Original Article

Clinical characteristics of coronavirus disease 2019 in Gansu province, China

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Background: The novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has outbreak in the world. Little is known about the clinical characteristics of patients with SARS-CoV-2 infection in the high-altitude region of China. We reported the clinical characteristics of patients with coronavirus disease 2019 (COVID-19) in Gansu province, China.

Methods: In this retrospective study, patients with laboratory-confirmed SARS-CoV-2 infection were consecutively enrolled from January 21, 2020 to February 11, 2020. The information on the epidemiological, clinical characteristics, laboratory tests, radiological features on admission, treatment and outcome were obtained with the final follow-up of March 13, 2020. On the basis of the median length of hospital stay, patients were further analyzed in two groups (long- *vs.* short-hospital stay).

Results: Of the 86 patients of COVID-19 in 11 cities of Gansu Province, the median hospital stay was 14.0 days (interquartile rang, 11.0–19.0 days). In the overall cohort, the median age was 41.0 years (interquartile rang, 31.0–54.3 years), and 48 (55.8%) patients were female. Forty (46.5%) had a history of exposure to epidemic regions, but none exposed to the Huanan seafood market in Wuhan. Common symptoms included fever (41, 47.7%), and cough (38, 44.2%). On admission, 30 (34.9%) and 58 (67.4%) patients had leukopenia and lymphopenia. According to chest CT scans, 53 (66.3%) of 80 patients showed bilateral pneumonia, and 19 (23.8%) of 80 patients showed unilateral pneumonia. Of the 15 asymptomatic cases, 10 (66.6%) cases were found CT findings of pneumonia. Besides, there were 65 (75.6%) patients with mild and moderate type of COVID-19. All 86 patients received antiviral and traditional Chinese medicine therapy, 53 (61.6%) received antibacterial therapy, and 3 (3.5%) patients received invasive ventilator mechanical ventilation. The proportion of patients received antibiotic treatment in long-hospital stay group was significantly higher than that in the short-hospital stay group (P=0.045). As of March 13, 2020, 84 (97.7%) patients were discharged, and two (2.3%) cases died.

Conclusions: In the Gansu province cohort of 86 patients of COVID-19, most patients were with mild or moderate type, and most asymptomatic cases showed CT imaging findings of SARS-CoV-2 related pneumonia.

Keywords: Coronavirus disease 2019 (COVID-19); severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2); Gansu province

Submitted Apr 04, 2020. Accepted for publication Jun 10, 2020.
doi: 10.21037/apm-20-887
View this article at: http://dx.doi.org/10.21037/apm-20-887

Introduction

The novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has outbreak in the world (1-4). Therefore, World Health Organization characterized the outbreak of coronavirus disease 2019 (COVID-19) as a pandemic on March 11, 2020 (5). Though a recent multicenter study analyzed 1,099 patients of COVID-19 in 30 provinces, autonomous regions, and municipalities in Mainland China (1), no detailed information was reported to clarify the differences among patients in different regions.

Previous studies reported the clinical characteristics of patients with COVID-19 in Hubei Province, Zhejiang Province and Jiangsu Province (6-8), which located in the plain region with humid climate. To date, little is known about the clinical characteristics of COVID-19 patients in the high-altitude region. Gansu Province, located in northwestern China, belongs to the high-altitude region. In addition, the climate of Gansu Province is relatively cold and arid, compared to the plain region, which might affect the spread of SARS-CoV-2. We report the clinical characteristics of patients with COVID-19 in Gansu Province. We present the following article in accordance with the STROBE reporting checklist (available at http://dx.doi.org/10.21037/apm-20-887).

Methods

Study design

In this retrospective study, we consecutively enrolled patients with SARS-CoV-2 infection who were admitted to the designated hospitals of Gansu Province from January 21, 2020 to February 11, 2020. Patients were further classified into two groups as long- and short-hospital stay group based on the median length of hospital stay. This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013) and was approved by ethics commissions of the First Hospital of Lanzhou University (No.: LDYYLL2020-15), with a waiver of written informed consent.

Data collection

Data coordinators in designated hospitals extracted the demographic, epidemiological, clinical symptoms or signs, laboratory tests, radiological findings on admission, and diagnostic classification, treatment and outcome from electronic medical records during hospital stay. All information was collected and analyzed in Lanzhou, the capital city of Gansu Province. Gansu Provincial medical treatment expert group of COVID-19 reviewed and abstracted the data. Standardized case report forms were utilized to collect data. If the core information were unclear or missing, the experts contacted the physicians in charge to clarify or supplement the information.

Definitions

The confirmed standard of COVID-19, according to the Diagnosis and Treatment Program of Novel Coronavirus Pneumonia issued by the National Health Commission of the People's Republic of China (1,9), was defined as positive result of real-time fluorescence polymerase-chain-reaction assay for patients' nasal and pharyngeal swab specimens. The degrees of severity of COVID-19 were classified as mild, moderate, severe, and critical ill. Mild type was defined as mild clinical symptoms and without imaging findings of pneumonia. Patients with moderate type have clinical symptoms (fever or other respiratory symptoms) and imaging findings of pneumonia. Patients with severe type should meet any of the following standards: (I) respiratory distress, respiratory rate ≥30 times/min; (II) oxygen saturation ≤93% at rest; (III) partial pressure of oxygen (PaO_2)/fraction of inspired oxygen (FiO_2) ≤300 mmHg (the PaO_2/FiO_2 should be corrected according to the following formula: $PaO_2/FiO_2 \times$ [atmospheric pressure (mmHg)/760] in the high altitude area (more than 1, 000 meters above sea level). And patients showing a rapid progression (>50%) on chest imaging within 24–48 hours should be regarded as severe type. Besides, patients with critical ill type should meet any of the following standards: (I) respiratory failure, and required mechanical ventilation;

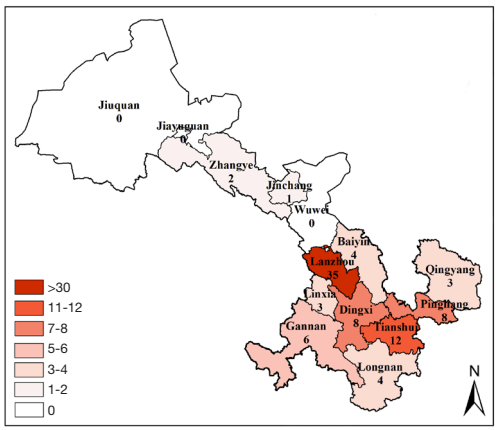

Figure 1 The distribution and number of patients with SARS-CoV-2 infection in Gansu province. SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

(II) shock; (III) complicated extrapulmonary organ failure and needed intensive care in the intensive care unit (9). In addition, imported cases were defined as a case that had exposure history of epidemic regions within 14 days before illness onset. Second-generation cases were defined as a case that directly contacted with imported patients. Unknown source of infection cases was defined as a case had unknown information regarding the exposure history. Patients were discharged once the results of two real-time fluorescence polymerase-chain-reaction tests taken 24 hours apart were negative for SARS-CoV-2 antigens.

Statistical analysis

Categorical data were expressed in numbers (percentages), and chi-square test was used for categorical variables as appropriate. Continuous variables were expressed as median [interquartile range (IQR)], and comparisons between groups were performed using independent samples *t*-test. All statistical analysis was performed with SPSS software version 24.0. A P value less than 0.05 was considered as statistical difference.

Results

Clinical characteristics

As of February 11, 2020, 86 laboratory-confirmed patients of COVID-19 were identified in 11 cities across Gansu Province (*Figure 1*). Of them, 35 (40.7%) patients had been admitted to designated hospitals in Lanzhou, the capital of Gansu Province. In our cohort, the median hospital stay was 14.0 days (IQR, 11.0–19.0 days). On the basis of the median hospital stay, we divided the cohort into two groups as the long-hospital stay group (n=44) defined as stay in hospital for equal or more than 14 days, and the short-hospital stay group (n=42) defined as stay in hospital for less than 14 days.

As shown in *Table 1*, the median age of the 86 patients was 41.0 years (IQR, 31.0–54.3 years), and the age ranged from 1 to 94 years. The proportions in age distribution were summarized in *Table 1*. Forty-eight (55.8%) patients were female. Of the 86 cases, 14 (16.3%) had comorbidities, including hypertension (6, 7.0%), diabetes (4, 4.7%), digestive disease (2, 2.3%), bronchial asthma (1, 1.2%), malignancy (1, 1.2%), cerebral infarction (1, 1.2%), and nephrotic syndrome (1, 1.2%). There were 40 (46.5%) imported cases, 36 (41.9%) second-generation cases, and 10 (11.6%) unknown source of infection cases (*Table 1*). None had a history of exposure to the Huanan seafood market in Wuhan, China.

Clinical manifestations

Patients had clinical symptoms of fever (41, 47.7%), cough (38, 44.2%), sore throat (16, 18.6%), myalgia (14, 16.3%), headache (11, 12.8%), shortness of breath (6, 7.0%), and diarrhea (1, 1.2%). Among 86 patients with SARS-CoV-2 infection, 16 (18.6%) cases were asymptomatic infection on admission. There were no significant different of symptoms of patients in two groups (*Table 1*).

Laboratory tests and radiological findings

On admission, 30 (34.9%) and 58 (67.4%) patients had leukopenia and lymphopenia, respectively. Eosinophilic neutropenia was present in 62 (72.1%) patients. Most patients showed the elevated levels of C-reactive protein (43, 50.0%), and erythrocyte sedimentation (42, 48.8%). Notably, the levels of γ-glutamyl transpeptidase (GGT) and glucose were significantly higher in long-hospital stay group than that of patients in short-hospital stay group. However, the abnormal proportion of GGT and glucose in two groups was not with statistical difference (*Table 2*). Other laboratory tests were summarized in *Table 2*.

All patients underwent chest-imaging examinations on admission. Twelve (14.0%) patients underwent chest X-ray, and only 4 (33.3%) of 12 cases were found abnormalities. Eighty (93%) patients underwent chest CT scan, and 72

Table 1 Characteristics of patients with COVID-19 on admission in Gansu province

Characteristics	All patients (n=86)	Short-hospital stay group (n=42)	Long-hospital stay group (n=44)	P value
Age, years				
Median (IQR, years)	41.0 (31.0–54.3)	40.5 (29.0–55.3)	42.5 (31.3–53.8)	0.789
Range	1–94	1–94	20–69	
≤29	22 (25.6%)	12 (28.6%)	10 (22.7%)	
30–39	15 (17.4%)	8 (19.0%)	7 (15.9%)	
40–49	15 (17.4%)	8 (19.0%)	7 (15.9%)	
50–59	14 (16.3%)	6 (14.3%)	8 (18.2%)	
≥60	16 (18.6%)	8 (19.0%)	8 (18.2%)	
Sex				0.135
Female	48 (55.8%)	27 (64.3%)	21 (47.7%)	
Male	38 (44.2%)	15 (35.7%)	23 (52.3%)	
Type of infection				0.483
Imported case	40 (46.5%)	21 (50.0%)	19 (43.2%)	
Second-generation case	36 (41.9%)	15 (35.7%)	21 (47.7%)	
Unknown source case	10 (11.6%)	6 (14.3%)	4 (9.1%)	
Comorbidities	14 (16.3%)	6 (14.3%)	8 (18.2%)	0.772
Hypertension	6 (7.0%)	1 (2.4%)	5 (11.4%)	0.203
Diabetes	4 (4.7%)	1 (2.4%)	3 (6.8%)	0.616
Digestive disease	2 (2.3%)	1 (2.4%)	1 (2.3%)	1.000
Bronchial asthma	1 (1.2%)	1 (2.4%)	0 (0.0%)	0.488
Cerebral infarction	1 (1.2%)	0 (0.0%)	1 (2.3%)	0.465
Nephrotic syndrome	1 (1.2%)	1 (2.4%)	0 (0.0%)	0.488
Hyperthyroidism	1 (1.2%)	1 (2.4%)	0 (0.0%)	0.488
Symptoms				
Fever	41 (47.7%)	19 (45.2%)	22 (50.0%)	0.666
Cough	38 (44.2%)	19 (45.2%)	19 (43.2%)	1.000
Sore throat	16 (18.6%)	10 (23.8%)	6 (13.6%)	0.274
Myalgia	14 (16.3%)	7 (16.7%)	7 (15.9%)	1.000
Headache	11 (12.8%)	8 (19.0%)	3 (6.8%)	0.113
Shortness of breath	6 (7.0%)	5 (11.9%)	1 (2.3%)	0.106
Diarrhea	1 (1.2%)	1 (2.4%)	0 (0.0%)	0.488

P values comparing short hospital stay group and long hospital stay group patients, using the chi-square test or independent samples *t*-test. COVID-19, coronavirus disease 2019; IQR, interquartile range.

Table 2 Laboratory tests and radiological findings of patients with COVID-19 on admission

Variables	All patients (n=86)	Short-hospital stay group (n=42)	Long-hospital stay group (n=44)	Normal range	P value
Blood routine					
Leucocytes (×10^9/L)	4.9 (3.4–6.2)	4.9 (3.4–6.4)	4.7 (3.6–5.9)	4–10	0.769
<4.0	30 (34.9%)	15 (35.7%)	15 (34.1%)		1.000
>10.0	5 (5.8%)	2 (4.8%)	3 (6.8%)		
Neutrophils (×10^9/L)	2.8 (1.9–4.1)	2.7 (1.7–4.5)	2.8 (2–3.8)	2–7	0.635
<2.0	22 (25.6%)	13 (31.0%)	9 (20.5%)		0.523
>7.0	6 (7%)	3 (7.1%)	3 (6.8%)		
Lymphocytes (×10^9/L)	1.2 (0. 9–1.7)	1.1 (0.9–1.5)	1.2 (0.9–1.8)	1.5–4	0.736
<1.5	58 (67.4%)	31 (73.8%)	27 (61.4%)		0.092
>4.0	2 (2.3%)	2 (4.8%)	0 (0.0%)		
Eosinophils (×10^9/L)	0.02 (0.01–0.06)	0.03 (0.01–0.06)	0.01 (0.00–0.03)	0.05–0.5	0.116
<0.05	62 (72.1%)	28 (66.7%)	34 (77.3%)		0.339
Platelets (×10^9/L)	167.5 (129.3–200.3)	176 (125.8–224.8)	166 (132.5–186.5)	100.0–300.0	0.490
<100	9 (10.5%)	4 (9.5%)	5 (11.4%)		0.898
>300	3 (3.5%)	2 (4.8%)	1 (2.3%)		
Blood biochemistry					
ALT (U/L)	21 (14.6–32.8)	20.5 (14.0–30.5)	21 (14.6–37.5)	5.0–40.0	0.666
>40.0	4 (4.7%)	1 (2.4%)	3 (6.8%)		0.616
AST (U/L)	24.5 (19.4–31.0)	27.5 (17.8–34.0)	23.2 (20.0–29.8)	8.0–40.0	0.667
>40.0	3 (3.5%)	2 (4.8%)	1 (2.3%)		0.612
GGT (μ/L)	25.0 (15.0–40.2)	20.0 (13.8–30.6)	30.0 (19.4–56.8)	11.0–50.0	0.027*
>50.0	14 (16.3%)	4 (9.5%)	10 (22.7%)		0.119
Total bilirubin (μmol/L)	12.6 (8.8–15.9)	12.6 (8.4–17.1)	12.1 (8.4–15.9)	0.0–21.0	0.339
>21.0	4 (4.7%)	1 (2.4%)	3 (6.8%)		0.616
Albumin (g/L)	43.3 (39.6–46.9)	42.5 (38.0–47.2)	43.6 (41.2–46.3)	40.0–55.0	0.922
<32.0	1 (1.2%)	1 (2.4%)	0 (0%)		0.488
LDH (U/L)	196.0 (166.5–247.0)	195.0 (163.0–263.5)	201.0 (168.0–236.3)	120.0–240.0	0.799
>240.0	21 (24.4%)	12 (28.6%)	9 (20.5%)		0.448
BUN (mmol/L)	3.9 (3.1–5.2)	4.5 (3.1–5.3)	3.7 (3.1–5.2)	2.9–7.1	0.545
<2.9	17 (19.8%)	7 (16.7%)	10 (22.7%)		0.621
>7.1	12 (14.0%)	5 (11.9%)	7 (15.9%)		
Serum creatinine (μmol/L)	61.0 (52.1–75.8)	62.5 (49.2–77.3)	60.0 (54.0–74.8)	53.0–106.0	0.976
>106.0	2 (2.3%)	1 (2.4%)	1 (2.3%)		1.000
Glucose (mmol/L)	5.4 (5.0–6.6)	5.3 (4.9–5.9)	5.9 (5.1–7.1)	3.9–6.1	0.035*
>11.1	4 (4.7%)	2 (4.8%)	2 (4.5%)		1.000

Table 2 (*Continued*)

Table 2 (*Continued*)

Variables	All patients (n=86)	Short-hospital stay group (n=42)	Long-hospital stay group (n=44)	Normal range	P value
Creatine kinase (U/L)	69.0 (49.0–109.6)	64 (47.5–116.0)	70 (54.0–114.3)	<171	0.408
>171.0	5 (5.8%)	3 (7.1%)	2 (4.5%)		1.000
Creatine kinase-MB (U/L)	12.0 (10.0–16.0)	11.5 (8.3–15.9)	13 (11.0–16.1)	<25	0.139
>25.0	5 (5.8%)	3 (7.1%)	2 (4.5%)		1.000
Coagulation function					
APTT (s)	31.9 (26.3–38.0)	34.3 (28.9–38.7)	30.1 (25.3–37.0)	21.0–37.0	0.112
>49.0	1 (1.2%)	0 (0.0%)	1 (2.3%)		1.000
PT (s)	11.6 (10.1–13.0)	11.3 (9.9–12.8)	11.9 (10.3–13.0)	10.5–13.5	0.198
>15.5	0 (0.0%)	0 (0.0%)	0 (0.0%)		1.000
INR	1.0 (0.8–1.1)	1.0 (0.8–1.1)	1.0 (0.9–1.1)	0.8–1.13	0.283
>1.13	13 (15.1%)	4 (9.5%)	9 (20.5%)		0.366
D-dimer (μg/L)	0.3 (0.2–0.5)	0.3 (0.1–0.6)	0.3 (0.2–0.5)	0.0–0.5	0.773
>0.5	16 (18.6%)	9 (21.4%)	7 (15.9%)		0.399
Infection-related biomarkers					
CRP (mg/L)	4.9 (0.1–14.1)	3.1 (0.0–12.7)	10.0 (1.4–16.0)	0.0–5.0	0.111
>5.0	43 (50.0%)	19 (45.2%)	24 (54.5%)		0.370
PCT (ng/mL)	0.05 (0.02–0.10)	0.06 (0.01–0.11)	0.05 (0.02–0.12)	0.0–0.5	0.844
>0.1	17 (19.8%)	7 (16.7%)	10 (22.7%)		0.778
ESR (mm/h)	24.0 (11.0–43.0)	24.0 (10.5–51.0)	24.5 (10.3–43.0)	0.0–20.0	0.996
>20.0	42 (48.8%)	20 (47.6%)	22 (50.0%)		1.000
Radiological findings					
Chest X-ray	12 (14.0%)	7 (16.7%)	5 (11.4%)		
Abnormalities	4 (4.7%)	2 (4.8%)	2 (4.5%)		1.000
Chest CT	80 (93.0%)	39 (92.9%)	41 (93.2%)		
Abnormalities	72 (83.7%)	36 (85.7%)	36 (81.8%)		1.000

P values comparing short hospital stay group and long hospital stay group patients, using the chi-square test or independent samples *t*-test. *Statistical difference. COVID-19, coronavirus disease 2019; ALT, alanine aminotransferase; AST, aspartate transaminase; GGT, γ-glutamyl transpeptidase; LDH, lactate dehydrogenase; BUN, blood urea nitrogen; APTT, activated partial thromboplastin time; PT, prothrombin time; PCT, procalcitonin; ESR, erythrocyte sedimentation rate; INR, international normalized ratio; CRP, C-reactive protein.

(90%) of 80 patients were found abnormalities. Of the 15 patients with asymptomatic infection, 10 (66.7%) cases were found CT findings of SARS-CoV-2 related pneumonia. Among 80 patients with CT, 53 (66.3%) showed bilateral pneumonia, and 19 (23.8%) showed unilateral pneumonia (*Table 2*). The typical abnormal CT imaging findings included ground-glass opacity, patchy shadow and consolidation in lungs. There was no statistical difference in radiological findings between two groups (*Table 2*).

Treatment and outcome

Of 86 patients with COVID-19, there were 65 (75.6%) patients with mild and moderate type, 16 (18.6%) cases

Table 3 Clinical treatments and outcomes of patients with COVID-19 on admission in Gansu province

Variables	All patients (n=86)	Short-hospital stay group (n=42)	Long-hospital stay group (n=44)	P value
Clinical type				
Mild and moderate type	65 (75.6%)	34 (81.0%)	31 (70.5%)	0.319
Severe type	16 (18.6%)	5 (11.9%)	11 (25.0%)	0.167
Critical ill type	5 (5.8%)	3 (7.1%)	2 (4.5%)	0.673
Treatment				
Oxygen therapy	59 (68.6%)	30 (71.4%)	29 (65.9%)	0.646
Mechanical ventilation	5 (5.8%)	3 (7.1%)	2 (4.5%)	0.673
Non-invasive (i.e., face mask)	2 (2.3%)	1 (2.4%)	1 (2.3%)	1.000
Invasive	3 (3.5%)	2 (4.8%)	1 (2.3%)	0.612
Antiviral treatment	86 (100.0%)	42 (100.0%)	44 (100.0%)	1.000
Antibiotic treatment	53 (61.6%)	21 (50.0%)	32 (72.7%)	0.045*
Glucocorticoids	31 (36.0%)	14 (33.3%)	17 (38.6%)	0.658
Intravenous immunoglobulin	10 (11.6%)	3 (7.1%)	7 (15.9%)	1.000
Clinical outcome				0.143
Discharged	84 (97.7%)	40 (95.2%)	44 (100.0%)	0.236
Died	2 (2.3%)	2 (4.8%)	0 (0.0%)	0.236
Hospital stay (days)	14.0 (11.0–19.0)	11.0 (9.0–12.0)	19.0 (16.0–23.0)	0.000*

P values comparing short hospital stay group and long hospital stay group patients, using the chi-square test or independent samples *t*-test. *, statistically significant difference. COVID-19, coronavirus disease 2019.

with severe type, and 5 (5.8%) cases with critical ill type. All patients received antiviral treatment, including interferon, arbidol, ribavirin, lopinavir, and ritonavir, and traditional Chinese medicine therapy. Fifty-three (61.6%) patients received intravenous antibacterial therapy, 31 (36%) patients received systemic glucocorticoids therapy, and 10 (11.6%) patients received intravenous immunoglobulin therapy. The proportion of patients who received antibiotic treatment in long-hospital stay group was significantly higher than that in short-hospital stay group (P=0.045). In addition, 59 (68.6%) patients received oxygen therapy, 2 (2.3%) patients received noninvasive ventilator mechanical ventilation and 3 (3.5%) patients received invasive ventilator mechanical ventilation (*Table 3*). As of March 13, 2020, 84 (97.7%) patients were discharged, and two (2.3%) cases died (*Table 3*).

Discussion

This multicenter study was the largest case series of patients with SARS-CoV-2 infection in high-altitude region, to our best knowledge. As of February 11, 2020, 86 patients of COVID-19 were consecutively recruited from 11 cities in Gansu Province. We observed that the majority (55.8%) of patients with SARS-CoV-2 infection in Gansu Province were female, which were different from other reports in plain region (1,6). The patient's age ranged from 1 to 94 years, with similar proportions in each age distribution (10). It suggested that SARS-CoV-2 infection might be gender-neutral and susceptible to the populations of all ages in high-altitude region.

The early and effective epidemiological investigation in Gansu Province made suspected infections and close

contacts tracked and segregated for clinical observations. Therefore, of the 86 confirmed cases, the median day from illness onset to admission (3.5 days) was shorter than that of previous studies (1,6,7). Besides, the proportion of mild and moderate type of COVID-19 in Gansu province was 75.6%. In our cohort, fever was only identified in 47.7% cases on admission, similar to the ratio of national cohort (1), and 18.6% cases were asymptomatic infections. Thus, physicians should be alert to the patients with epidemic exposure history, even if no fever or any symptom (11,12). Laboratory results and imaging characteristics of COVID-19 patients in Gansu Province were similar to that of previous reports (1,4). Notably, 66.7% asymptomatic patients with SARS-CoV-2 infection had viral pneumonia-related CT imaging findings on admission. The results indicated that the diagnosis of COVID-19 could not be ruled out in suspected cases without any symptoms (9). Physicians and radiologists should remain cautious to suspicious cases with a history of epidemic exposure, and recommend both CT scan and SARS-CoV-2 nucleic acid tests (12).

Since it is reported that traditional Chinese medicine might be helpful to relieve symptom and accelerate rehabilitation (13,14), all patients in our cohort received traditional Chinese medicine therapy. More evidence is still needed to support the effect of traditional Chinese medicine on SARS-CoV-2 clearance and patients' outcome (15). More important, a higher proportion of patients received antibiotics in the long-hospital stay group, which suggested that secondary bacterial infections might cause the extended hospital stay. The mortality rate of COVID-19 in Gansu Province was 2.3%, which was comparable to that of the national level (1). Therefore, the restrictive effect of high-altitude and dry climate on SARS-CoV-2 remains unknown.

The study has several limitations. First, our study included only cases of COVID-19 in Gansu province, and no cases were collected from other high-altitude regions. Further prospective studies are needed to cover a wider population to report the clinical characteristics of patients with COVID-19 in high-altitude region. Besides, incomplete laboratory data in our study should be considered due to the nature of retrospective analysis. Lastly, since imported cases had living or traveling in epidemic region for a long time, it is hard to determine the exact time of SARS-CoV-2 exposure. Thus, the study could not analyze the incubation time from viral infection to symptoms onset.

In summary, in the Gansu province cohort of 86 patients with COVID-19, most patients were with mild or moderate type, and most asymptomatic cases showed CT imaging findings of SARS-CoV-2 related pneumonia.

Acknowledgments

Funding: This study was supported by Gansu Provincial COVID-19 Science and Technology Major Project.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at http://dx.doi.org/10.21037/apm-20-887

Data Sharing Statement: Available at http://dx.doi.org/10.21037/apm-20-887

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/apm-20-887). 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. This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013) and was approved by ethics commissions of the First Hospital of Lanzhou University (No.: LDYYLL2020-15), with a waiver of written informed consent.

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Cite this article as: Yue H, Bai X, Wang J, Yu Q, Liu W, Pu J, Wang X, Hu J, Xu D, Li X, Kang N, Li L, Lu W, Feng T, Ding L, Li X, Qi X; for the Gansu Provincial Medical Treatment Expert Group of COVID-19. Clinical characteristics of coronavirus disease 2019 in Gansu province, China. Ann Palliat Med 2020;9(4):1404-1412. doi: 10.21037/apm-20-887

