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Clinical characteristics of diarrhea in 90 cases with COVID-19: A descriptive study

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ABSTRACT

Background: The novel coronavirus disease (COVID-19) has spread worldwide. Herein, we aimed to clarify the epidemiological and clinical characteristics of patients presenting with diarrhea.

Methods: A descriptive design was adopted from Jan 10 to Feb 17, 2020. All the cases included were diagnosed with COVID-19 under the interim guidance of the WHO.

Results: 912 patients with COVID-19 were admitted to hospital, in which, 90 cases (9.87%) presented with diarrhea. Among the 90 cases, 8 cases (9%) presented with diarrhea as the initial symptom, and 24%, 17%, and 24% of the patients complained of nausea, vomiting, and poor appetite, respectively. The most common fecal characteristics on admission were watery stool (64%) and mushy stool (28%). For the defecation frequency, 37% of the cases defecated over three times a day. The median time from illness onset to diarrhea was 3.0 days (IQR 0.0–5.0) and the median duration of diarrhea was 5.0 days (IQR 2.0–9.3).

Conclusion: Clinicians are required to promptly identify the patients with initial diarrhea symptoms and pay adequate attention to the nutrient requirements of the patients with diarrhea during hospitalization. Standardized management is also recommended for the discharge of the patients to avoid potential fecal-oral transmission.

1. Introduction

The novel coronavirus disease (COVID-19) has spread worldwide and the rapidly increasing cases indicate that COVID-19 can be transmitted from person to person [1]. During the current pandemic, droplets and contact are considered the main transmission routes of the novel coronavirus. Although fever and respiratory signs are the common initial and major symptoms, gastrointestinal (GI) symptoms (i.e. diarrhea) have also been observed in 2%–18.1% of the patients [2–7]. It has been reported that some patients showed only gastrointestinal symptoms without other typical manifestations of the COVID-19 infection but were subsequently confirmed to be infected by testing the collected fecal samples [7–9], suggesting the potential occurrence of fecal-oral transmission. Therefore, it is speculated that the digestive system may serve as an alternative infection route. Among the gastrointestinal symptoms in COVID-19 cases including diarrhea, nausea, vomiting, and abdominal pain, diarrhea is the one that possibly increases the chance of potential fecal-oral transmission but could be easily overlooked by health care workers. Herein, we conducted a comprehensive study on the clinical features of ninety COVID-19 patients with diarrhea as the symptom before admission based on our first-hand experience, aiming to achieve a better understanding of the clinical manifestations of COVID-19 and help the clinicians accurately and promptly identify infected cases.

2. Methods

2.1. Study design and participants

This study was approved by the Medical Ethical Committee of Tongji Hospital (No. TJ-C20200136). We enrolled 90 cases of COVID-19 admitted to our hospital from Jan 10 to Feb 17, 2020, whose diagnosis of COVID-19 was based on the WHO interim guidance. The outcomes of all patients were recorded.

2.2. Data collection

The clinical, laboratory, and treatment outcome data were collected from electronic medical records. The recorded information included demographic data, medical history, underlying comorbidities, symptoms, signs, and laboratory findings. Disease onset was defined as the day when the symptom was noticed. Fecal characteristics during...
3. Results

Among the 912 cases with COVID-19 we retrieved, 90 patients (9.87%) presented with diarrhea, and their demographics, clinical characteristics, and outcomes were summarized, as shown in Table 1. The median age was 61.0 years (IQR 48.3–69.0), ranging from 22 to 82 years, with the number of male cases slightly outnumbering that of female cases. The top two common initial symptoms were fever and cough, followed by diarrhea which occurred in 8 cases (9%). Besides, 24%, 17%, and 24% of the patients complained of nausea, vomiting, and poor appetite, respectively. Comorbidities were presented in over half of the patients, with hypertension being the most common comorbidity, followed by diabetes and coronary heart disease.

The most common fecal characteristics on admission were watery stool (64%) and mushy stool (28%). As for the frequency of diarrhea, 23 (37%) out of 63 cases defecated over three times a day. The number of cases receiving general diet, enteral nutrition, and parenteral nutrition was 89 (99%), 4 (4%), and 2 (2%), respectively (Table 1).

The median time from illness onset to admission was 10.0 days (IQR 6.0–14.0) and the length of stay in hospital was 14.0 days (IQR 9.0–19.0). The median time from illness onset to diarrhea was 3.0 days (IQR 0.0–5.0) and the median duration of diarrhea was 5.0 days (IQR 2.0–9.3). See Table 1 for details.

Laboratory findings are shown in Table 2. Lymphocyte and albumin counts were below normal in 43% and 46% of all the cases, respectively. C-reactive protein levels were elevated in more than two-thirds of all cases. Routine stool examinations showed normal in most of the

| Table 1 | Demographics and clinical characteristics of patients presenting with diarrhea. | Patients (n = 90) |
| --- | --- | --- |
| Age, years | 61.0 (48.3–69.0) | |
| Sex | Male 51 (57%) | |
| Female 39 (43%) | |
| Comorbidity | Hypertension 57 (63%) | |
| Diabetes 18 (20%) | |
| Coronary heart disease 15 (17%) | |
| Pulmonary disease 7 (8%) | |
| Cholecystectomy 5 (6%) | |
| Subgastrctomony 1 (1%) | |
| Duodenal ulcer 2 (2%) | |
| Initial symptom | Fever 65 (72%) | |
| Cough 12 (13%) | |
| Diarrhea 8 (9%) | |
| Dyspnea 3 (3%) | |
| Poor appetite 2 (2%) | |
| Symptoms before admission | Fever 80 (89%) | |
| Cough 62 (69%) | |
| Fatigue 43 (48%) | |
| Dyspnea 28 (31%) | |
| Chest tightness 28 (31%) | |
| Myalgia 19 (21%) | |
| Asthma 17 (19%) | |
| Hemoptysis 2 (2%) | |
| Abdominal pain 6 (7%) | |
| Pharyngalgia 4 (4%) | |
| Abdominal pain 3 (4%) | |
| General diet 89 (99%) | |
| Enteral nutrition 4 (4%) | |
| Parenteral nutrition 2 (2%) | |
| Nutritional patterns during hospitalization | General diet 89 (99%) | |
| Enteral nutrition 4 (4%) | |
| Parenteral nutrition 2 (2%) | |
| None 1 (1%) | |

hospitalization were also included.

2.3. Statistical analysis

Categorical variables were represented by frequency and percentages, and continuous variables were described by mean (SD) if they were normally distributed otherwise by median (IQR). For laboratory results, we had assessed whether the measurements were outside the normal range of laboratory standards of Tongji Hospital. SPSS (version 19.0) was used for all analysis.

| Table 2 | Laboratory findings of patients presenting with diarrhea. | Patients (n = 90) |
| --- | --- | --- |
| Stool routine | Color | White blood cell count, ×10⁹/L |
| Yellow 31/33 (94%) | 7.4 (4.8–12.1) |
| Brown yellow 2/33 (6%) | 12/89 (13%) |
| RBC in stool sample | None 32/33 (97%) | 47/89 (53%) |
| WBC in stool sample | None 33/33 (100%) | 30/89 (34%) |
| Lymphocyte count, ×10⁹/L | <4 | 1.2 (0.7–1.7) |
| <10 | 38/89 (43%) | 51/89 (57%) |
| <1.1 | 116/35 (52%) | Haemoglobin, g/L, 89 cases |
| <1.1 | 35/67 (52%) | 127.0 (115.0–138.0) |
| <1.1 | 32/67 (48%) | Alamine aminotransferase, U/L |
| <41 | 29.0 (15.5–43.5) | ≤41 |
| >41 | 64/89 (72%) | 64/89 (72%) |
| Albumin, g/L | <35 | 25/89 (28%) |
| ≥35 | 41/89 (46%) | 35.7 (31.1–38.3) |
| Sodium, mmol/L | <136 | 10/89 (11%) |
| ≥136 | 79/89 (89%) | 140.2 (138.3–142.4) |
| Potassium, mmol/L | <3.5 | 11/89 (12%) |
| ≥3.5 | 71/89 (80%) | 4.5 (4.0–4.7) |
| <5.1 | 7/89 (8%) | 34.5) |
| >5.1 | 11/89 (12%) | 34.5) |
| Hypersensitive C-reactive protein, mg/L | <1 | 16/89 (18%) |
| <1 | 13/88 (15%) | 16.2 (1.9–78.3) |
| >1 | 15/88 (17%) | 16.2 (1.9–78.3) |
| >3 | 60/88 (68%) | 16.2 (1.9–78.3) |
| D-dimer, ug/mL | <0.5 | 30/73 (41%) |
| ≥0.5 | 14/73 (19%) | 14/73 (19%) |
| ≥1 | 29/73 (40%) | 14/73 (19%) |
| High-sensitivity troponin I, pg/mL | ≤34.2 | 53/70 (76%) |
| >34.2 | 17/70 (24%) | 8.3 (2.6–34.5) |
| BNP (pg/mL) | <116 | 125.0 (27.0–601.0) |
| ≥116 | 32/67 (48%) | 125.0 (27.0–601.0) |
| <116 | 35/67 (52%) | 125.0 (27.0–601.0) |
cases. Hyponatremia and hypokalemia occurred in 10 (11%) and 7 (8%) cases, respectively.

4. Discussion

In this study, 9% and 2% of the 90 patients showed initial symptoms of diarrhea and poor appetite, respectively. Additionally, the first COVID-19 case in the United States also reported a 2-day history of nausea and vomiting on admission, and both the virus nucleic acid tests of the stool and respiratory samples were subsequently confirmed as positive [10]. Such patients might be overlooked, resulting in potentially serious consequences to the patients and a high risk of infecting more people. Thus, it is vital that clinicians are aware of that COVID-19 patients may present with initial gastrointestinal symptoms such as diarrhea, keep appropriate vigilance, and maintain an index of suspicion for early detections, early diagnoses, early isolations, and early interventions.

It is worth noting that COVID-19 patients with mild to moderate liver injuries, including elevated aminotransferases and hyponatremia, have also been reported, and some of the patients had digestive system impairment [11]. In our study, 24% of the patients showed clinical signs of poor nutrition. The reduced susceptibility of albumin to viral infections could be attributed to the loss of nutrients and liver damage. There is a clinical problem in how to meet the nutritional needs of patients, especially severely ill ones. Seriously ill patients who had interrupted oxygen administration when having a meal or going out to the bathroom were found to have repeated drops in oxygen saturation to less than 80%. Severe hypoxia attacks made the condition turn down rapidly since it was difficult to be recovered, resulting in a subsequent multi-organ failure or even sudden death [12]. In fact, these patients generally had difficulty in eating, thus some experts recommend a five-step nutritional therapy [13]. For patients receiving non-invasive ventilator, meals can be offered smaller and more frequently to help increase tolerance. Patients with an intolerance should be given enteral nutrition as soon as possible to help maintain the intestinal mucosal barrier function and supplement the body’s needs. In addition, frequent defecation in patients with diarrhea increases the challenges of caring and the risk of occupational exposure for caregivers.

In a recent study, the testing result of 2019-nCOV RNA in respiratory samples remained positive for median 16.7 days and that of the fecal samples remained positive for median 27.9 days from the symptom onset [14]. It was suggested that the duration of viral shedding in fecal samples could be possibly extended up to 5 weeks after the patients’ respiratory samples tested back to negative. Therefore, positivity for virus RNA in the fecal samples normally lags behind that of the respiratory tract samples. Even though knowledge about the viability of 2019-nCOV is incomplete [15], the virus might remain viable in the environment for days, resulting in the potential fecal-oral transmission, which could even happen after viral clearance in the respiratory tract. Moreover, the asymptomatic transmission had also been reported [16]. Although experts have not suggested any additional testing of fecal samples in the diagnostic procedures for COVID-19, routine testing of virus RNA in stool samples is highly recommended after the clearance of viral RNA in patients’ respiratory samples. Besides, strict precautions to prevent transmission should be taken for patients who are in hospitalization or self-quarantine if their fecal samples have tested positive. A study recently done in China showed that four patients with COVID-19 who met criteria for discharge or discontinuation of quarantine had positive 2019-nCOV RNA test results 5 to 13 days later [17]. This finding suggests that at least a few of discharged patients may still be virus carriers. Therefore, discharge education plays an important role in the management of patients. After discharge, the patients are required to continue undergoing 14 days of medical observation, isolation management, and health monitoring. Finally, patients must take actions to reduce close contact with family members, such as having separate meals, and receive follow-up visits regularly.

5. Conclusion

Clinicians are required to promptly identify the patients with initial diarrhea symptoms and pay adequate attention to the nutrient requirements of the patients with diarrhea during hospitalization. Standardized management is also recommended for the discharge of the patients to avoid potential fecal-oral transmission.

There are also several limitations in this study. Firstly, there were no nucleic acid tests carried out in the fecal samples of all the 90 cases. Secondly, in view of a retrospective study, specific diarrhea conditions in some patients were unknown from the electronic medical records. Further studies need to be conducted on the viability and infectivity of 2019-nCOV in feces.

Ethical statement

This study was approved by the Medical Ethical Committee of Tongji Hospital of Tongji Medical College of Huazhong University of Science and Technology (Grant No. 2020kyfXGYJ023).

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CRediT authorship contribution statement

Yaru Xiao: Data curation, Writing - original draft. Sufang Huang: Conceptualization, Supervision, Writing - review & editing. Li Yan: Funding acquisition, Methodology. Hui Wang: Conceptualization, Methodology. Fang Wang: Visualization. Ting Zhou: Investigation. Juan Deng: Software. Mei He: Investigation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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