangqin1978@zju.edu.cn)
Department of Geriatrics, the First Affiliated Hospital, School of Medicine, Zhejiang University

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Research

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Abstract

Background

The outbreak of the 2019 novel coronavirus since December, 2019, has now causing nearly 75 thousand confirmed cases in China (until paper preparing). This epidemic has posed significant threats to international health and the economy. Zhejiang province, which once had the 2nd most accumulative cases among all provinces, has now dropped to top No.5 (until paper preparing). It had a high discharge rates (43.86%) from hospital and the lowest death rate among all top 5 epidemic provinces, this drew our attention to the epidemiological, clinical characteristics and local government engagement of this region.

Methods

In this study, we included all confirmed cases of COVID-19 pneumonia in Zhejiang province from Jan 21 to Feb 11, 2020. All data come from cases issued by Zhejiang provincial health commission.

Results

Until Feb 11, 2020, 1143 cases were confirmed in Zhejiang province. We analysed the cases growth information in Zhejiang province and age, gender, severe cases percent, the source of the patients, the time of disease onset to confirm and the clinical symptoms of the patients. We also compared the clinical symptoms of elders and the young.

Conclusions

The patients in Zhejiang province had no age and gender preference, and the average time of disease onset to confirm was 5.9 days. The clinical symptoms were mainly fever, cough and weakness, similarly with before reported. The difference between elders and younger are not significant. Until paper preparing, Zhejiang province has very high discharge rate and low death rate, low cases increase rate in China.

Introduction

Since December 2019, more and more cases of pneumonia of unknown aetiology have been reported in Wuhan, Hubei province, China. [1–3] In late January, 2020, with more and more people from Wuhan come back to their hometown to celebrate the Chinese new year, some cases also have been reported in other Chinese cities and other countries around the world. Until Jan 24, 2020, at least 830 cases have been diagnosed in nine countries: China, Thailand, Japan, South Korea, Singapore, Vietnam, Taiwan, Nepal, and the United States, [4] by now has increased to 10 thousands case in 25 countries. The reported cases proved human-to-human transmission. As the third coronavirus to emerge in the human population in the past two decades, [5–7] its emergence had put global public health institutions on high alert. On February 11, 2020, WHO named this new coronavirus 'COVID-19'.

The symptoms of COVID-19 pneumonia are confused with cold and flu, which caused difficulties in the initial outbreak prevention. China quickly responded by limiting large flow and gather of population, and now the outbreak outside Hubei is under control. Since the outbreak began, the majority attention were drawn by the epidemic origin Wuhan, [8–10] little scientific studies of other Chinese cities has been reported. Zhejiang province, which once had the 2nd most accumulative cases among all provinces, now is top No.5, the study regarding the epidemiology and clinical features of pneumonia caused by COVID-19 is scarce. In this study, we did a description of the epidemiology and clinical features of patients with confirmed COVID-19 pneumonia in Zhejiang province. To our knowledge, this is the first detailed study of Zhejiang Province. We illustrated the age, gender, average onset date, patients origin, clinical characteristics, etc,. We also attempted to discuss the reason of high discharge rate, low death rate, and rapid control of the epidemic in Zhejiang.

Methods

We recruited all confirmed cases from Jan 21 to Feb 11, 2020 in Zhejiang province from the announcement of Zhejiang provincial health commission. Some information have not been issued, especially in the early stage, so the different indicators may have different total numbers. We used all data we know to do the statistical analysis. We used GraphPad Prism for all analyses.

Results

On Jan 21, 2020, the first 5 COVID-19 pneumonia cases emerged in 4 different cities in Zhejiang province. Later, the number of new confirmed cases rapidly increased every day, and reached the top on Jan 29. Then, the new cases began to decline continuously, except Feb 3. All 11 cities have been infected with the COVID-19 in Zhejiang province, especially Wenzhou, which has accounted for nearly half of the total cases. However, the new cases in other cities almost never above 25 (Fig1. A, C and D). Until Feb 11, although there were accumulative 1143 confirmed case in Zhejiang province, the new added cases has decreased to less than 25. The outbreak has been effectively and quickly under the control (Fig1.A and B).

The earliest 3 days' confirmed patients all have Wuhan-living and travelling history. Since Jan 23, patients who have not gone to Wuhan began to emerge, indicating that the infection spread in Zhejiang. When enter February, most of the new infected cases were without Wuhan-living and travelling history (Fig2).

The patients have no gender distinction, with 544 (50.4%) male and 535 (49.6%) Female. Their age ranged from a few months to 90's years, and median age is 47 years (SD:15). The average time from initial symptoms appear to confirm is 5.9 days (SD: 4.0), and half of them spend only not longer than 5 days (Table1).

Similar as reported in other studies, most patients had fever (700, 72.2%) or cough (388, 40.0%) and weakness (112, 11.5%). 89 (9.2%) patients had expectoration. 83 (8.6%) patients had headache. 65

(6.7%) patients had muscle ache. Other symptoms included pharyngeal discomfort (102 [10.5%]), chills(52 [5.4%]), dizziness (30 [3.1%]), nasal obstruction (26 [2.7%]), diarrhoea (25 [2.6%]), chest tightness (25 [2.6%]), runny nose (25 [2.6%]), difficulty in breathing (10 [1.0%]), nausea and vomiting (7 [0.7%]), poor appetite (5 [0.5%]), abdominal pain (3 [0.3%]), chest pain (2 [0.2%]), palpitation (2 [0.2%]) and gastrointestinal discomfort (2 [0.2%]). Only one case with each following symptoms, including photophobia, redness and swelling of the eyes, soreness of waist. Besides, 13 [1.3%] patients have no clinical symptoms, but CT examination show pneumonia. 258 cases have been issued the earliest imaging examination results, in which, 242 [93.8%] patients have pathological changes, and 16 [6.2%] patients have no changes (Table2). Interestingly, We found that the earliest CT examination results related to the age. Patients with no CT changes were younger than patients with CT pathological changes (Fig3).

To find whether the symptoms related to age, we also compared the elders (older than 65 years) and the young (younger than 65) with COVID-19 infection in Zhejiang province. In general, the differences between them were not significant, except that more young patients show pharyngeal discomfort, headache, and dizziness (Table3).

Among all confirmed patients, about 7% were severe (declined from more than 15% at the beginning). Since Jan 23, some patients discharged the hospital, and starting from Jan 28, the number of discharged cases increased every day. Until Feb 11, 279 patients had discharged the hospital (Table 1 and Fig4).

Conclusions

The epidemic of COVID-19 in Zhejiang province is under the control and getting to the end. The patients in Zhejiang province had no age and gender preference, and the average time of disease onset to confirm was 5.9 days. The clinical symptoms were mainly fever, cough and weakness, similarly with before reported. The difference between elders and younger are not significant. Until paper preparing, Zhejiang province has very high discharge rate and low death rate, low cases increase rate in China.

Discussion

COVID-19, as the third human coronavirus besides SARS and MERS, which cause severe respiratory disease, the outbreak of its infection has posed significant threats to international health and the economy. Until paper preparing (Feb 20, 2020), there were nearly 75 thousand confirmed cases and more than 2 thousand dead cases in China, and about 25 countries have diagnosed COVID-19 cases. Zhejiang province, as the accumulative cases top No. 5 (once top No. 2) provinces in China, which is the only province with only 1 dead cases (One patient died after Feb 11, 2020) and no medical workers infected, deserves our attention to it.

We described the epidemiology and clinical characteristics of the COVID-19 pneumonia in Zhejiang province. Although the accumulative confirmed cases were already above 1 thousand, the new confirmed

cases have began to decline since February, and only single digits recently. About half of the cases from Wenzhou, to which about 3 thousand people got back from Wuhan in January, 2020. Therefore, at the beginning, almost all cases had Wuhan-living or travelling history. The median age of the patients is 47, with no age preference. We also noticed that there was a 90's old woman, who has discharged the hospital and a few months old baby. Excitingly, one pregnant patient has successfully given birth to a COVID-19 negative child. The clinical characteristics were similar with before reported. Until Feb 11, 24.4% patients had discharged the hospital, and until paper preparing, 53.78% patients had discharged.

The top of the new confirmed cases emerged on Jan 29, only 9 days after the first case emerged. And the pneumonia has been under control in about one month. This is likely due to the quick and effective prevention and control measurement of local government and the efforts of our medical workers. From the beginning of the outbreak, the government search for people who come back from Wuhan and separate them and their close contacts, suggest people stay at home, reduce gather and report the health information in time via the community. The effect confirmed that prevent communication at the early stage is an effective way to limit the spread. Except the traditional measurements, Zhejiang province also use some modern technology to control the epidemic. It is the first province using big data information and electrical ID to identify the heath and the suspected infections, these measures are still useful at now when the epidemic is under control and workers are coming back from their hometown all around the country. It is the first province using 5-color-map to indicate the severity of infection in different city, county, street, block and community.

Although there were no effective drugs to the COVID-19 pneumonia, Zhejiang province has a very high discharge rate and the lowest death rate among all top 5 epidemic provinces. This is likely due to the following reasons: (1) the average days from onset to confirm is only 5.9 days: early diagnosis. (2) Medical workers reference the experiences of SARS-treatments, and making continuous improvements according to the disease condition, mainly including respiratory support, nutritional support, drug treatment (antiviral drug, antibacterial drug etc), artificial liver therapy, psychological intervention, and combination of Chinese traditional medicine.

In conclusion, this epidemic in Zhejiang province is now under control and likely finish soon. but we still need to be vigilant and careful. And the further investigation of treatment is still necessary.

Declarations

Ethics approval and consent to participate. Our data come from the issue of the government on the Wechat.

Consent for publication. Not applicable.

Availability of data and materials. The datasets generated and/or analysed during the current study are available on the Wechat subscription of Zhejiang province government.

Competing interests. The authors declare that they have no competing interests.

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Authors' contributions. Caixia Gong, Cheng Ma and Shumin Li collected the epidemiological and clinical data and processed statistical data. Caixia Gong and Cheng Ma drafted the manuscript. Yunmei Yang and Qin Zhang revised the final manuscript.

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Tables

Table1: Demographics and clinical outcomes of patients with COVID-19 in Zhejiang province

	Patients (n = 1079)
Age, years	
Median (SD)	47 (15)
Range	7m-96
≤34	231 (21.4%)
35-44	240 (22.2%)
45-54	272 (25.2%)
55-64	193 (17.9%)
65-74	109 (10.1%)
75-84	23 (2.1%)
85-96	11 (1.0%)
Sex	
Male	544 (50.4%)
Female	535 (49.6%)
	Patients (n = 964)
Time from onset to confirm, days	
Mean(SD)	5.9(4.0)
Range	0-23
≤5	524 (54.3%)
6-10	318 (33.0%)
11-15	94 (9.8%)
16-23	28 (2.9%)
	Patients (n = 1143)
Clinical outcome	
Remained in hospital	864 (75.6%)
discharged	279 (24.4%)
died	0

Table2: Clinical characteristics of patients with COVID-19 in Zhejiang province

	Patients (n = 970)
Signs and symptoms	
Fever	700 (72.2%)
(Average temperature)	(37.98°C)
Cough	388 (40.0%)
Weakness	112 (11.5%)
Pharyngeal discomfort	102 (10.5%)
Expectoration	89 (9.2%)
Headache	83 (8.6%)
Muscle ache	65 (6.7%)
Chills	52 (5.4%)
Dizziness	30 (3.1%)
Nasal obstruction	26 (2.7%)
Diarrhoea	25 (2.6%)
Chest tightness	25 (2.6%)
Runny nose	25 (2.6%)
Difficulty in breathing	10 (1.0%)
Nausea and vomiting	7 (0.7%)
Poor appetite	5 (0.5%)
Abdominal pain	3 (0.3%)
Chest pain	2 (0.2%)
Palpitation	2 (0.2%)
Gastrointestinal discomfort	2 (0.2%)
Photophobia	1 (0.1%)
Redness and swelling of the eyes	1 (0.1%)
Soreness of waist	1 (0.1%)
No clinical symptoms	13 (1.3%)
More than one sign or symptom	480 (49.5%)
Fever and cough	251 (25.9%)

Fever, cough and weakness	37 (3.8%)
	Patients (n = 258)
CT findings	
Pathological changes	242 (93.8%)
No changes	16 (6.2%)

Table3: Clinical characteristics comparison between old patients and young patients with COVID-19 in Zhejiang province

	Old (≥65)	Young (<65)
	Patients (n = 143)	**patients (n = 936)**
Sex		
Male	69 (48.3%)	475 (50.7%)
Female	74 (51.7%)	461 (49.3%)
Age, years		
Median (SD)	69 (6.7)	44 (12)
	Patients (n = 126)	**Patients (n = 838)**
Time from onset to confirm, days		
Mean (SD)	5.4 (4.4)	6.0 (3.9)
	Patients (n = 123)	**Patients (n = 847)**
Signs and symptoms		
Fever	91 (74.0%)	609 (71.9%)
(Average temperature)	(37.99℃)	(37.98℃)
Cough	46 (37.4%)	342 (40.4%)
Weakness	15 (12.2%)	97 (11.5%)
Expectoration	11 (8.9%)	81 (9.6%)
Muscle ache	11 (8.9%)	54 (6.4%)
Chills	6 (4.9%)	46 (5.4%)
Pharyngeal discomfort	6 (4.9%)	96 (11.3%)
Diarrhoea	5 (4.1%)	20 (2.3%)
Headache	4 (3.3%)	79 (9.3%)
Chest tightness	4 (3.3%)	21 (2.5%)
Runny nose	4 (3.3%)	21 (2.5%)
Nausea and vomiting	2 (1.6%)	5 (0.6%)
Nasal obstruction	2 (1.6%)	24 (2.8%)
Dizziness	1 (0.8%)	29 (3.4%)
Difficulty in breathing	1 (0.8%)	9 (1.1%)
Poor appetite	1 (0.8%)	4 (0.5%)

Gastrointestinal discomfort	1 (0.8%)	1 (0.1%)
Abdominal pain	0	3 (0.4%)
Chest pain	0	2 (0.2%)
Palpitation	0	2 (0.2%)
Photophobia	0	1 (0.1%)
Redness and swelling of the eyes	0	1 (0.1%)
Soreness of waist	0	1 (0.1%)
No clinical symptoms	2 (1.6%)	11 (1.3%)
More than one sign or symptom	51 (41.5%)	429 (50.6%)
Fever and cough	29 (23.6%)	222 (26.2%)
Fever, cough and weakness	3 (2.4%)	34 (4.0%)
	Patients (n = 42)	**Patients (n = 216)**
CT findings		
Pathological changes	40 (95.2%)	202 (93.5%)
No changes	2 (4.8%)	14 (6.5%)

Figures

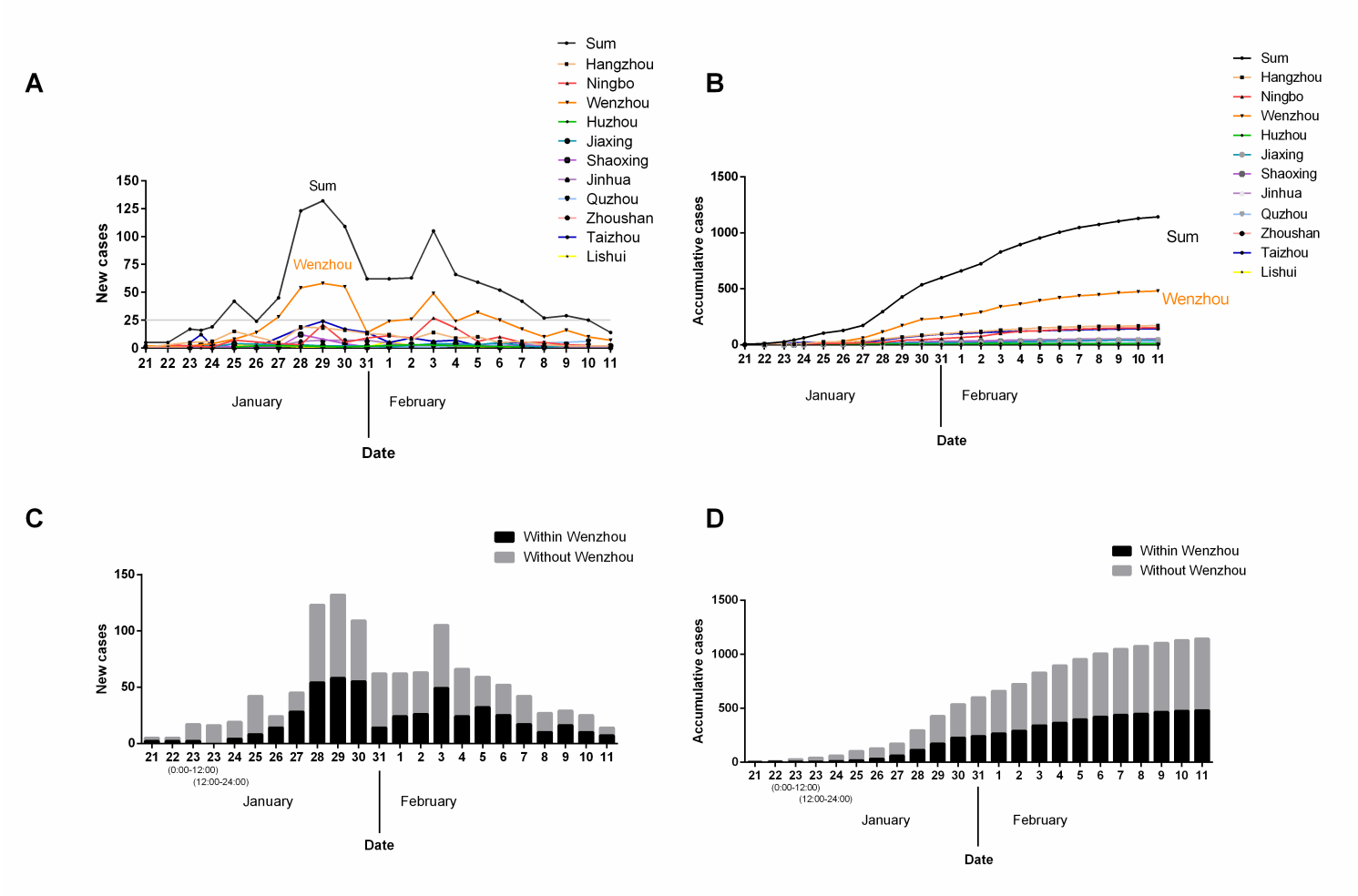

Figure 1

New confirmed and accumulative cases with COVID-19 pneumonia every day from Jan 21 to Feb 11 in Zhejiang province. A. New confirmed cases in 11 cities of Zhejiang province every day from Jan 21 to Feb 11. B. Accumulative confirmed cases in 11 cities of Zhejiang province every day from Jan 21 to Feb 11. C. Distribution of new confirmed cases in Wenzhou and other cities of Zhejiang province. D. Accumulative confirmed cases in Wenzhou and other cities of Zhejiang province.

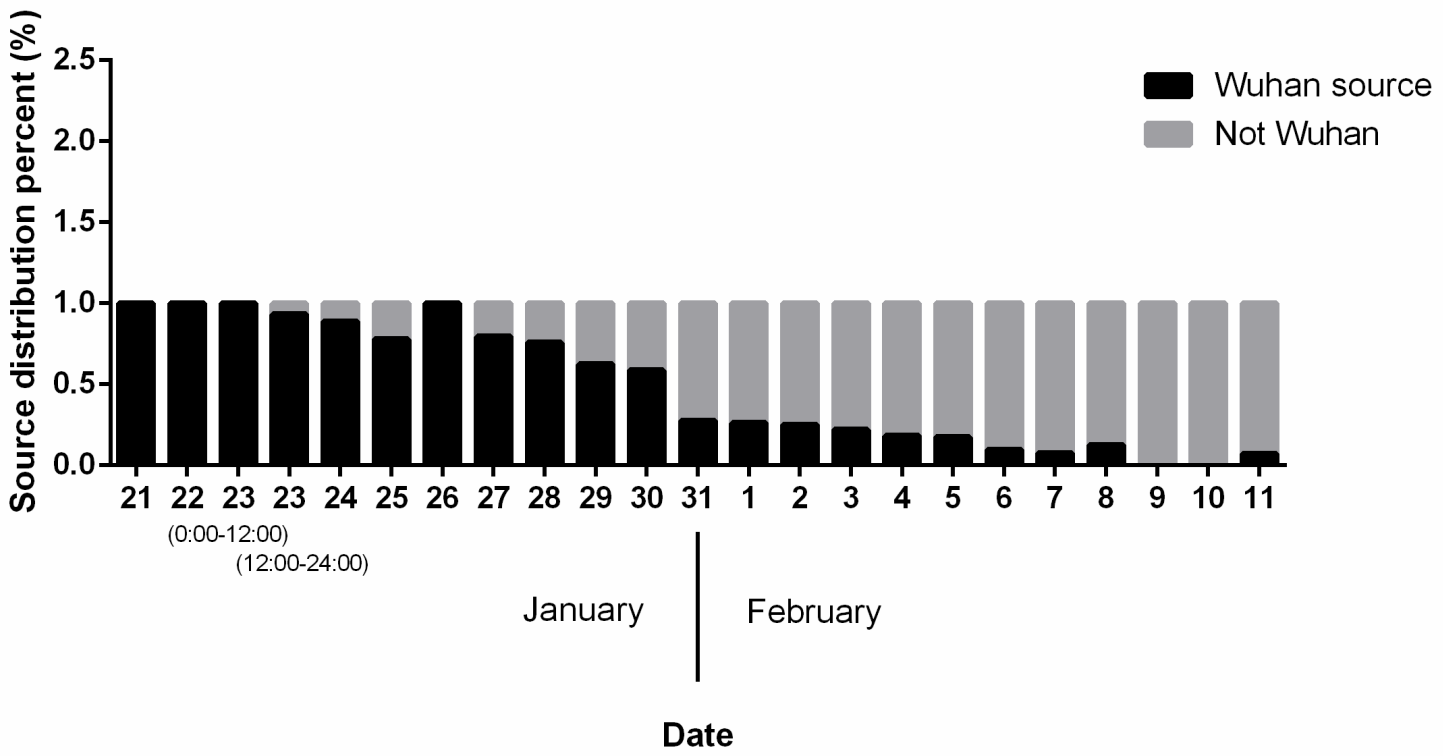

Figure 2

Source of infection classification of patients with COVID-19 in Zhejiang province (n=1051): We classified the source of infection as Wuhan source and not directly from Wuhan.

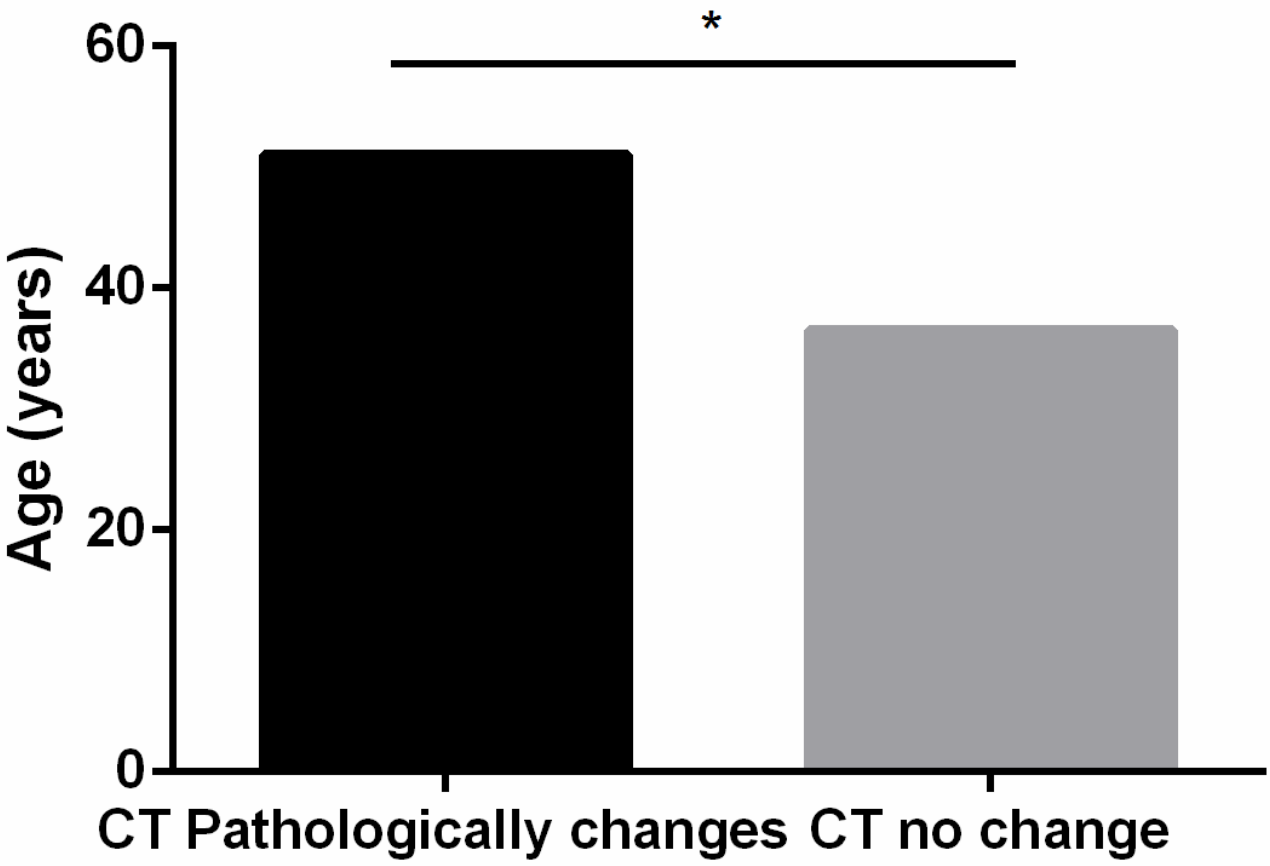

Figure 3

The age of patients with or without CT pathologically changes: Patients with no CT changes were younger than CT changed. *, $p<0.05$, Unpaired t test.

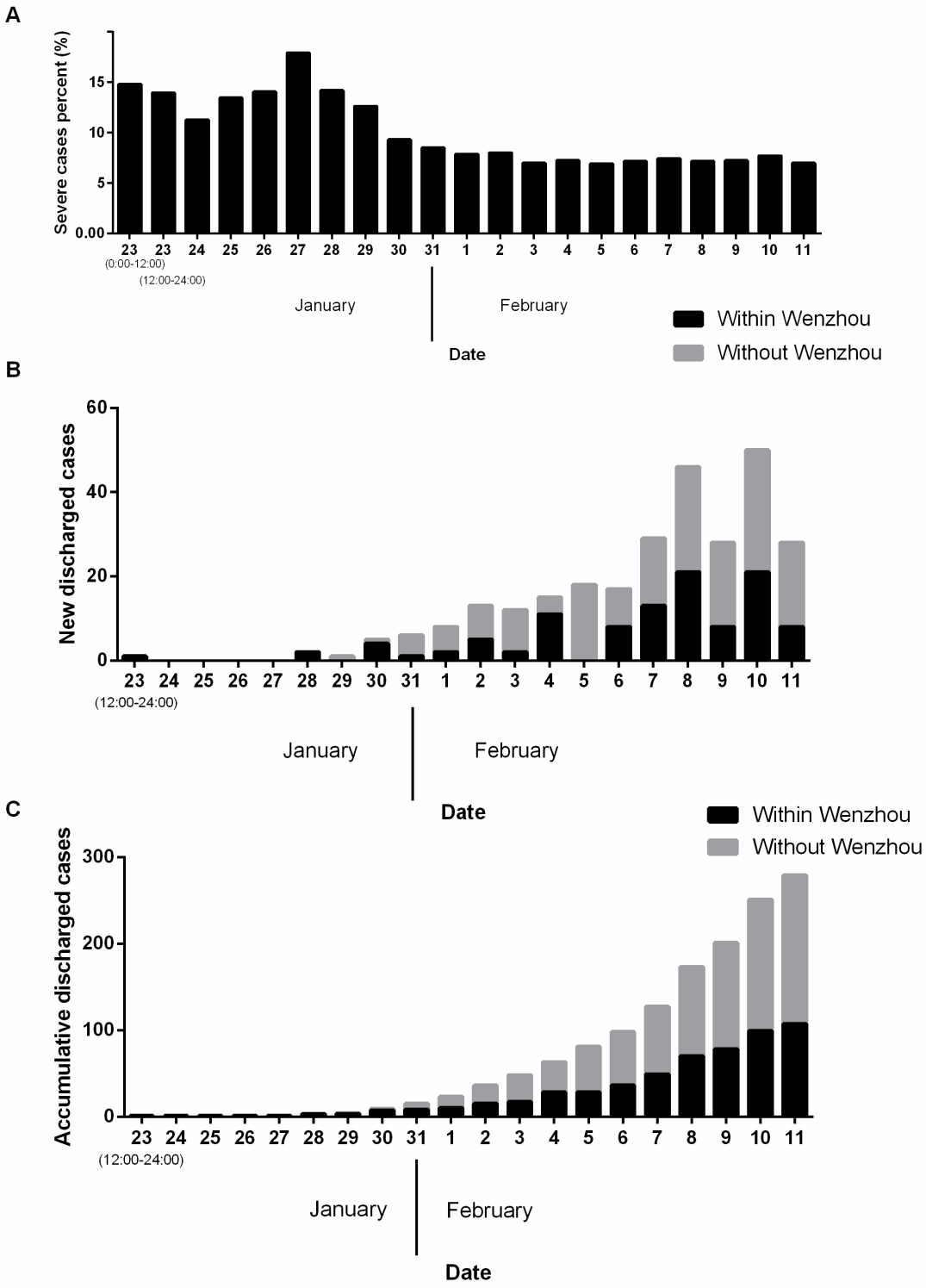

Figure 4

Severe and discharged cases with COVID-19 every day from Jan 23 to Feb 11 in Zhejiang province. A. Severe cases in Zhejiang province every day from Jan 23 to Feb 11. B. New discharged cases in Wenzhou and other cities of Zhejiang province every day from Jan 23 to Feb 11. C. Accumulative discharged cases in Wenzhou and other cities of Zhejiang province every day from Jan 23 to Feb 11.