

Epidemiologic and Clinical Characteristics of 26 Cases of COVID-19 Arising from Patient-to-Patient Transmission in Liaocheng, China

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Lizhen Wang¹
Yueting Duan¹
Wenming Zhang²
Juan Liang²
Jianxiang Xu³
Yongqing Zhang³
Changgang Wu³
Yangling Xu³
Hua Li²

¹Department of Tuberculosis, Liaocheng Infectious Disease Hospital, Liaocheng, Shandong, People's Republic of China;

²Intensive Care Unit, Liaocheng Infectious Disease Hospital, Liaocheng, Shandong, People's Republic of China;

³Department of Respiration, Liaocheng Infectious Disease Hospital, Liaocheng, Shandong, People's Republic of China

Introduction: Over 40,000 cases of coronavirus (CoV) disease 2019 (COVID-19) have been confirmed in China. The causative agent, 2019 novel CoV (2019-nCoV), has spread rapidly to more than 25 countries worldwide. Human-to-human transmission has accounted for most of the infections outside Wuhan. Most studies to date on COVID-19 have focused on disease etiology and the genomics of 2019-nCoV, with few reports on the epidemiologic and clinical characteristics of infected patients.

Methods: We report early clinical features of 26 patients with confirmed COVID-19 who were admitted to Liaocheng Infectious Disease Hospital in Shandong Province.

Results: The median age of the 26 patients with COVID-19 in this study was 42 years. The most common occupation was retail staff (16 patients, 61.54%), with 11 patients or their family members working at the same supermarket. Only 2 patients had visited Wuhan since December 2019; the other cases of 2019-nCoV infection arose from patient-to-patient transmission. Twelve patients had more than one sign or symptom; however, seven patients had no sign or symptom. The average time from symptom onset to admission was 4.5 days. CT revealed signs of bronchitis in 2 patients and unilateral and bilateral pneumonia in 9 and 15 patients, respectively. The patients received the following treatments: antiviral therapy (100%), Chinese medicine (76.92%), antibiotics (50%), gastric mucosal protection (19.23%), immunotherapy (7.69%), and glucocorticoids (3.85%). Most patients (25/26) required ≥ 1 treatment.

Discussion: In contrast to previous reports, most patients (24/26) had not been in close contact with individuals from Wuhan. Additionally, 11 patients or their family members worked at the same supermarket, suggesting active viral transmission in a location frequented by a large number of people. Close monitoring is essential for preventing the large-scale spread of the virus in such places.

Keywords: coronavirus disease 2019, human-to-human transmission, epidemiologic characteristics, clinical characteristics

Introduction

Over 40,000 cases of coronavirus (CoV) disease 2019 (COVID-19) have been confirmed in China. The causative agent, 2019 novel CoV (2019-nCoV), has spread rapidly to more than 25 countries worldwide.¹ The mortality rate is reported to be around 1.4%, which is far lower than the rates for the other two coronavirus epidemics that occurred in the 21st century – namely, severe acute respiratory syndrome (SARS)-CoV in 2003 (10%) and Middle East respiratory syndrome (MERS)-CoV in 2012 (37%).^{2,3} The source of infection is potentially traceable to

Correspondence: Hua Li
Department of Respiration, Liaocheng Infectious Disease Hospital, 45 Jianshe Eastern Road, Dongchang, Liaocheng, Shandong 252000, People's Republic of China
Email weiyichunguang@163.com

a seafood market in Wuhan, with many early cases thought to have originated from zoonotic or environmental exposure.⁴ Human-to-human transmission has accounted for most of the infections outside Wuhan.⁵ Most studies to date on COVID-19 have focused on disease etiology and the genomics of 2019-nCoV,^{6–8} with few reports on the epidemiologic and clinical characteristics of infected patients.^{5,9} Here we report early clinical features of 25 patients with confirmed COVID-19 who were admitted to Liaocheng Infectious Disease Hospital in Shandong Province.

Methods

This study was approved by the ethics committee of Liaocheng Infectious Disease Hospital, and written informed consent was obtained from patients or their family members. This study was conducted in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Patients were hospitalized from January 31 to February 12, 2020, at Liaocheng Infectious Disease Hospital, Shandong Province, China, and were diagnosed with COVID-19 by expert consensus based on throat and nasopharyngeal swab samples by quantitative PCR assay or gene sequencing. Chest computed tomography (CT) was also performed on all patients. Data were obtained from patients' medical records and verified by two physicians.

Results

The median age of the 26 patients with COVID-19 in this study was 42 years (25th to 75th percentile, 34–53 years); 11 patients were male, 5 were smokers, and 3 were students (aged 10, 15, and 18 years). The most common occupation was retail staff (16 patients, 61.54%), with 11 patients or their family members working at the same supermarket. Comorbidities were relatively infrequent (Table 1).

Only 2 patients had visited Wuhan since December 2019; the other cases of 2019-nCoV infection arose from patient-to-patient transmission. Twelve patients had more than one sign or symptom; fever was the first symptom in 14 (53.85%) cases, followed by cough (30.77%), expectoration (23.08%), sore throat (11.54%), fatigue (7.69%), rhinorrhea (7.69%), headache (3.85%), and shortness of breath (3.85%). Seven patients had no sign or symptom. The average time from symptom onset to admission was 4.5 days. CT revealed signs of bronchitis in 2 patients and unilateral and bilateral pneumonia in 9 and 15 patients, respectively (Table 2).

Hematologic and biochemical parameters of the patients are shown in Table 3. At the time of admission, 5 patients

Table 1 Demographics and Baseline Characteristics of 26 Patients with COVID-19 in Liaocheng Infectious Disease Hospital (Jan 31–Feb 12, 2020)

	n=26
Age (y)	42.0 (33.5–53.3)
Sex (Female/male)	15/11
Smoking, n (%)	5 (19.2%)
Occupation, n (%)	
Staff	16 (61.5%)
Agricultural worker	2 (7.7%)
Self-employed	1 (3.9%)
Retired	4 (15.4%)
Student	3 (11.5%)
Comorbidity, n (%)	
Hypertension	5 (19.2%)
Diabetes	3 (11.5%)
Cardiovascular and cerebrovascular diseases	2 (7.7%)
Malignant tumour	1 (3.9%)
HIV infection	1 (3.9%)
Previous surgeries	2 (7.7%)
More than one comorbidity	3 (11.5%)

Note: Variables presented as median (interquartile range) or number of patients, n (%).

Abbreviation: HIV, human immunodeficiency virus.

(19.23%) had leucocyte counts below the normal range and 1 (3.85%) had a count above the normal range. Neutrophil counts were below and above the normal range in 3 (11.54%) and 2 (7.69%) patients, respectively. Lymphocyte counts were below the normal range in 11 patients (42.31%). Monocyte and platelet counts were higher than normal in 1 (3.85%) and 4 (15.38%) patients, respectively. Hemoglobin level was below the normal range in 5 patients (19.23%) and higher than normal in 2 patients (7.69%).

Albumin level in 5 patients (19.23%), blood urea nitrogen in 1 patient (3.85%), and serum creatinine in 7 patients (26.92%) were below the normal range, whereas total bilirubin in 1 patient (3.85%), lactate dehydrogenase in 6 patients (23.08%), creatine kinase-MB in 2 patients (7.69%), and glucose concentration in 4 patients (15.38%) were higher than normal.

Prothrombin time was higher and lower than normal in 2 (7.69%) and 1 (3.85%) patient, respectively. Two patients each had activated partial thromboplastin time above and below the normal range. d-Dimer level was above the normal range in 1 patient (3.85%). Procalcitonin in 24 patients (92.31%), hypersensitive C-reactive protein in 14 patients (53.85%), and serum amyloid A in 16 patients (61.54%) were higher than normal.

Table 2 Clinical Characteristics and Treatment of 26 Patients with COVID-19 in Liaocheng Infectious Disease Hospital (Jan 31–Feb 12, 2020)

	n=26
Time from onset to admission (d)	4.5 (0.0–7.3)
Signs and Symptoms at Admission, n (%)	
Fever	14 (53.9%)
Cough	8 (30.8%)
Expectoration	6 (23.1%)
Shortness of breath	1 (3.9%)
Sore throat	3 (11.5%)
Fatigue	2 (7.7%)
Headache	1 (3.9%)
Rhinorrhoea	2 (7.7%)
Diarrhoea	0 (0.0%)
More than one sign or symptom	12 (46.2%)
No sign or symptom	7 (26.9%)
Contact with individuals from Wuhan, n (%)	2 (7.7%)
Chest CT Findings, n (%)	
Unilateral pneumonia	9 (34.6%)
Bilateral pneumonia	15 (57.7%)
Treatment, n (%)	
Antiviral treatment	26 (100.0%)
Antibiotic treatment	13 (50.0%)
Chinese medicine	20 (76.9%)
Glucocorticoids	1 (3.9%)
Gastric mucosal protection	5 (19.2%)
Immunotherapy	2 (7.7%)
Oxygen therapy	3 (11.5%)
More than one treatment,	25 (96.2%)

Note: Variables presented as median (interquartile range) or number of patients, n (%).

The patients received the following treatments: antiviral therapy (100%), Chinese medicine (76.92%), antibiotics (50%), gastric mucosal protection (19.23%), immunotherapy (7.69%), and glucocorticoids (3.85%). Most patients (25/26) required ≥ 1 treatment (Table 2).

Discussion

We report here a cohort of 25 cases of laboratory-confirmed COVID-19 at our hospital caused by patient-to-patient transmission of 2019-nCoV. As a result of consistent and effective prevention and treatment measures, all of the cases have thus far been mild. However, as of February 12, 2020, the number of patients with COVID-19 has far exceeded the observed rates of SARS and MERS.¹ This may be attributable to a failure to identify the etiologic agent early on and the ability of 2019-nCoV to rapidly spread from person to

Table 3 Laboratory Results of 26 Patients with COVID-19 in Liaocheng Infectious Disease Hospital (Jan 31–Feb 12, 2020)

	n=26
Blood Routine	
Leucocytes ($\times 10^9/L$; normal range 4.0–10.0)	5.3 (4.3–6.6)
Increased	1 (3.9%)
Decreased	5 (19.2%)
Neutrophils ($\times 10^9/L$; normal range 2.0–7.7)	3.7 (2.8–4.9)
Increased	2 (7.7%)
Decreased	3 (11.5%)
Lymphocytes ($\times 10^9/L$; normal range 0.8–4.0)	0.8 (0.6–1.4)
Decreased	11 (42.3%)
Monocyte ($\times 10^9/L$; normal range 0.12–0.8)	0.4 (0.3–0.6)
Increased	1 (3.9%)
Platelets ($\times 10^9/L$; normal range 100.0–300.0)	191.0 (156.8–250.3)
Increased	4 (15.4%)
Haemoglobin (g/L; normal range 110.0–160.0)	140.0 (120.8–153.3)
Increased	2 (7.7%)
Decreased	5 (19.2%)
Coagulation Function	
Prothrombin time (s; normal range 11.0–14.0)	12.6 (12.2–13.1)
Increased	2 (7.7%)
Decreased	1 (3.9%)
Activated partial thromboplastin time (s; normal range 22.0–38.0)	28.7 (25.5–33.5)
Increased	2 (7.7%)
Decreased	2 (7.7%)
D-dimer ($\mu g/mL$; normal range 0.0–1.0)	0.3 (0.2–0.4)
Increased	1 (3.9%)
Blood Biochemistry	
Albumin (g/L; normal range 35.0–55.0)	38.7 (35.7–40.6)
Decreased	5 (19.2%)
Alanine aminotransferase (U/L; normal range 0.0–40.0)	18.0 (14.0–23.0)
Aspartate aminotransferase (U/L; normal range 0.0–40.0)	19.5 (16.8–21.3)
Total bilirubin ($\mu mol/L$; normal range 0.0–21.0)	12.2 (10.3–16.3)
Increased	1 (3.9%)
Blood urea nitrogen (mmol/L; normal range 1.69–8.34)	3.2 (2.7–3.5)
Decreased	1 (3.9%)
Serum creatinine ($\mu mol/L$; normal range 44.0–97.0)	55.6 (42.0–61.6)
Decreased	7 (26.9%)
Creatine kinase (U/L; normal range 24.0–194.0)	67.5 (50.8–88.8)
Lactate dehydrogenase (U/L; normal range 109.0–245.0)	216.5 (180.5–240.3)
Increased	6 (23.1%)

(Continued)

Table 3 (Continued).

	n=26
Creatine kinase-MB (U/L; normal range 0.0–2.5.0) Increased	13.0 (11.0–17.0) 2 (7.7%)
Glucose (mmol/L; normal range 3.90–6.44) Increased	5.1 (4.9–5.6) 4 (15.4%)
Infection-Related Biomarkers	
Procalcitonin (ng/mL; normal range 0.0–0.05) Increased	0.2 (0.1–0.3) 24 (92.3%)
Hypersensitive C-reactive protein (mg/L; normal range 0.5–10.0) Increased	11.5 (1.4–28.7) 14 (53.9%)
Serum amyloid A (mg/L; normal range 0.0–10.0) Increased	12.7 (5.0–66.9) 16 (61.5%)

Note: Variables presented as median (interquartile range) or number of patients, n (%).

person, rather than greater infectivity of the virus itself.^{10,11} In contrast to previous reports, most patients (24/26) had not been in close contact with individuals from Wuhan.¹² Additionally, 11 patients or their family members worked at the same supermarket, suggesting active viral transmission in a location frequented by a large number of people. Close monitoring is essential for preventing the large-scale spread of the virus in such places.¹³

Most of the infected patients were healthy adults; exceptions were 1 patient aged 77 years and 2 students aged 15 and 10 years. The demographic data also diverged from previous research, which could be related to the epidemiologic characteristics of our cohort such as familial aggregation and patient-to-patient transmission, rather than a lower resistance to infection or impaired immune function.¹³ However, the clinical features and laboratory test results were similar to those reported in a study of 99 cases of 2019-nCoV-related pneumonia in Wuhan.⁴ Although our study was limited by a lack of critically ill patients and short admission times, our findings nonetheless provide evidence of person-to-person transmission of 2019-nCoV within a family home or in densely populated public places such as a supermarket. Stricter precautions are necessary to prevent 2019-nCoV transmission at the early stage of infection, even outside of Wuhan.

Author Contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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