Original Article

Clinical characteristics of fever clinic visits during the coronavirus disease 2019 pandemic: a retrospective case-control study

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Background: Little is known about the change in characteristics of fever-clinic visits during the coronavirus disease 2019 (COVID-19) pandemic. We sought to examine the changes in the volume, characteristics, and outcomes of patients presenting at a fever clinic duringclinic during the first-level response to COVID-19.

Methods: We conducted a single tertiary-center retrospective case-control study. We included consecutive patients aged 14 years or older who visited the fever clinic of a tertiary hospital during the period of the first-level response to the COVID-19 pandemic in Fuzhou, China (from 24 January to 26 February 2020). We also analyzed the data of patients in the same period of 2019 as a control. We compared a number of outcome measures, including the fever clinic volumes, consultation length, proportion of patients with pneumonia, hospital admission rate, and in-hospital mortality, using the fever-clinic visit data during the two periods.

Results: We included 1,013 participants [median age: 35; interquartile range (IQR): 27–50, 48.7% male] in this retrospective study, including 707 in 2020 and 306 in 2019. The median daily number of participants who presented at the fever clinic in 2020 was significantly higher than that in 2019 [18 (IQR: 15–22) *vs.* 13 (IQR: 8–17), P=0.001]. Participants in 2020 had a longer consultation length than those in 2019 [127 (IQR: 51–204) *vs.* 20 (IQR: 1–60) min, P<0.001]. Participants in 2020 were also more likely to be diagnosed with acute pneumonia than those in 2019 [168 (23.8%) *vs.* 40 (13.1%), P<0.001]. The hospital admission rate in 2020 was higher than in 2019 [73 (10.3%) *vs.* 13 (4.2%), P=0.001]. No significant difference was found in terms of the in-hospital mortality of participants in 2020 and 2019 [8 (1.1%) *vs.* 0, P=0.114].

Conclusions: Our findings suggest a higher visits volume, proportion of acute pneumonia, and hospital admission rate among patients presenting at fever clinic during the COVID-19 pandemic. Improved measures need to be implemented.

Keywords: Coronavirus disease 2019 (COVID-19); pandemic; fever clinic; public health; consultation duration

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Introduction

Coronavirus disease 2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, poses a global public health crisis that challenges fever-clinic services (1). As of 16 April 2022, over 500 million people around the world have been infected with SARS-CoV-2, and over six million people have died (2). Fever is the predominant clinical feature of COVID-19 (3), but it is also a symptom of many other infectious diseases. In Mainland China, a fever clinic is a separate unit of an emergency department that specializes in the screening of infectious diseases and avoiding cross-infection. After the SARS outbreak in 2003 in mainland, fever clinics were initiated by the instruction of the Chinese State Ministry of Health (4). The fever clinics are key places wherein susceptible subjects may gather, aiming to achieve early detection and isolation, which play a key role in preventing the spread of virus and cross-infection (5). After the first case of COVID-19 was reported in Fuzhou, a non-epidemic area, our fever clinic was upgraded to serve for COVID-19 screening and prevention of disease transmission. However, little is known about the change in characteristics of fever-clinic visits as the COVID-19 pandemic intensified in this non-epidemic area. Thus, we conducted a retrospective observational study to compare the volume, characteristics, and outcomes of patients presenting at the fever clinic of a large tertiary center hospital during the first-level response to the COVID-19 in 2020 and the same period in 2019. Our findings might help practitioners and public health officials to better understand the importance of the fever clinics during the COVID-19 pandemic. We present the following article in accordance with the STROBE reporting checklist (available at https://atm.amegroups.com/article/view/10.21037/atm-22-1620/rc).

Methods

Fever-clinic upgrade

Before the COVID-19 pandemic, four doctors were allocated to the fever clinic of a large tertiary hospital that routinely screened for respiratory tract joint inspection reagent, including *Mycoplasma pneumoniae*, *Legionella pneumoniae*, respiratory syncytial virus, influenza virus A, influenza virus B, parainfluenza virus, adenovirus and *Chlamydia pneumoniae*, in patients presenting with fever and respiratory symptoms. Previously, patients with potential eruptive infectious diseases (e.g., measles and rubella) received initial treatment at the fever clinic and were then subsequently transferred to a designated contagious hospital for further management. From January 24 to February 26, 2020, Fuzhou implemented a first-level response to the COVID-19 pandemic after the first confirmed COVID-19 case was reported on 21 January 2020 (6). During this period, the fever-clinic service of the tertiary hospital in Fuzhou was upgraded to respond to the possible outbreak (see *Figures 1,2*). In brief, 10 doctors in two separate groups were allocated to the fever clinic 24/7. Doctors and nurses in the fever clinic were equipped with 'Tier 3' personal protective equipment (PPE). All those who visited the fever clinic had to maintain physical distancing of at least 1.5 m, undergo health code checking, and answer inquiries about their travel history. A computed tomography (CT) room was designated for patients presenting at the fever clinic, which was sterilized using ultra-violet light and alcohol spray on surfaces immediately after the screening of any fever patient. Suspect COVID-19 patients underwent SARS-Cov-2 messenger ribonucleic acid detection using real-time reverse transcriptase-polymerase chain reaction (RT-PCR) and were placed under surveillance in isolated observation rooms. Patients confirmed to have SARS-COV-2 were immediately transferred to qualified hospitals designated for COVID-19 patients, and other patients who required further treatment were transferred to the emergency rooms.

Study design, setting, and participants

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and was approved by the Ethics Committee of Fujian Medical University Union Hospital (No. 2020KY095). Individual consent for this retrospective analysis was waived. This single tertiary-center case-control study was conducted at a large comprehensive public hospital that admits over 100,000 patients each year, and has had fever-clinic visits of 4,800–5,800 annually over the past three years (7). We included consecutive patients aged 14 or older who presented at the fever clinic of this hospital between 24 January and 26 February 2020. We also analyzed the data of patients in the same period of 2019 as a control. We excluded those with incomplete medical information.

Patient and public involvement statement

It was not appropriate to involve patients or the public in the design, conduct, reporting, or dissemination plans of the present study.

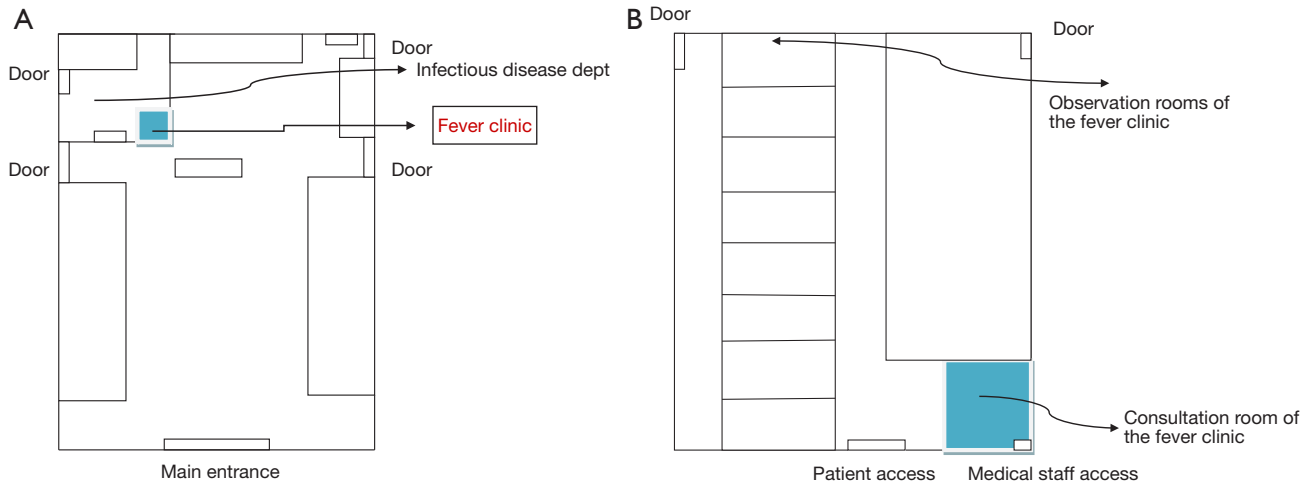

Figure 1 Layout of the fever clinic. (A) In 2019, the fever clinic was located in the southwest corner of the 1st floor of the outpatient building; the large square represents the Infection Department, and the small square represents the fever clinic. (B) Layout of the fever clinic in the independent temporary building modified in 2020.

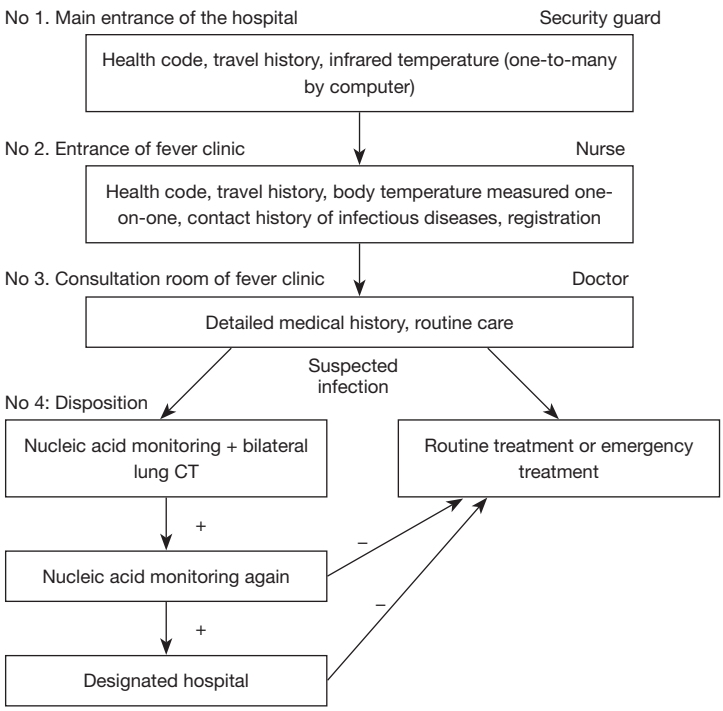

Figure 2 Flow chart of the fever clinic visit. "+" represents positive; "–" represents negative. CT, computed tomography.

Data extraction

In this study, two physicians reviewed and extracted the epidemiological, demographic, clinical, and laboratory data using a digital database. If any data were missing from or uncertain in the medical records, we obtained and clarified the data by direct communication with the doctors on duty. The outcome data were adjudicated by two senior physicians blinded to the baseline demographics. New

and cumulative confirmed COVID-19 case counts in the Fujian province and Fuzhou city between January 22 and February 21, 2020 were retrieved daily by two authors (6). Based on these data, we obtained an overview of the spread and development of the COVID-19 pandemic in Fujian province and Fuzhou city and patients presenting at our fever clinic. Confirmation of COVID-19 was based on the symptoms and two consecutive positive nucleic acid test results detected by RT-PCR (8). Fever was defined as an armpit temperature of >38.0 ℃ lasting at least one hour (9). The diagnosis of acute pneumonia relied mainly on clinical symptoms and chest-imaging findings (10).

Outcomes

Our primary outcome measures include the fever-clinic visit volumes, and the consultation length. Fever-clinic visit volume was defined as the total number of patients who attended the fever clinic (11). Consultation length was defined as the time interval between the start (when the digital operating system automatically turned on the electronic health record when a patient entered the consultation room) and the end of the consultation (when the physician turned off the electronic health record) as recorded by an electronic outpatient operation system (12). Our secondary outcome measures included the proportion of patients diagnosed with acute pneumonia (defined as microbiological evidence or with characteristic radiological features), hospital admission rate, and in-hospital mortality.

Statistics

All the statistical analyses were performed by SPSS 21.0 (IBM, USA). Continuous data are summarized as mean values with standard deviation (if normally distributed) or and median value with the interquartile range (if not normally distributed) as appropriate. The categorical variables are expressed as counts with percentages. We compared the differences between patients in 2020 and 2019 using a chi-square test, fisher's exact test, *t*-test, or Mann-Whitney U test as appropriate. To better understand the change in volume of the fever clinic visits during the early COVID-19 pandemic, we analyzed the correlation between the number of patients presenting at our fever clinic and the number of confirmed COVID-19 cases in Fujian province and Fuzhou city using a Spearman correlation analysis. P<0.05 was considered statistically significant.

Results

Between 24 January and 26 February 2020, 707 patients visited the Fever Clinic, compared to 306 patients during the same period in 2019. The median daily number of people who presented at the fever clinic in 2020 was significantly higher than that in 2019 [18 (IQR: 15–22) *vs.* 13 (IQR: 8–17), P=0.001]. To further examine the increase in fever-clinic attendance, we investigated the link between the number of fever-clinic attendances and the number of confirmed COVID-19 cases in Fujian province and Fuzhou city in 2020. *Figure 3A*,*3B* show that the number of confirmed COVID-19 cases in Fujian province and Fuzhou city increased rapidly between 28 January, and 13 February 2020, and began to decline thereafter. The number of patients presenting at our fever clinic peaked between 24 January and 29 January and returned to a lower level from 30 January 2020. The Spearman correlation analysis showed that the total number of patients presenting at our fever clinic was significantly associated with the total number of the confirmed COVID-19 cases in Fujian province (rho =0.994, P<0.001). A similar correlation was found between the total number of patients presenting at our fever clinic and the total number of confirmed COVID-19 patients in Fuzhou city (rho =0.989, P<0.001).

Table 1 summarizes the clinical characteristics and outcomes of patients in 2020 and 2019. Compared to the patients in 2019, the patients in 2020 were similar in age, sex, residence, and medical insurance cover, were less likely to have previous lung disease [8 (1.1%) *vs.* 13 (4.2%), P=0.001], and digestive disease [52 (7.4%) *vs.* 43 (14.1%), P=0.001], but were more likely to have malignant tumors [80 (11.3%) *vs.* 15 (4.9%), P=0.001], and hematologic diseases [71 (10.0%) *vs.* 6 (2.0%), P<0.001], and were less likely to have a body temperature of <37.3 ℃ [277 (39.18%) *vs.* 176 (57.52%), P<0.001], and any respiratory symptoms [436 (61.67%) *vs.* 251 (82.03%), P<0.001]. In relation to the types of treatment, patients were more likely to be treated with non-antibiotics [210 (29.7%) *vs.* 42 (13.7%), P<0.001], including antiviral therapy [183 (25.9%) *vs.* 192 (62.7%), P<0.001], in 2020 than 2019.

The consultation length in 2020 was longer than that in 2019 [127 (IQR: 51–204) *vs.* 20 (IQR: 1–60) min, P<0.001]. The proportion of patients with an acute respiratory infection in 2020 was lower than that in 2019 [486 (68.74%) *vs.* 260 (84.97%), P<0.001]. However, the proportion of patients with chest-imaging confirmed acute pneumonia was higher in 2020 than in 2019 [168 (23.8%) *vs.* 40 (13.1%),

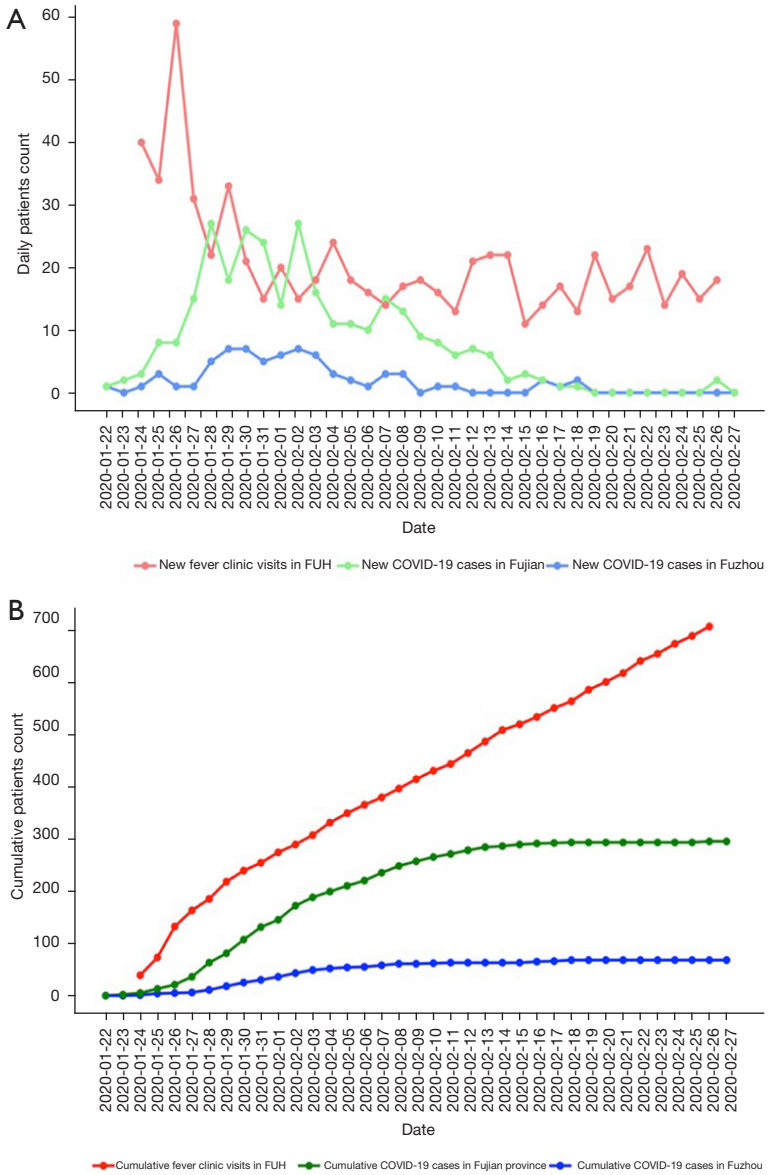

Figure 3 The daily total number of patients (A) and the number of daily new patients (B) presenting at our fever clinic and the total number of confirmed COVID-19 cases in Fujian province and Fuzhou city. FUH, Fujian Medical University Union Hospital; COVID-19, coronavirus disease 2019.

P<0.001]. The hospital admission rate was higher in 2020 than 2019 [73 (10.3%) *vs.* 13 (4.2%), P=0.001]. There was no significant difference in the in-hospital mortality of patients in 2020 and 2019 [8 (1.1%) *vs.* 0, P=0.114].

A total of 20 (2.8%) suspected COVID-19 patients were screened during their attendance at the Fever Clinic. However, none of these patients had laboratory-confirmed COVID-19 infection based on two consecutive RT-PCR nucleic detections.

Discussion

Our hospital experienced a significant increase in fever-clinic visits during the first-level response to COVID. Additionally, our results showed that the consultation duration was prolonged during the COVID-19 pandemic, which suggests that the fever-clinic process was affected during this period.

We observed a dramatic increase in fever-clinic visits during the first-level response to COVID-19. The median

Table 1 Characteristics of patients presenting at the Fever Clinic in 2019 and 2020

Characteristics	Total (n=1,013)	2019 (n=306)	2020 (n=707)	P value
Age (years), median [IQR]	35 [27–50]	35 [27–50]	35 [27–51]	0.796
Male, n (%)	493 (48.7)	140 (45.8)	353 (49.9)	0.222
Residence (Fuzhou), n (%)	858 (84.7)	259 (84.6)	599 (84.7)	0.973
Medical insurance cover, n (%)	660 (65.2)	208 (68.0)	452 (63.9)	0.215
Coexisting disorder, n (%)				
Lung disease	21 (2.1)	13 (4.2)	8 (1.1)	0.001
Hypertension	81 (8.0)	31 (10.1)	50 (7.1)	0.099
Diabetes	42 (4.1)	13 (4.2)	29(4.1)	0.914
Cardio-cerebrovascular disease	44 (4.3)	22 (7.2)	22 (3.1)	0.003
Tumor	95 (9.4)	15 (4.9)	80 (11.3)	0.001
Digestive disease	95 (9.4)	43 (14.1)	52 (7.4)	0.001
Immune disease	24 (1.7)	8 (2.6)	16 (2.3)	0.736
Hematological diseases	77 (7.6)	6 (2.0)	71 (10.0)	<0.001
Onset symptoms, n (%)				
Temperature distribution				<0.001
<37.3 ℃	453 (44.7)	176 (57.5)	277 (39.2)	
37.3–37.9 ℃	269 (26.6)	43 (33.1)	226 (52.6)	
38.1–38.9 ℃	234 (23.1)	75 (57.7)	157 (36.5)	
>39 ℃	50 (58.2)	12 (9.2)	47 (10.9)	
Respiratory symptoms	687 (67.8)	251 (82.0)	436 (61.7)	<0.001
Cough	104 (63.4)	19 (65.5)	85 (63.0)	0.800
Sore throat	23 (14.0)	2 (6.9)	21 (15.6)	0.360
Catarrh	57 (34.8)	9 (31.0)	48 (35.6)	0.640
Respiratory infection, n (%)	746 (73.6)	260 (85.0)	486 (68.7)	<0.001
Other infection, n (%)	368 (36.3)	87 (28.4)	281 (39.8)	0.001
Mixed infection, n (%)	91 (9.0)	31 (10.1)	60 (8.5)	0.401
Acute pneumonia, n (%)	208 (20.5)	40 (13.1)	168 (23.8)	<0.001
Suppurative tonsillitis, n (%)	13 (7.9)	4 (13.8)	9 (6.7)	0.360
Drug therapy, n (%)				<0.001
Antivirus only	180 (17.8)	100 (32.7)	80 (11.3)	
Antibacterial only	386 (38.1)	72 (23.5)	314 (44.4)	
Combined antiviral and antibacterial treatment	195 (19.2)	92 (30.1)	103(14.6)	
Non-antibiotics	252 (24.9)	42 (13.7)	210 (29.7)	
Consultation length (min), median [IQR]	80 [12–179]	21 [1–60]	127 [51–204]	<0.001
Admission, n (%)	86 (8.5)	13 (4.2)	73 (10.3)	0.001
Mortality, n (%)	8 (0.8)	0	8 (1.1)	0.114

Previous lung disease includes chronic obstructive pulmonary disease, asthma, and malignant lung tumor; increased means over the upper limit of the normal range. IQR, interquartile range.

daily number of people who presented at the fever clinic in 2020 was nearly 40% higher than that in 2019 (18 *vs.* 13). Additionally, we found a link between the total number of patients presenting at our fever clinic and the total number of the confirmed COVID-19 cases in Fuzhou city and Fujian province. During the pandemic, with the increasing number of reported COVID-19 cases, the public might have become more inclined to pay attention to their health, resulting in a dramatic increase in fever-clinic visits. This speculation was supported by data from the Mayo Clinic that showed that fever was more prevalent in patients presenting at academic hospitals in the COVID period than in pre-COVID period [506 (6.5%) *vs.* 846 (5.2%)] (13). The fever-clinic service was upgraded to reduce the burden placed on the Emergency Department and minimize the potential spread of SARS-CoV-2 infection and provide more effective patient management and a better visiting program. Our data showed that the upgraded fever-clinic service had the capacity to treat more patients.

We found that the consultation length was longer in 2020 than 2019 [127 (IQR: 51–204) *vs.* 20 (IQR: 1–60) min]. This finding is in line with data from a Beijing tertiary hospital showing that the total length of stay in the fever clinic was 22 [12–47] min before the outbreak compared to 442 [374–636] min after the outbreak (P<0.001) (1). Possible explanations for the extended length of stay include that the upgraded fever clinic needed to perform additional tasks to provide more comprehensive treatment. For example, a major task of the fever clinic before the outbreak was to screen influenza, which usually takes less time than the detection of SARS-COV-2 nucleic acid using RT-PCR. Additionally, waiting for a chest CT scan in 2020 took longer, as the CT room had to be sterilized immediately using ultra-violet light and alcohol spray after each patient use. Only when the negative SARS-COV-2 results were obtained could the patients be transferred to the emergency department resuscitation rooms to minimize the risk of neglecting patients with COVID-19 and cross-infection. Conversely, data from the Mayo Clinic showed that the emergency department length of stay in patients during the COVID-19 period was shorter than pre-COVID-19 [3.2 (2.0–4.5) *vs.* 3.8 (2.5–5.4) h, P<0.001] (13). Increasing consultation duration is highly cost-effective, which may be associated with both patient- and practice-level characteristics.

The proportion of patients with respiratory symptoms presenting at our fever clinic was lower in 2020 than 2019. The wide use of facial masks may partly account for this finding, as PPE is associated with a reduced risk of respiratory infection and air pollution-related upper respiratory responses (14,15). Conversely, a study from Germany showed that the proportion of patients with the chief complaints of shortness of breath (9.2% *vs.* 5.9%, P<0.001) and chest pain (7.1% *vs.* 6.6%, P=0.04) was higher in the COVID period than the pre-COVID-19 period (16). However, a study from Madrid (Spain) showed that the proportion of respiratory symptoms was similar between patients presenting at the emergency department in 2020 and 2019 [269 (16.1%) *vs.* 820 (17%)] (17). These discrepancies may be explained by the mechanisms operating under different processing conditions in different countries. Notably, acute pneumonia was more common in our patients in 2020 than in 2019. This finding is in line with data from the Mayo Clinic showing an increased percentage of respiratory system diagnoses in the COVID-19 period than the same period in 2019 [902 (11.6%) *vs.* 1,034 (6.8%), P<0.001] (13). Taken together, these results highlight that medical visits may have been delayed due to isolation and transportation limitations related to the first-level response to COVID-19.

We found that the admission rate was higher in 2020 than in 2019. A reasonable explanation might include the higher proportion of patients with CT-confirmed acute pneumonia in 2020. There was no significant difference in the in-hospital mortality of the patients in 2020 and 2019 [8 (1.1%) *vs.* 0, P=0.114]. However, our limited sample size did not have adequate statistical power to detect between-group differences in mortality. The question of whether changes in fever-clinic services affect the quality of care and health-related outcomes needs to be investigated in large sample-sized studies.

Limitations

Our study is limited by its retrospective nature and the inclusion of a moderate number of patients treated at a single comprehensive general hospital based in Fuzhou. Thus, our findings may not be generalizable to other countries due to cultural and administrative differences. The COVID-19 pandemic is now under considerable control in Fuzhou and most places in China; however, our findings may provide insights to other fever clinics and public fever-related healthcare services and help to prepare and train hospitals where the pandemic remains a threat.

Conclusions

The COVID-19 pandemic appears to have affected the

volume, chief complaints, and characteristics of patients presenting at the fever clinic. Our findings suggest that practitioners and hospital managers should emphasize the importance of fever-clinic visits and that improved measures need to be implemented.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://atm.amegroups.com/article/view/10.21037/atm-22-1620/rc

Data Sharing Statement: Available at https://atm.amegroups.com/article/view/10.21037/atm-22-1620/dss

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://atm.amegroups.com/article/view/10.21037/atm-22-1620/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and was approved by the Ethics Committee of Fujian Medical University Union Hospital (No. 2020KY095). Individual consent for this retrospective analysis was waived.

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