International Surgery Journal
Patil LS et al. Int Surg J. 2021 Dec;8(12):3516-3519
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20214740

Original Research Article

Impact of COVID-19 pandemic on outcome of acute appendicitis: a retrospective analysis

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Received: 17 October 2021
Accepted: 10 November 2021

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ABSTRACT

Background: Acute appendicitis is the most common abdominal surgical emergency. Lockdown and stay-at-home orders are strategies that were implemented globally during the acute pandemic period of COVID-19 to prevent disease dissemination, health system overload and mortality. However, there are concerns that patients did not seek necessary health care because of these rules.
Methods: Retrospective observational study was conducted on patients who presented with acute appendicitis from January 2020 to May 2020. They were classified according to the time of presentation that is before declaration of the state of alarm (pre-COVID-19), and after its declaration (post-COVID-19) in India (24 March 2020). An evaluation was made of demographic variables, complications and duration of hospital stay in both the groups.
Results: 45 patients were included, 20 in pre-COVID-19 group and 25 in post-COVID-19 group. In post-COVID-19 group, the interval from onset of symptoms to admission was 65.0 hour, which is significantly longer than the 17.3 hour interval noted in pre-COVID-19 group ($p<0.001$). The prevalence of complicated appendicitis after the epidemic outbreak was significantly higher than before the outbreak (52% versus 20%, $p<0.001$).The mean hospital stay was longer in post-COVID-19 group (5.6±5.9 versus 3.2±4.3 days; $p=0.041$).
Conclusions: COVID-19 pandemic influenced the time of diagnosis of appendicitis, as well as its course, and mean hospital stay. Complicated appendicitis was more common in patients with acute appendicitis after the outbreak of COVID-19 pandemic.

Keywords: Acute appendicitis, COVID-19, Complicated appendicitis, Pandemic

INTRODUCTION

Acute appendicitis is the most common abdominal surgical emergency.[1] Lockdown and stay-at-home orders were strategies that were enforced globally during the acute pandemic period of corona virus disease to prevent disease dissemination, health system overload and mortality. The novel coronavirus severe acute respiratory syndrome corona virus-2 (SARS-CoV-2) (COVID-19) strain resulted in a pandemic affecting China, Europe, United States (US) and subsequently India. The first COVID-19 patient in India was reported on 27 January 2020 and since then many states declared a state of emergency and eventually put in place stay-at-home advisories.[2] Many surgical societies, including the American college of surgeons, published guidelines in regards to the triage of elective cases, recommending the postponement of elective surgeries.[3] Also, state and hospital officials strongly encouraged low-acuity patients to avoid emergency rooms (ERs) at the time of the pandemic surge in order to prioritize the care of high-acuity patients and avoid infection by and spread of the COVID-19 strain. This resulted in a decrease of up to 50% in patients seeking emergency care in the first weeks of the stay-at-home advisory. This decrease persisted in the following weeks and data suggest that a portion of high-acuity patients that could require emergent care, did

not present for evaluation due to fear of COVID-19 infection.[4]

The media has published stories of patients with severe medical problems, such as myocardial infarctions and strokes as well as surgical conditions, such as appendicitis, avoiding presenting to the ER.[5]

In this study, we hypothesize that the introduction of restrictions due to COVID-19 has resulted in a significant impact on both the number of patients presenting to ER with signs and symptoms of acute appendicitis as well as their disease burden.

Aims and objectives

Aims and objectives of the study were to analyse the impact of COVID-19 pandemic on the time elapsed between onset of symptoms and diagnosis of acute appendicitis and the effect of this delay on disease progression, surgical approach and length of hospital stay.

METHODS

A retrospective observational study was conducted on patients who presented with acute appendicitis to department of general surgery at SSIMS and RC from January 2020 to May 2020. They were classified according to the time of presentation i.e. before declaration of the state of alarm (pre-COVID-19), and after its declaration (post-COVID-19) in India (24 March 2020). Electronic data base and discharge summaries of the patients from the concerned time duration were retrieved and the required parameters and variables were assessed. An evaluation was made of demographic variables, complications, type of treatment given, intraoperative findings and duration of hospital stay in both the groups.

Inclusion criteria

Subjects with suspected acute appendicitis based on history and physical examination results, then confirmed by abdominal ultrasonography/contrast enhanced computed tomography (CECT) scans were included in the study; and age greater than or equal to 18 were included in the study.

Exclusion criteria

Patients with a history of mental illness with age <18 years were excluded from the study.

After the outbreak of the 2019-nCoV, all the patients were routinely examined by chest CT scans and viral nucleic acid amplification testing from throat swab samples. The nucleic acid amplification test results came out within 24 hour after admission.

Statistical analysis

IBM statistical package for the social sciences (SPSS) statistics 16.0 was used for statistical analysis. Descriptive variables were assessed as mean with standard deviation (SD), categorical variables between two groups were compared using Chi-squared test or Fisher's exact test and continuous variables were tabulated using student's t-test. It was assumed that after lockdown initiation, there might be significant changes in clinical parameters and outcomes due to delayed presentation to the hospital. P value of less than 0.05 was considered significant.

RESULTS

A total of 45 patients were included, with 20 in pre-COVID-19 group and 25 in post-COVID-19 group.

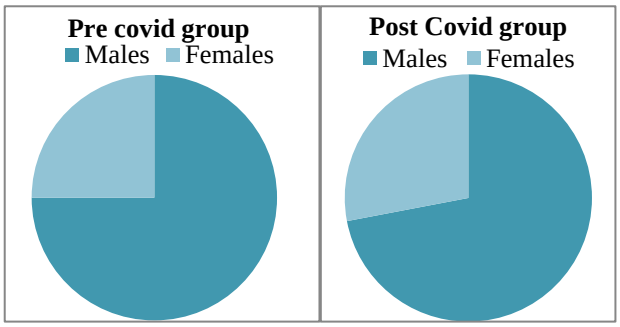

Figure 1: Sex distribution between pre-COVID and post-COVID group.

There were no statistical differences detected in terms of the demographic and clinical characteristics between the two groups with respect to age, sex, preoperative clinical findings (body temperature, and WBC counts).

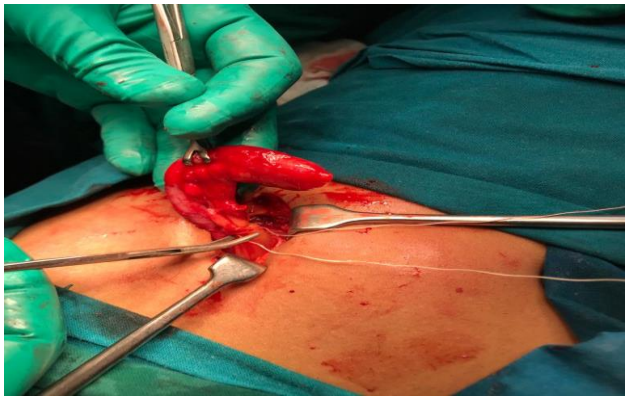

Figure 2: Intraoperative finding of acute appendicitis showing thickened and inflamed appendix.

The prevalence of complicated appendicitis after the epidemic outbreak was significantly higher than before the outbreak (52% versus 20%, p<0.001). Post-COVID-19 group had a lower score of patient's intention to seek treatment than pre-COVID-19 group (9.5±2.7 versus

3.4±2.6, p<0.001).The mean hospital stay was longer in post-COVID-19 group (5.6±5.9 versus 3.2±4.3 days; p=0.041).

Figure 3: Appendicectomy specimen.

Table 2: Comparison of treatment modalities between pre-COVID-19 and post COVID-19 group.

Treatment modality	Pre-COVID-19 group (n=20)	Post-COVID-19 group (n=25)
Conservative	2	1
Open appendicectomy	14	24
Laparoscopic appendicectomy	4	0

In post-COVID-19 group, the interval from onset of symptoms to admission was 65.0 hour, which is significantly longer than the 17.3 hour interval noted in pre-COVID-19 group (p<0.001).

Figure 4: Gangrenous appendix.

Figure 5: Inflamed appendix with appendicolith.

Table 1: Comparison between pre-COVID-19 and post-COVID-19 group.

Parameters assessed	Pre-COVID-19 group (n=20)	Post-COVID-19 group (n=25)	P value
Duration since onset of symptoms (hours)	17.3	65.0	<0.001
Complicated appendicitis (%)	4 (20)	13 (52)	<0.001
Appendicular abscess (%)	2 (10)	6 (24)	0.001
Perforated (%)	1 (5)	4 (16)	0.003
Gangrenous (%)	1 (5)	3 (12)	0.020
Score for intention to receive treatment	9.5	3.4	<0.001
Mean duration of hospital stay (days)	3.2±4.3	5.6±5.9	0.41

DISCUSSION

This study was conducted in SSIMS and RC which is a tertiary care centre in the city of Davangere, comparing the various parameters between pre-COVID-19 and post-COVID-19 era. There are a few studies related to appendicitis during this pandemic and most of them arrived into a conclusion of treating lesser number of patients amidst the present scenario.[6,7]

The duration of pain abdomen before presentation to the hospital significantly increased in post-COVID-19 group showing 65 hours (p<0.001). The scenario of delayed presentation to health care centres has been since ages in developing countries due to affordability issues and lack of adequate transportation during normal days which itself was compromised due to the pandemic. It can be anticipated that during these times of strict immobility, being confined to homes, maintaining social distancing, taking home based treatments in the fear and anxiety of contracting virus from health care personnel and hospitals.[8]

This further aggravates the diseased status of the patient thus explaining the increased rates of perforation and complicated cases in our setting. Even the health care personnel were reluctant to admit patients due to the fear of contacting the disease themselves.

Appendicular perforation is one of the dreaded complications of late presentation to the hospital which increases morbidity and mortality in comparison to non-complicated appendicitis. Studies have shown the perforation rates ranging from 16% to 40%.[9]

Our study showed almost similar rates of perforation though there was a significant increase in perforation rates in post-COVID-19 group by thirty-two percent comparing to post-COVID-19 patients (52% versus 20%). Around two to six percent of cases with acute appendicitis present with appendiceal mass which mainly includes inflammatory phlegmon or abscess.[10] In our study, it increased from 10% in pre-COVID-19 group to 24% in the post-COVID-19 group. Only one case was managed conservatively in the post-COVID-19 group. The mean operative time duration increased significantly between two groups, the latter one showing mean duration slightly more in comparison. This could be due to extra precautions taken by the operating surgeons, virtually limiting chances of prick injuries, trying the best to limit complications to occur and operating while wearing personal protective equipment (PPE) with a foggy visibility along with complicated appendicitis encountered mandated extra cautiousness to take into account. The duration of hospital stay was also prolonged in the post-COVID-19 group. We could see a greater number of patients surfacing to the emergencies and getting operated in comparison to the same time frame before this contagious disaster. The valid reason for this disparity could be due to closure of private hospitals around the area and conversion of government hospital to exclusive COVID care centre from where the patient turns up and the pooling occurred at our institute as this serves as one of the tertiary centres in the region.

The limitations of this study is that it's a retrospective, single centre study with a small sample size.

CONCLUSION

COVID-19 pandemic influenced the time of diagnosis of appendicitis, as well as its course, and mean hospital stay. Patients exhibited a low willingness to receive treatment. Complicated appendicitis was more common in patients with acute appendicitis after the outbreak of COVID-19 pandemic.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Patil LS, Jagadeesha R. Impact of COVID-19 pandemic on outcome of acute appendicitis–a retrospective analysis. Int Surg J 2021;8:3516-9.