



**Original Article**

## Prevalence of Gastrointestinal Symptoms in Patients with COVID-19 in Jahrom County, Fras Province, Southwest of Iran

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### ABSTRACT

**Background:** While classic symptoms of coronavirus disease 2019 (COVID-19) are well known, monitoring symptoms with less frequency is critical for controlling COVID-19 transmission.

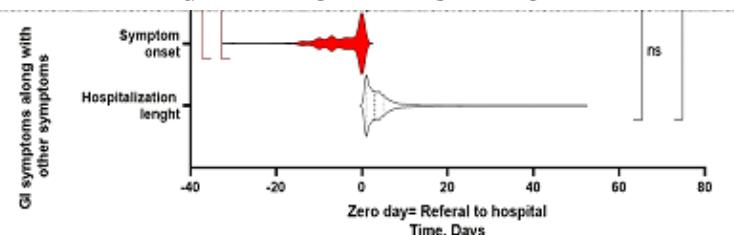
**Objectives:** This study aimed to evaluate the association of gastrointestinal (GI) symptoms with nasal swab Polymerase Chain Reaction (PCR) test positivity and high-resolution CT (HRCT) findings in favor of COVID-19 in patients suspected of COVID-19 in Jahrom city.

**Methods:** This cross-sectional study was performed on 2519 COVID-19 suspected patients in Peymaniye Hospital, Jahrom city, from January 2020 to July 2020. In addition to nasal swab PCR test, diagnostic data, various clinical symptoms, and demographic data were gathered. Patients were categorized as having GI symptoms alone or with other COVID-19 symptoms or not having GI symptoms. Data were analyzed using logistic regression and Mantel-Cox log-rank analysis.

**Results:** There were 59 patients with isolated GI symptoms, 1694 without any GI symptoms, and 766 patients with GI symptoms along with other symptoms. The average hospitalization length of patients without GI symptoms was significantly higher than the other two groups ( $P < 0.001$ ). The abnormal HRCT results were significantly higher among patients with Isolated GI symptoms ( $P < 0.001$ ). Patients without GI symptoms were 1.7 (95% CI: 1.003-2.908,  $P: 0.049$ ) times more likely to test positive for COVID-19 than those with isolated GI symptoms. Patients with isolated GI symptoms were less likely to be admitted to the ICU (95% CI: 0.174-0.987,  $P: 0.047$ ).

**Conclusions:** Our study demonstrated distinct clinical outcomes in COVID-19 patients based on the presence of GI symptoms. While patients who had isolated GI symptoms had more probability of lung involvement in CT scan results, the probability of being admitted to ICU is less likely in them.

### GRAPHICAL ABSTRACT



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## Introduction

More than two years have passed since the COVID-19 pandemic; the world is fighting the SARS-CoV-2 virus, which causes severe respiratory disease in infected patients [1-3]. Iran has also been affected by the virus. On February 21, 2020, the number of COVID-19 patients in Iran was 28 in four provinces, and 67.8% belonged to Qom province. On February 27, the number of patients in Tehran province reached more than 100 with an upward slope. This number reached 1,000 infected people in the country on March 10<sup>th</sup>. On March 3, the number of patients in the country was 2281, of which 45.7% were in Tehran province. The spatial spread of the coronavirus from the provinces of Tehran, Qom, Gilan, Markazi, Mazandaran, and Isfahan to the surrounding areas was spreading rapidly [4].

Symptoms of COVID-19 can range from a superficial infection to acute respiratory failure syndrome. The chance of hospitalized patients entering the respiratory failure phase is reported to be between 17 and 29% [5]. The severity of the disease varies from asymptomatic and mild to severe, which is mild in 81%, severe in 14% [shortness of breath, hypoxia or involvement of more than 50% of the lungs on imaging], and 5% severe and critical illness [respiratory failure, shock or dysfunction of several organs] [6]. The mortality rate in this disease is 2.3%. Most fatal cases in elderly patients occur in patients with the underlying disease [cardiovascular disease, diabetes, chronic lung disease, hypertension, and cancer] [7]. Pneumonia is the most common severe manifestation of infection, characterized in the early stages by fever, cough, shortness of breath, and bilateral infiltration of the chest [8]. At the onset of the disease, the most common clinical features were 99% fever, 40% anorexia, 59% dry cough, 70% fatigue, 35% muscle pain, 31% shortness of breath, and 27% sputum production [9].

Studies in COVID-19 patients have also reported common gastrointestinal symptoms such as diarrhea, nausea, and vomiting [10]. Anorexia was the most common GI symptom in adults while diarrhea was the most common symptom

in adults and children, and vomiting was more common in children than in adults. Abdominal pain was more common in critically ill patients. It is thought that due to prolonged hypoxemia, tissue necrosis due to tissue hypoxia may damage GI mucosal cells, resulting in ulceration and bleeding [11]. In addition to the classic respiratory symptoms of COVID-19, GI symptoms have been reported frequently during the disease. In this study, we looked at GI symptoms such as anorexia, nausea, vomiting and diarrhea in patients with COVID-19, which are not common symptoms and, in some cases, may occur in the absence of respiratory symptoms. We aimed to monitor GI symptoms of patients suspected of COVID-19 to use the results in disease management and control of transmission of coronavirus infection.

## Methods

This prospective cross-sectional study was performed on the COVID-19 suspected patients in Peymaniye Hospital, Jahrom city of Iran, from January 2020 to July 2020. Patients being tested for COVID-19 with nasal swab specimens and PCR tests were included in this study. After obtaining permission from the Ethics Council and the director and management of Peymaniye Hospital, the researchers began to study. Patient information was collected retrospectively. Patients suspected of COVID-19 infection were referred for PCR test, and their data were included in this study; all cases of suspected COVID-19 were evaluated from January 2020 to July 2020. Patients discharged from the hospital were also contacted by telephone, and the required information was collected from them. PCR nasal swab tested for COVID-19 during or before hospitalization was considered inclusion criteria. Exclusion criteria included incomplete medical records and dissatisfaction to participate in the study.

Data collection tools in this study was a checklist comprised questions on age, gender, marital status, length of hospital stay, patient's place of residence, history of underlying disease (hypertension, diabetes, hypertension, hyperlipidemia, etc.), and information related to subjective symptoms reporting of nausea,

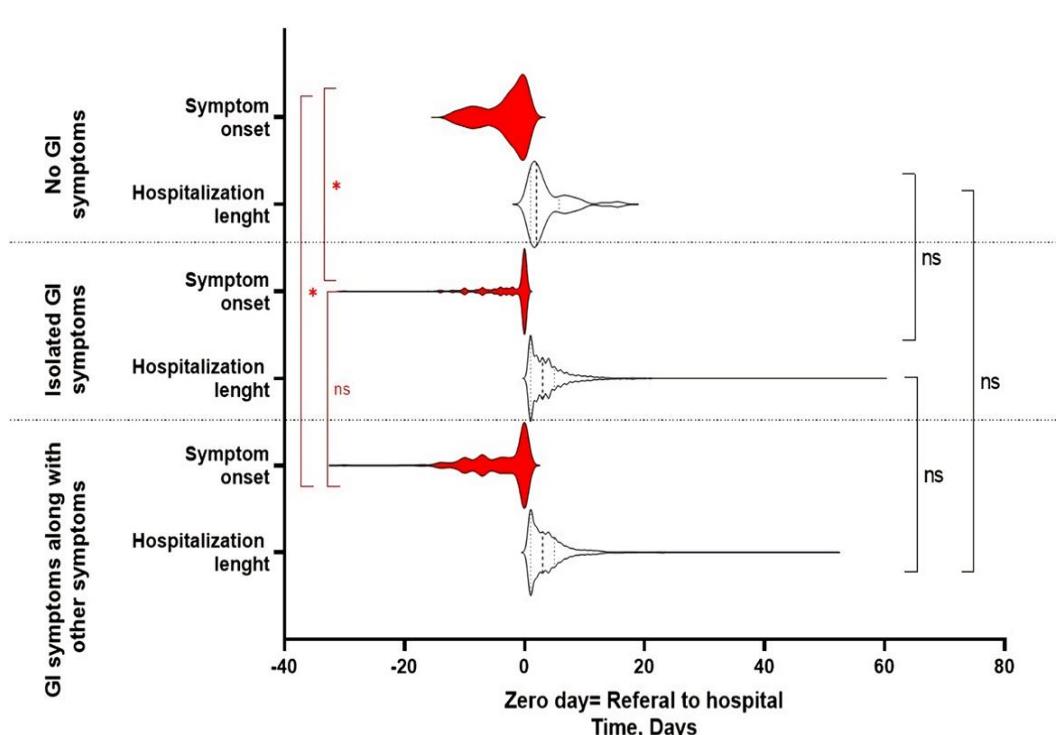
diarrhea, and vomiting in patients with COVID-19. We described the data using numbers and percentages, mean and standard deviation (SD). SPSS version 20 was used to analyze the logistic regression data, and Mantel-Cox log-rank analysis. The significant level was set at 0.05. GraphPad Prism 8 was used to visualize the data. All of the participants were informed about the study's objective and completed a consent form.

## Results and Discussions

In the present study, 2519 patients were studied and compared with GI-related symptoms. Among the patients with isolated GI symptoms, 32 patients (54.24%) were male, and 27 (45.76%) were female. In the patients without GI symptoms, 911 patients (53.78%) were male, and 783 (46.22%) were female. Similarly, in the GI symptoms group and other symptoms, 410 patients (53.52%) were male, and 356 (46.48%) were female. Our results did not show any statistically significant differences in terms of gender distribution between these three groups ( $P > 0.05$ ).

The mean age of patients with Isolated GI symptoms was  $55.75 \pm 17.85$  years, in patients

Without GI symptoms was  $57.53 \pm 51.12$  years and in patients with GI symptoms along with other symptoms was  $56.33 \pm 17.69$  years ( $P > 0.05$ ). About 29.10% of patients with GI symptoms along with other symptoms have close contact history, which was significantly higher than close contact history in the other two groups ( $P < 0.001$ ), and the average number of hospitalization days in this group was  $7.45 \pm 4.75$  days, which was significantly higher than the number of hospitalization days in patients who had only GI symptoms or those without GI symptoms ( $P < 0.001$ ) (Figure 1). About 46.65% of patients in the group without GI symptoms, 33.9% of those with isolated GI symptoms, and 44.78% of patients with GI symptoms and other symptoms had a fever ( $P < 0.001$ ). Patients without GI symptoms showed more fever than other groups (Table 1). Among the underlying diseases, 1.89% of patients without GI symptoms had a hematologic disease, and the incidence of hematologic disease in this group was significantly higher than in other groups ( $P < 0.001$ ).



**Figure 1:** Duration of hospitalization and symptom onset among the different groups of patients

The results HRCT were abnormal in 11.86% of patients with GI symptoms, 7.56% of patients

without GI symptoms, and 5.87% of patients with GI symptoms and other symptoms. The number

of abnormal HRCT results in the group of patients with GI symptoms was significantly higher than other patients ( $P<0.001$ ) (Table 1). The number of deaths related to Covid-19 can also be seen in Table 1. The mortality rate in patients with only

GI symptoms was 3.3%, in patients without GI symptoms was 4.54% and in patients with GI symptoms with other symptoms was 4.7%. There was no statistically significant difference between the three groups ( $P> 0.05$ ) (Table1).

**Table 1:** The relationship between GI symptoms with demographic information, symptoms, comorbidity, mortality and HRCT results of the patients

Variables		Isolated GI symptoms (n=59)	Without GI symptoms (n=1694)	GI symptoms along with other symptoms (n=766)	P-value
		N/Mean (%/SD)	N/Mean (%/SD)	N/Mean (%/SD)	
Sex	Male	32 (54.24)	911 (53.78)	410 (53.52)	0.99
	Female	27 (45.76)	783 (46.22)	356 (46.48)	
Age		55.75 (17.85)	57.53 (51.12)	56.33 (17.69)	0.747
Days passing the symptom onset		5.14 (3.53)	6.56 (4.93)	7.45 (4.75)	<0.001
Mean O2 saturation		92.9 (5.42)	90.32 (7.35)	89.81 (9.08)	0.951
Close contact history		10 (16.95)	382 (22.55)	223 (29.11)	<0.001
Cigarette smoking history		2 (3.39)	60 (3.54)	42 (5.48)	0.687
Opium history		0.00 (0.00)	63 (3.72)	34 (4.44)	0.206
Fever		20 (33.9)	790 (46.64)	343 (44.78)	<0.001
Cough		0.00 (0.00)	1081 (63.81)	281 (36.68)	<0.001
Myalgia		0.00 (0.00)	898 (53.01)	268 (34.99)	<0.001
Altered level of consciousness		0.00 (0.00)	132 (7.79)	10 (1.31)	<0.001
Hypogesia		0.00 (0.00)	108 (6.38)	76 (9.92)	<0.001
Hyposmia		0.00 (0.00)	102 (6.02)	79 (10.31)	<0.001
Headache		0.00 (0.00)	248 (14.64)	169 (22.06)	<0.001
Chest pain		0.00 (0.00)	220 (12.99)	96 (12.53)	<0.001
Skin		0.00 (0.00)	7 (0.41)	2 (0.26)	<0.001
Nausea		36 (61.02)	0.00 (0.00)	297 (38.77)	<0.001
Vomit		33 (55.93)	0.00 (0.00)	263 (34.33)	<0.001
Diarrhea		20 (33.9)	0.00 (0.00)	124 (16.19)	<0.001
Cancer history		2 (3.39)	45 (2.66)	18 (2.35)	0.837
Liver disease history		2 (3.39)	13 (0.77)	8 (1.04)	0.784
Diabetes mellitus history		12 (20.34)	367 (21.66)	179 (23.37)	0.606
Hematologic disease history		0.00 (0.00)	32 (1.89)	5 (0.65)	<0.001
Pregnancy		1 (1.69)	20 (1.18)	10 (1.31)	0.571
Heart diseases history		12 (20.34)	343 (20.25)	154 (20.1)	0.996
Kidney diseases history		1 (1.69)	63 (3.72)	40 (5.22)	0.141
Asthma history		1 (1.69)	56 (3.31)	32 (4.18)	0.412
Respiratory diseases history		0.00 (0.00)	23 (1.36)	18 (2.35)	0.120
Neurologic diseases history		2 (3.39)	31 (1.83)	6 (0.78)	0.077
Hypertension		16 (27.12)	476 (28.1)	222 (28.98)	0.884
COVID-19 related Mortality		2 (3.3)	75 (4.54)	36 (4.7)	0.597
Admission time		3.79 (3.59)	4.06 (4.01)	4.04 (4.09)	0.151
PCR test	Positive	28 (47.46)	608 (35.89)	265 (34.6)	0.137
	Negative	31 (52.54)	1086 (64.11)	501 (65.4)	
HRCT	Not done	34 (57.63)	1228 (72.49)	528 (68.93)	<0.001
	Done, normal	18 (30.51)	338 (19.95)	193 (25.2)	
	Done, abnormal	7 (11.86)	128 (7.56)	45 (5.87)	

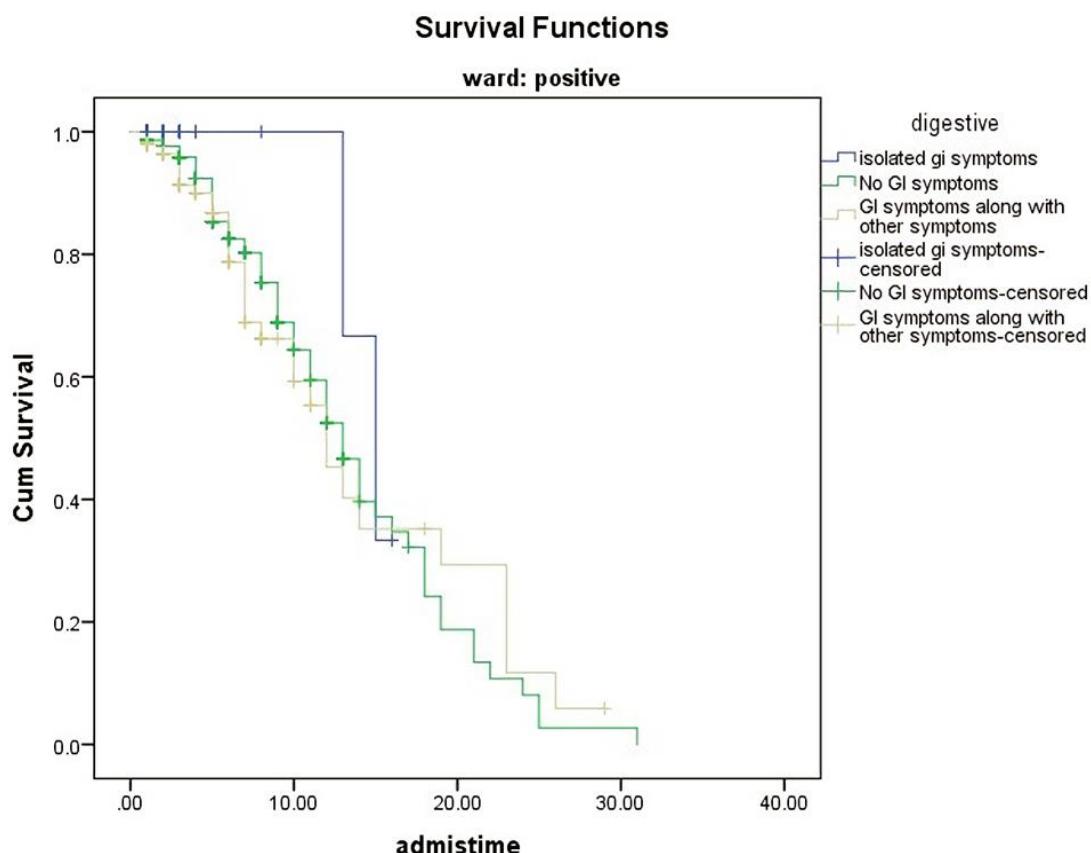
According to logistic regression, patients without GI symptoms were 1.7 (95% CI: 1.003-2.908, P: 0.049) times more likely to test positive for COVID-19 than those with isolated GI symptoms. There was no significant relationship between ICU admission and the presence or absence of GI symptoms ( $P>0.05$ ). Patients with isolated GI symptoms who test positive for PCR were less likely to be admitted to the ICU (95% CI: 0.174-

0.987, P: 0.047). In our study, no significant relationship was found between mortality and having or not having GI symptoms among the patients ( $P>0.05$ ) (Table 2). The Mantel-Cox log-rank analysis used to examine the difference in survival between the three groups in the study, did not show a significant difference ( $P= 0.595$ ) (Figure 2).

**Table 2:** The relationship between positive PCR test, admission in ICU, positive test and admission in ICU, and mortality with GI symptoms

Patient Status	GI Symptoms	OR (95% CI) <sup>T</sup>	P-value
Positive test	Isolated GI symptoms (n=59)	1.7 (1.003-2.908)	0.049
	Without GI symptoms (n=1694)	1.708 (0.885-1.266)	0.534
Admission in ICU	Isolated GI symptoms (n=59)	1.058 (0.536-4.824)	0.397
	Without GI symptoms (n=1694)	1.608 (0.733-1.491)	0.804
Positive test and admission in ICU	Isolated GI symptoms (n=59)	1.046 (0.174-0.987)	0.047
	Without GI symptoms (n=1694)	0.414 (0.574-1.166)	0.266
Mortality	Isolated GI symptoms (n=59)	0.818 (0.111-2.151)	0.344
	Without GI symptoms (n=1694)	0.489 (0.584-1.371)	0.611

T Odds ratio and 95% confidence interval



**Figure 2:** Survival function of COVID-19 patient with different GI symptoms

In the present study, COVID-19 patients were studied and compared with GI-related symptoms.

Results of this study did not show any statistically significant differences in terms of gender

distribution between the three groups of the study. The history of close contact was significantly higher among patients with GI symptoms and other symptoms. Moreover, the average number of hospitalization days among patients with GI symptoms and other symptoms was significantly higher than patients of the other two groups. The results of our study showed that the incidence of hematologic disease in patients without GI symptoms was significantly higher than in other study groups. The number of abnormal HRCT results in patients with GI symptoms was significantly higher than in other patients.

The various study results indicated that the proportion of COVID-19 patients that initially presented only with GI signs and symptoms varies from 10.1% to more than 60% (12-15). The prevalence of GI symptoms in these patients included decreased appetite/anorexia by 91.3%, nausea and or vomiting by 79.13%, diarrhea by 41.73%, and abdominal pain by 18.89%. However, in our study, patients with a final diagnosis of COVID-19 did not initially present any GI signs and symptoms. In our study, patients were divided into three groups with GI symptoms and other symptoms, only GI symptoms and without GI symptoms. This discrepancy can be the low statistical population of those studies.

A growing number of studies have reported an increase in GI signs and symptoms of diarrhea, nausea or vomiting, anorexia, and abdominal pain in COVID-19 patients. In general, the incidence of GI manifestations as the initial manifestation of the disease or the course of the disease is reported to be about 15% (16). Many patients present with only GI signs and symptoms, from 10.1% of patients (17) to 100% (12), which usually delays diagnosis. According to these articles consistent with our study, contrary to what was initially thought of COVID-19, these pandemics do not present with only respiratory symptoms. On the other hand, GI manifestations suggests the possibility of oral-fecal transmission, which requires the necessary measures and recommendations to reduce the risk of transmission. The study by Cai et al. (8) reported the presence of coronavirus RNA in the feces of

83.3% of patients for up to one month. Chen *et al.*'s study also reported that the virus RNA was found in 53.4% of the patients' feces. Moreover, it is reported that in 23.3% of COVID-19 patients, virus RNA was visible in the feces of patients even after that, the results of their PCR was negative (18).

In our study, there were abnormal HRCT in 11.86% of patients with GI symptoms, 7.56% of patients without GI symptoms, and 5.87% of patients with GI symptoms and other symptoms, showing a significantly higher rate of abnormal HRCT findings in patients with GI symptoms. In the study of Abdelmohsen et al. (19), a GI CT scan was also performed. They concluded that COVID-19 is considered a systemic disease with extrapulmonary manifestations; patients with COVID-19 and accompanying worrisome symptoms should undergo GI imaging. The most common GI findings were ischemic GI disorders that might become life-threatening.

Our study showed that patients with isolated GI symptoms who test positive for PCR were less likely to be admitted to the ICU (95% CI: 0.174-0.987, P: 0.047). While studies by Montazeri et al. (20) and Buscarini et al. (21) did not find any relationship between the GI symptoms and ICU admission possibility. It might be due to the differences in the grouping of patients as these studies have categorized patients into GI and non-GI groups.

#### *Limitations of the study*

One of the limitations of our study is that due to the emergence of COVID-19 disease and the novelty of the subject, the information in this field is constantly updated and increased. The mechanisms related to the complications raised during the infection are not yet fully known. Further studies should be performed on the causes of various complications caused by COVID-19 to determine the exact relationship between the pathogenesis, prognosis, and severity of the disease. Our previous studies in Jahrom show that many other factors like paraclinical findings (22), gender (23), and ethnicity (24), or even method of referral to a medical center (25) might determine the outcome.

## Conclusions

Our research found that COVID-19 patients had different clinical outcomes depending on GI symptoms. GI symptoms could be considered prognostic factors for COVID-19 patients this needs further confirmation by more advanced studies as isolated GI symptoms occur in a lower number of patients. Although patients with isolated GI symptoms had a higher likelihood of lung involvement in CT scans, they were less likely to be admitted to the ICU that its interpretation remains intricate.

## Ethical code

**Approval ID:** IR.JUMS.REC.1399.071

**Evaluated by:** Jahrom University of Medical Sciences

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## Authors' contributions

Based on the recommendations of the international Committee of Medical Journal Editors, all authors met the criteria of authorship.

## Conflict of Interest

We have no conflicts of interest to disclose.

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## References

- [1]. Al-Mandhari A., Samhouri D., Abubakar A., Brennan R., *East. Mediterr. Health J.*, 2020, **26**:136 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [2]. Huang C., Wang Y., Li X., Ren L., Zhao J., Hu Y., Zhang L., Fan G., Xu J., Gu X., Cheng Z., *Lancet*, 2020, **395**:497 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [3]. Li Q., Guan X., Wu P., Wang X., Zhou L., Tong Y., Ren R., Leung K.S., Lau E.H., Wong J.Y., Xing X., *N. Engl. J. Med.*, 2020, **382**:1199 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [4]. Rahnama M.R., Bazargan M., *Environ. Hazards Manag.*, 2020, **7**:113 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [5]. CDC. *Interim clinical guidance for management of patients with confirmed coronavirus disease (COVID-19)*. United States: Centers for Disease Control and Prevention; 2020 [[Publisher](#)]
- [6]. Tetro J.A., *Microbes Infect.*, 2020, **22**:72 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [7]. Tavakoli A., Vahdat K., Keshavarz M., *Iran. South Med. J.*, 2020, **22**:432 [[Google Scholar](#)], [[Publisher](#)]
- [8]. Jiehao C., Jin X., Daojiong L., Zhi Y., Lei X., Zhenghai Q., Yuehua Z., Hua Z., Ran J., Pengcheng L., Xiangshi W., *Clin. Infect. Dis.*, 2020, **71**:1547 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [9]. McIntosh K., Hirsch M., Bloom A., *Lancet Infect Dis.*, 2020, **1**:2019 [[Google Scholar](#)], [[Publisher](#)]
- [10]. Wang L., Gao Y.H., Lou L.L., Zhang G.J., *Eur. Respir. J.*, 2020, **55**:2000398 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [11]. Tian Y., Rong L., Nian W., He Y., *Aliment. Pharmacol. Ther.*, 2020, **51**:843 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [12]. Jiang F., Deng L., Zhang L., Cai Y., Cheung C.W., Xia Z., *J. Gen. Intern. Med.*, 2020, **35**:1545 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [13]. Han C., Duan C., Zhang S., Spiegel B., Shi H., Wang W., Zhang L., Lin R., Liu J., Ding Z., Hou X., *Am. J. Gastroenterol.*, 2020, **115**:916 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [14]. Luo S., Zhang X., Xu H., *Clin. Gastroenterol. Hepatol.*, 2020, **18**:1636 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]

- [15]. Kariyawasam J.C., Jayarajah U., Riza R., Abeysuriya V., Seneviratne S.L., *Tran. R. Soc. Trop. Med. Hyg.*, 2021, **115**:1362 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [16]. Hu Z., Song C., Xu C., Jin G., Chen Y., Xu X., Ma H., Chen W., Lin Y., Zheng Y., Wang J., *Sci. China Life Sci.*, 2020, **63**:706 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [17]. Redd W.D., Zhou J.C., Hathorn K.E., McCarty T.R., Bazarbashi A.N., Thompson C.C., Shen L., Chan W.W., *Gastroenterology*. 2020, **159**:765 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [18]. Chen N., Zhou M., Dong X., Qu J., Gong F., Han Y., Qiu Y., Wang J., Liu Y., Wei Y., Yu T., *Lancet*, 2020, **395**:507 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [19]. Abdelmohsen M.A., Alkandari B.M., Gupta V.K., Elsebaie N., *Egypt. J. Radiol. Nucl. Med.*, 2021, **52**:1 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [20]. Montazeri M., Maghbouli N., Jamali R., Sharifi A., Pazoki M., Salimzadeh A., Barzegari B., Rafiei N., Mansouri E.S., Hadadi A., *Arch. Iran. Med.*, 2021, **24**:131 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [21]. Buscarini E., Manfredi G., Brambilla G., Menozzi F., Londoni C., Alicante S., Iiritano E., Romeo S., Pedaci M., Benelli G., Canetta C., *Gut*, 2020, **69**:1547 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [22]. Javdani F., Parsa S., Shakeri H., Hatami N., Kalani N., Haghbeen M., Raufi R., Abbasi A., Keshavarz P., Hashemi S.A., Shafiee A., *MedRxiv*, 2020, **1**:29 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [23]. Rahmanian F., Hatami N., Haghbeen M., Raoufi R., Abbasi A.R., Shakeri H., Keshavarz P., Rafie E., Chegin M., Doost E.R., Abiri S., *Bull. Emerg. Trauma*, 2021, **9**:80 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [24]. Kalani N., Hatami N., Haghbeen M., Yaqoob U., Raeyat Doost E., *Acta Med. Iran.*, 2021, **59**:466 [[Google Scholar](#)], [[Publisher](#)]
- [25]. Kalani N., Hatami N., Ali S., John Mehramiz N., Rahmanian F., Raeyat Doost E., Haghbeen M., Abiri S., Foroughian M., Ebrahimi M., *Bull. Emerg. Trauma*, 2021 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]

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