

Prevalence of gastrointestinal symptoms after recovery from COVID-19: A questionnaire-based study in the Aseer region

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic has affected millions of people worldwide, and although it is primarily a respiratory illness, gastrointestinal symptoms have been reported in a significant proportion of patients.

Aim: Prevalence of gastrointestinal symptoms after recovery from COVID-19.

Methodology: A community-based cross-sectional study was conducted in the Aseer region of Saudi Arabia. The study population included individuals aged 18 years or older with COVID-19 and living in the Aseer region. The data were collected through a pretested, structured online questionnaire preceded by consent and were used to maintain the confidentiality of the data. The questionnaire covered participants' data, COVID-19 infection status, and gastrointestinal tract symptoms during and after recovery from the infection.

Results: A total of 409 participants in the Aseer region completed the study survey. The participants' ages ranged from 18 to more than 50 years, with a mean age of 34.5 ± 11.9 years. A total of 205 (50.1%) participants were females. A total of 263 (64.3%) of the study participants experienced gastrointestinal tract symptoms during COVID-19 infection. Additionally, 203 (49.6%) of the study participants had gastrointestinal tract symptoms after recovering from COVID-19 infection. The most commonly reported symptoms were diarrhea (13.2%), nausea (13.2%), anorexia (12.7%), abdominal pain (11%), and constipation. Male sex who suffered from severe COVID-19 infection, and gastrointestinal tract symptoms during acute infection were significantly associated with post-COVID-19 gastrointestinal tract symptoms ($p < 0.05$).

Conclusions: In conclusion, the current study showed that nearly two-thirds of active COVID-19 patients experienced gastrointestinal tract symptoms. Additionally, approximately half of the COVID-19 patients who recovered had gastrointestinal tract-related symptoms, but few of those patients had gastrointestinal tract-related symptoms within 1 week.

Keywords

COVID-19, GIT symptoms, post-COVID-19 GIT symptoms, prevalence, Saudi Arabia

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Introduction

By the beginning of 2020, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was causing a rapidly expanding epidemic of coronavirus disease in 2019 (COVID-19) worldwide. The World Health Organization (WHO) later defined this disease as a pandemic.¹ The outbreak began in December 2019 in Wuhan, China's Hubei Province. On January 30, 2020, the WHO designated the illness a Public Health Emergency of International Concern, and on March

11, 2020, it was acknowledged as a pandemic.^{2,3} After the initial infections in Saudi Arabia on March 2, 2020, several

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measures were taken to prevent the spread of the COVID-19 virus, such as lockdowns, social distancing, and avoiding crowds.^{4,5}

The most common signs and symptoms of COVID-19 were myalgia, fever, dry cough, and shortness of breath.^{6,7} During SARS-CoV-2 infection, gastrointestinal (GI) symptoms such as nausea, vomiting, diarrhea, and abdominal discomfort are often reported. Some people experience these symptoms even in the absence of respiratory involvement. Patients with cirrhosis have a 2.7-fold increased chance of developing peptic ulcers due to gastric infections, and they may also experience greater gastrointestinal symptoms.^{8–10} GI symptoms were observed in 20%–50% of individuals, and patients occasionally presented before respiratory symptoms.¹¹

The majority of COVID-19 patients recover completely; however, recent data indicate that 10%–15% of patients have a range of mid- and long-term side effects following their initial sickness.¹² These questions and answers help clinicians learn more about post-COVID-19 conditions so that physicians can make decisions that will help protect everyone, even if our present understanding of the causes of post-COVID-19 conditions, and why some people are more impacted are limited. This study aimed to determine the prevalence of gastrointestinal symptoms in patients who have recovered from COVID-19 in the Aseer region. Additionally, we aimed to assess the severity and duration of these symptoms and identify any demographic or clinical factors that may be associated with their development.

Methodology

This community-based cross-sectional study was conducted in the Aseer region, Southern Saudi Arabia, from October 2023 to March 2024. The study subjects were community members residing in the Aseer region. The study included individuals aged 18 years or older who had recovered from COVID-19. Confirmation of COVID-19 infection was primarily through positive nucleic acid amplification tests (NAATs), rapid antigen tests, and medical records. A pre-tested structured online questionnaire was used for data collection, preceded by obtaining consent from participants. The questionnaire covered demographic data, COVID-19 infection status, gastrointestinal symptoms during and after recovery, socioeconomic status, educational level, smoking habits, gastrointestinal tract (GIT) medical history, dietary habits, and vaccination status. The questionnaire targeted COVID-19 infected individuals within the Aseer region, and inclusion criteria were adjusted to reflect this focus. The questionnaire's validity and reliability were assessed through a pilot study involving 25 participants, representing 6.1% of the final study population, who were excluded from the final study. The exclusion criteria were those who did not complete the questionnaire form or who had negative NAATs and rapid antigen tests. The ethical approval for the study

was obtained, and the ethical approval code is mentioned in the manuscript. The severity of COVID-19 was classified based on guidelines and definitions provided by health authorities, including mild, moderate, severe, and critical categories.

Statistical analysis

After the data were extracted, the data were revised, coded, and analyzed with the statistical software IBM SPSS version 22 (SPSS, Inc., Chicago, IL, USA). All the statistical analyses were performed using two-tailed tests. A *p* value less than 0.05 was considered to indicate statistical significance. Descriptive analysis based on frequency and percent distribution was performed for all variables, including participants' sociodemographic data, COVID-19 infection status, and pre-COVID-19 GIT medical history and dietary habits. Participants who experienced GIT symptoms and their duration during and after recovery from COVID-19 infection were graphed. Cross-tabulation was used to assess factors associated with GIT symptoms after recovery from COVID-19 infection using the Pearson's chi-square test and Mont Carlo exact test for small frequency distributions. A multiple stepwise logistic regression method using the backward LR model was used to identify the most significant predictors of experiencing GIT symptoms after recovery based on the adjusted odds ratio and 95% confidence interval.

Results

A total of 409 participants in the Aseer region completed the study survey. The participants' ages ranged from 18 to more than 50 years, with a mean age of 34.5 ± 11.9 years. A total of 205 (50.1%) participants were females. For educational level, 258 (63.1%) had a bachelor's degree, 118 (28.9%) had a secondary level of education/diploma, and 20 (4.9%) had a postgraduate degree. Only 93 (22.7%) worked in the health-care field, and 242 (59.2%) reported being aware of epidemic development and its health effects. A monthly income less than 5000 SR was reported by 163 (39.9%) participants, 121 (29.6%) had a monthly income of 5000–10,000 SR, and 125 (30.6%) had a monthly income exceeding 10,000 SR. A total of 61 (14.9%) of the study respondents were smokers (Table 1).

COVID-19 infection and vaccination among study participants in the Aseer region, Saudi Arabia (Table 2). The vast majority of COVID-19 infections were diagnosed in 2020 (42.5%) or 2021 (30.3%). The severity of infection was mild to moderate in 145 (59.9%) of the patients, severe in 148 (36.2%), and critical in 16 (3.9%). Only 47 (11.5%) needed hospitalization due to COVID-19 infection; 35 (74.5%) were admitted to the ward, and 12 (25.5%) needed admission to the intensive care unit (ICU). For vaccination, the vast majority (96.3%; 394) received the COVID-19 vaccine, 330 (83.8%) received Pfizer-BioNtech COVID-19

Table 1. Sociodemographic characteristics of the study participants in the Aseer region, Saudi Arabia ($n=409$).

Demographics	N	%
Age (years)		
18–30	181	44.3
31–50	200	48.9
>50	28	6.8
Gender		
Male	204	49.9
Female	205	50.1
Educational level		
Below secondary	13	3.2
Secondary	65	15.9
Diploma	53	13.0
Bachelor degree	258	63.1
Postgraduate	20	4.9
Monthly income		
<5000 SR	163	39.9
5000–10,000 SR	121	29.6
>10,000 SR	125	30.6
Work in the healthcare field		
Yes	93	22.7
No	316	77.3
Are you aware of epidemic developments and their health effects?		
Yes	242	59.2
No	167	40.8
Smoking		
Yes	61	14.9
No	348	85.1

vaccine, and 56 (14.2%) received Oxford-AstraZeneca COVID-19 vaccine. A total of 239 (60.7%) patients received three doses, 141 (35.8%) received two doses, 6 received one dose, and 8 received more than three doses.

Regarding the history of pre-COVID-19 GIT disorders and dietary habits (Table 3), 99 (24.2%) of the study participants had digestive disease before contracting COVID-19. The most commonly reported diseases were esophageal reflux (33.9%), irritable bowel syndrome (53.4%), piles (16.9%), gastric ulcers (16.1%), and GIT inflammation (8.5%). For dietary habits, 265 (64.8%) reported that their diet was acceptable, while 51 (12.5%) reported that their diet was poor.

Gastrointestinal symptoms during COVID-19 infection among study participants (Figure 1). A total of 263 (64.3%) of the study participants experienced GIT symptoms during COVID-19 infection. The most common symptoms included anorexia (34.7%), diarrhea (29.8%), nausea (28.4%), abdominal pain (18.8%), and vomiting (13.4%). For duration, most patients spent less than 1 week (62%; 163), most had 1–2 weeks (28.1%), and most had 2–4 weeks (6.1%).

For gastrointestinal symptoms after recovering from COVID-19 (Figure 2), 203 (49.6%) of the study participants experienced GIT symptoms after recovering from COVID-19 infection. The most commonly reported symptoms were

diarrhea (13.2%), nausea (13.2%), anorexia (12.7%), abdominal pain (11%), and constipation (7.1%), while 16.1% had other symptoms. Considering the duration of symptoms, 127 (62.6%) patients spent less than 1 week, 30 (14.8%) had 1–2 weeks, and 20 (9.9%) had 2–4 weeks.

Factors associated with GIT symptoms after recovery from COVID-19 infection (Table 4). Approximately 67.9% of participants aged more than 50 years experienced GIT symptoms after recovering from COVID-19 infection, while 43.6% of the other participants aged 18–30 years had symptoms; these differences were statistically significant ($p=0.031$). Additionally, GIT symptoms were reported among 54.1% of those who were not healthcare workers and 34.4% of those who worked in the healthcare field ($p=0.001$). Similarly, 60.8% of patients with severe COVID-19 infection experienced GIT symptoms after recovery, whereas 30.1% of patients with mild infection experienced GIT symptoms ($p=0.001$). Exactly 67.3% of patients who had GIT symptoms during COVID-19 infection experienced symptoms after recovery, while 17.8% of those who did not experienced symptoms ($p=0.001$). GIT symptoms were reported by 83% of patients who needed to be hospitalized due to COVID-19 infection, whereas 45.3% of those who did not need to be hospitalized ($p=0.001$). Additionally, 61.6% of patients with preexisting digestive diseases before

Table 2. COVID-19 infection and vaccination among study participants in the Aseer region, Saudi Arabia (n=409).

COVID-19 infection and vaccination	N	%
Year of COVID-19 infection		
2019	46	11.2
2020	174	42.5
2021	124	30.3
2022	53	13.0
2023	12	2.9
How would you describe the severity of COVID-19 infection?		
Mild	73	17.8
Moderate	172	42.1
Severe	148	36.2
Critical	16	3.9
Have you needed to be hospitalized due to COVID-19 infection?		
Yes	47	11.5
No	362	88.5
If yes, at which department (n=47)		
General ward	35	74.5
ICU	12	25.5
Have you received the COVID-19 vaccine?		
Yes	394	96.3
No	15	3.7
Type of received vaccine (n=394)		
Pfizer	330	83.8
AstraZeneca	56	14.2
Moderna	7	1.8
Others	1	0.3
Number of received doses (n=394)		
One time	6	1.5
Two times	141	35.8
Three times	239	60.7
Greater than three times	8	2.0

COVID-19: coronavirus disease 2019; ICU: intensive care unit.

Table 3. History of pre-COVID-19 GIT disorders and dietary habits, Aseer region, Saudi Arabia.

GIT disorders and diet	N	%
Do you have any preexisting digestive diseases before contracting COVID-19?		
Yes	99	24.2
No	310	75.8
If yes, which disease you had? (n=99)		
Esophageal reflux	40	33.9
Irritable bowel syndrome	63	53.4
Piles	20	16.9
Gastric ulcer	19	16.1
Inflammations	10	8.5
Gallstones	9	7.6
Inflammatory bowel disease	8	6.8
Celiac disease	5	4.2
How do you rate your diet in general?		
Poor	51	12.5
Acceptable	265	64.8
Good	93	22.7

COVID-19: coronavirus disease 2019; GIT: gastrointestinal tract.

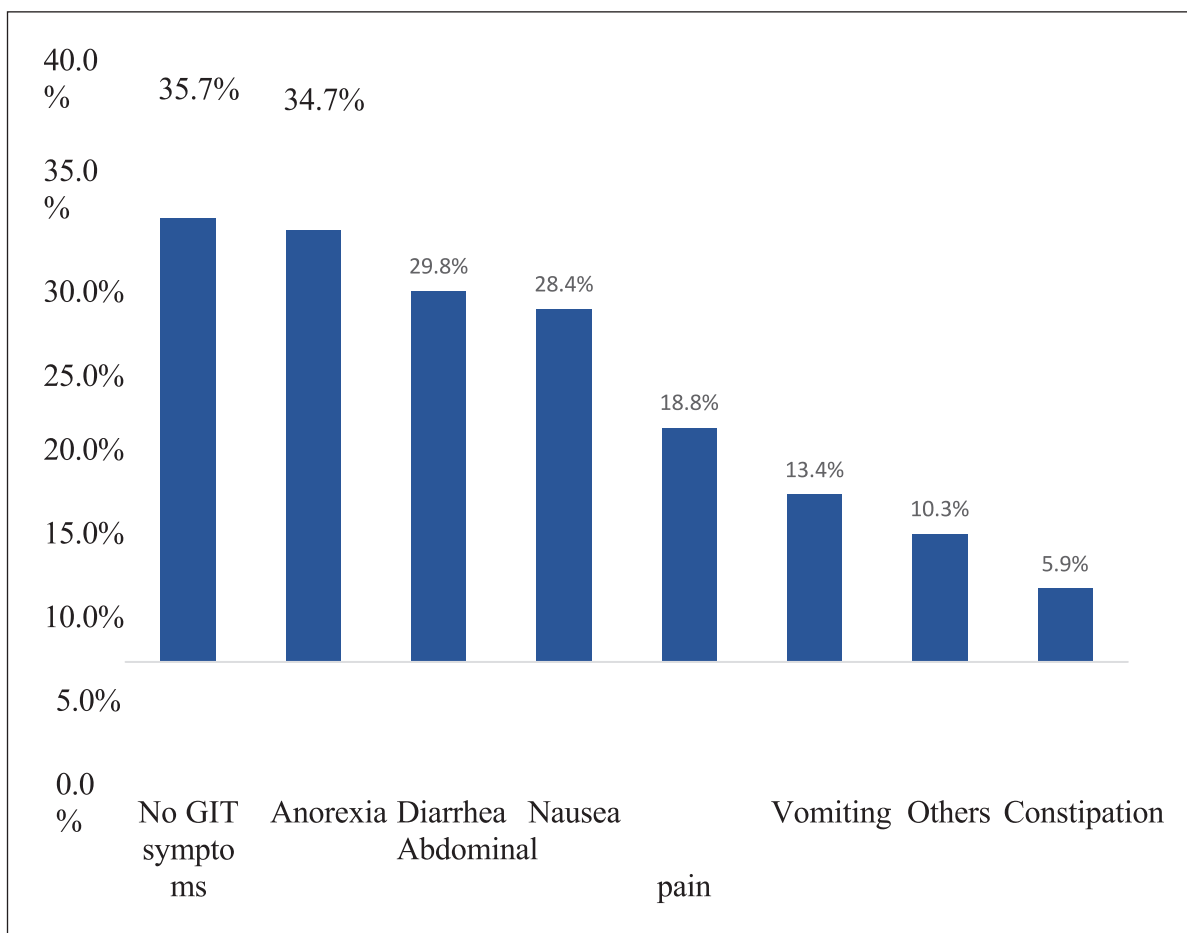


Figure 1. Gastrointestinal symptoms during COVID-19 infection among study participants. COVID-19: coronavirus disease 2019.

contracting COVID-19 had GIT symptoms after recovery, whereas 45.8% of those with preexisting digestive diseases did not ($p=0.006$).

Multiple stepwise logistic regression model for predictors of GIT symptoms after recovery from COVID-19 infection (Table 5). Among all the included factors, those presented in the table were the most significant predators. Having GIT symptoms during infection increased the risk of having symptoms after recovery by approximately 10-fold (OR=10.2; 95% CI=5.9–17.5). Additionally, COVID-19 patients who needed hospitalization were six times more likely to experience GIT symptoms after recovery (OR=6.0; 95% CI=2.4–14.8). Compared with healthcare workers (HCWs), nonhealthcare workers (NHCWs) were four times more likely to have GIT symptoms (OR=4.0; 95% CI=2.1–7.7). Additionally, male sex (OR=1.9), smoking (OR=1.4), participants who contracted COVID-19 in the previous calendar year (OR=1.2), and severe COVID-19 infection (OR=1.4) were associated with a greater risk of having GIT symptoms after recovery.

Discussion

The rapid outbreak of SARS-CoV-2 caused the COVID-19 pandemic. Many post-COVID-19 sequelae, including those affecting the gastrointestinal system, have been described.¹³

The current study aimed to assess the prevalence and determinants of gastrointestinal symptoms after recovery from COVID-19 infection. This study revealed that most patients were diagnosed during the calendar years 2020 and 2021, and most of them had moderate-to-severe COVID-19. Approximately 1/10th of the patients needed to be hospitalized due to the infection, and 1/4th of the hospitalized patients needed to be admitted to the ICU. The vast majority of the study patients were vaccinated and mainly received the Pfizer vaccine in two to three doses.

Regarding COVID-19 infection-associated GIT symptoms, the current study showed that approximately two-thirds of the study participants experienced at least one of the GIT symptoms during COVID-19 infection. Anorexia, diarrhea, nausea, abdominal pain, and vomiting were the most

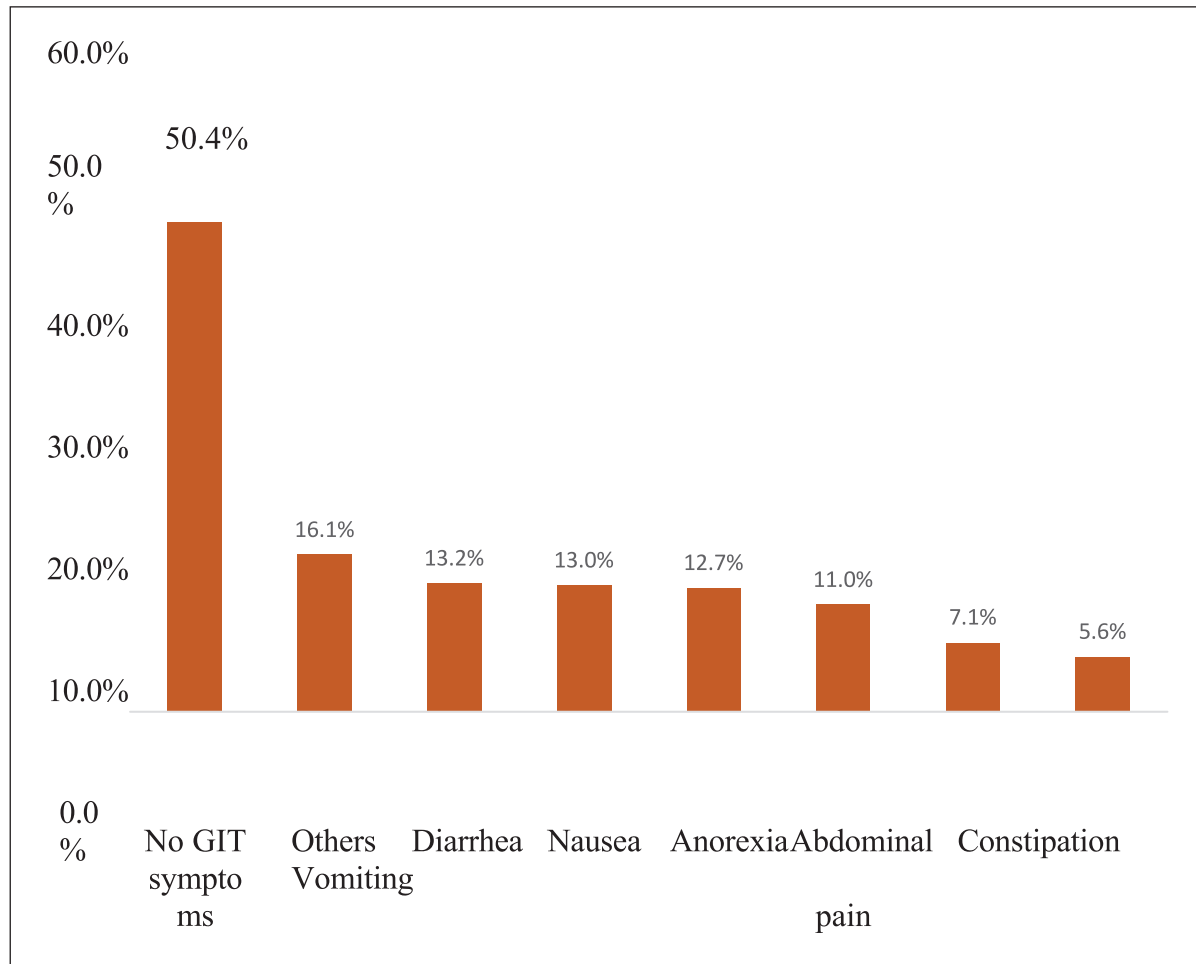


Figure 2. Gastrointestinal symptoms after COVID-19 infection recovery among study participants. COVID-19: coronavirus disease 2019.

frequently associated GIT symptoms, occurring mainly after less than 1 week. Similar findings were reported by Gurung et al.,¹⁴ in which the intestinal involvement rate was 58.7%. Among the gastrointestinal symptoms, diarrhea was the most common symptom in 67 patients (40.6%), nausea and vomiting were the most common symptoms in 66 patients (40%), followed by abdominal pain in 27 patients (16.4%), and anorexia in 19 patients (11.5%). Furthermore, our study assessed the prevalence of GI symptoms associated with COVID-19 infection, which seems to be similar to the findings of many previous studies. On the other hand, GI symptoms were recorded in less than 30% of patients with COVID-19 infection, ranging from 12.1% to 29.9%, according to several investigations.^{15–27}

Post-COVID syndrome, also known as long-COVID syndrome, has been documented in multiple studies. This condition lasts longer than 12 weeks following the start of the infection. According to self-reported data from the United Kingdom, as of January 2023, approximately 3.3% of the general population had long-term COVID-19.²⁸ Numerous pathophysiological theories have been proposed to explain the

effects of SARS-CoV-2 infection on the GIT. SARS-CoV-2 attaches itself to the angiotensin-converting enzyme-2 receptor, which is strongly expressed in the ileal enterocytes of the small and large intestines. This binding may contribute to inflammation and gut microbial dysbiosis by reducing tryptophan uptake and disrupting angiotensin homeostasis.^{13,29,30}

Concerning post-COVID-19 GIT symptoms, the current study revealed that approximately half of the study participants had GIT symptoms after recovering from COVID-19 infection. The most commonly reported symptoms were diarrhea, nausea, anorexia, abdominal pain, and constipation. The duration of symptoms was less than 1 week for approximately two-thirds of the patients. Elmunzer et al.³¹ reported that 89.8% of respondents retained any COVID-related symptoms, GI or non-GI, while 42.1% of patients who reported COVID-related GI symptoms during the index hospitalization (abdominal pain, nausea, vomiting, or diarrhea) kept at least one of these symptoms at follow-up. Additionally, Blackett et al.³² reported that 40% of COVID-19 patients experienced new GI symptoms after recovering from COVID-19. The most commonly reported symptoms included

Table 4. Factors associated with GIT symptoms after recovery from COVID-19 infection.

Factors	Gastrointestinal symptoms after COVID-19 recovery				p Value
	No		Yes		
	N	%	N	%	
Age (years)					
18–30	102	56.4	79	43.6	0.031*
31–50	95	47.5	105	52.5	
>50	9	32.1	19	67.9	
Gender					
Male	105	51.5	99	48.5	0.656
Female	101	49.3	104	50.7	
Educational level					
Below secondary	2	15.4	11	84.6	0.098
Secondary	31	47.7	34	52.3	
Diploma	26	49.1	27	50.9	
Bachelor degree	138	53.5	120	46.5	
Postgraduate	9	45.0	11	55.0	
Work in the healthcare field					
Yes	61	65.6	32	34.4	0.001*
No	145	45.9	171	54.1	
Are you aware of epidemic developments and their health effects?					
Yes	129	53.3	113	46.7	0.152
No	77	46.1	90	53.9	
Year					
2019	25	54.3	21	45.7	0.127 ^a
2020	99	56.9	75	43.1	
2021	53	42.7	71	57.3	
2022	23	43.4	30	56.6	
2023	6	50.0	6	50.0	
How would you describe the severity of COVID-19 infection?					
Mild	51	69.9	22	30.1	0.001*
Moderate	88	51.2	84	48.8	
Severe	58	39.2	90	60.8	
Critical	9	56.3	7	43.8	
Have you needed to be hospitalized due to COVID-19 infection?					
Yes	8	17.0	39	83.0	0.001*
No	198	54.7	164	45.3	
If yes, at which department					
Ward	7	20.0	28	80.00	0.353 ^a
ICU	1	8.3	11	91.7	
No	120	82.2	26	17.8	0.001*
Gastrointestinal symptoms during COVID-19 infection					
Yes	86	32.7	177	67.3	0.062
Yes	24	39.3	37	60.7	
No	182	52.3	166	47.7	
Smoking					
Poor	22	43.1	29	56.9	
How do you rate your diet in general?					
Acceptable	138	52.1	127	47.9	0.495
Good	46	49.5	47	50.5	
Do you have any preexisting digestive diseases before contracting COVID-19?					
Yes	38	38.4	61	61.6	0.006*
No	168	54.2	142	45.8	

p: Pearson's χ^2 test. COVID-19: coronavirus disease 2019; GIT: gastrointestinal tract; ICU: intensive care unit.

^aExact probability test.

*p < 0.05 (significant).

Table 5. Multiple stepwise logistic regression model for predictors of GIT symptoms after recovery from COVID-19 infection.

Predictors	p Value	AOR	95% CI	
			Lower	Upper
Male versus female	0.015*	1.90	1.10	3.20
Non-healthcare workers versus health care workers	0.001*	4.0	2.1	7.7
Smoking	0.049*	1.4	1.1	2.3
Years 2021/2022 versus earlier	0.047*	1.2	1.2	1.9
Severe COVID-19 infection	0.049*	1.4	1.0	1.9
Needed hospitalization due to COVID-19 infection	0.001*	6.0	2.4	14.8
Gastrointestinal symptoms during COVID-19 infection	0.001*	10.2	5.9	17.5

AOR: adjusted odds ratio, CI: confidence interval; COVID-19: coronavirus disease 2019; GIT: gastrointestinal tract.

* $p < 0.05$ (significant).

abdominal pain (7.5%), constipation (6.8%), diarrhea (4.1%), and vomiting (4.1%). Other studies have shown that the prevalence of postinfectious IBS after acute gastroenteritis is estimated to be 10%.^{33,34} Another study revealed that, in 134 individuals with COVID-19, the percentage of patients showing symptoms consistent with IBS increased from 16% before to 41% after diagnosis. The IBS symptom severity score also showed a significant increase in the severity of GI symptoms from a mean of 61 pre-COVID-19 patients to 248 post-COVID-19 patients (equivalent to moderate IBS symptoms).³⁵ In Italy, 3% of patients experienced “new bowel control problems” 48 days on average after COVID-19 release.³⁶ In France, 17% of 150 noncritically ill COVID-19 patients reported continuing vomiting or diarrhea 30 days after discharge; at 60 days, that number dropped to 12%.³⁷ Eighty-one out of 1655 hospitalized patients in China recalled vomiting or diarrhea 6 months later. Having GIT symptoms during infection, the need for hospitalization, male sex, participants who contracted COVID-19 in the previous calendar year, and severe COVID-19 infection were all associated with a greater risk of having GIT symptoms after recovery.

To assess intestinal SARS-CoV-2 antigen persistence beyond remission, a cohort of 14 patients was investigated by Gaebler et al.³⁸ at an average time of 4 months (range: 2.8–5.7 months) following the initial diagnosis of COVID-19. Five out of the 14 participants exhibited intestinal enterocyte-associated SARS-CoV-2 N protein; according to the data, 3 of the 14 participants produced PCR amplicons that were sequenced and confirmed to be SARS-CoV-2. The uneven and occasional nature of the viral detection probably led to an overestimation of the true persistence of the virus. These findings demonstrated the possibility that SARS-CoV-2 can survive in particular organs in a way that is consistent with the persistence of other nonretroviral RNA viruses, even though this small sample included patients without PACS.³⁹

Limitations

This study has several limitations. The retrospective nature of the survey may introduce recall bias, as participants

might not accurately remember their symptoms or the timing of their infection. The calculation and justification of the study’s sample size, while sufficient for our primary analyses, may limit the generalizability of our findings to the broader population. Additionally, the reliance on self-reported data can introduce reporting biases. Lastly, the evolving nature of the COVID-19 pandemic means that new variants and longer-term effects may not be fully captured in this study

Conclusions and recommendations

In conclusion, the current study showed that nearly two out of every three active COVID-19 patients experienced GIT symptoms. Additionally, nearly one out of each of the two recovered COVID-19 patients had GIT-related symptoms, but all had symptoms within 7–21 days. Male sex who had severity of infection and who experienced GIT symptoms during the active infection phase were significantly associated with a greater probability of having GIT symptoms after recovery. Large-scale studies are recommended to enhance our understanding of other postinfection gastrointestinal disorders. Additionally, the ongoing GI effects of COVID-19 after recovery require further study.

Author contributions

Saad Ali Alshahrani, Sultan Saad Alnasser, Nawaf Mhamed Alshehri, Saad hayf Alqahtani, Saud Hayf Alqahtani: Conceptualization, methodology, and data analysis.

Khalid Siraj Altalhiyyah, Mohammed Mousa Albariqi, Meshal Ali Alkhayri, Saad Ali Alshahrani: Data collection, validation, and writing—original draft preparation.

Mohammed Attieh Alzahrani: Review and editing, supervision, and project administration.

Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical considerations

The study was conducted in accordance with the Research Ethics Committee at King Khalid University (HAPO-06-B-001) approved on 2023 with approval number: ECM#2023-3003.

Ethics approval

Ethical approval for this study was obtained from ethical approval for this study was obtained from the research ethics committee at King Khalid University (Approval number ECM# 2023-3003)

Informed consent

Informed consent was obtained from the study participants prior to study commencement using a written consent form.

Trial registration

Not applicable.

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