



COVID-19 and Complicated Appendicitis: What is the Relationship?

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors contributed to all aspects of the manuscript.

Article Information

DOI: 10.9734/JAMMR/2021/v33i1831050

Editor(s):

- (1) Dr. Ashish Anand, GV Montgomery Veteran Affairs Medical Center, University of Mississippi Medical Center, William Carey School of Osteopathic Medicine, USA.
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 - (3) Alejandro Quiroga-Garza, Universidad Autonoma de Nuevo Leon, Mexico.
- Complete Peer review History: <https://www.sdiarticle4.com/review-history/72921>

Short Research Article

Received 12 June 2021
Accepted 17 August 2021
Published 17 August 2021

ABSTRACT

Aims: The COVID-19 pandemic disrupted healthcare globally and several authors have observed a change in the presentation of acute appendicitis within the period. We have observed an upsurge in the presentation of complicated appendicitis within the first 4 weeks of 2021. We aim to compare our findings with a similar period prior to the COVID-19 pandemic.

Study design: Observational cohort study.

Place and duration of the study: Benue State University Teaching Hospital(BSUTH), Makurdi, Nigeria.

Methodology: We identified all patients that presented with appendicitis in our facility within the first four weeks of 2021 and retrieved their folders to ascertain our observation. We then retrieved the folders of patients who presented with appendicitis a year earlier when the pandemic was inexistent in our country. We compared the data between the two periods.

Results: In the period of the pandemic, we found an increased presentation of acute appendicitis, with most patients presenting as complicated appendicitis. There was an increased length of time between symptom onset and presentation, increase in operating time, postoperative complications, and length of hospital stay in the index period.

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Conclusion: We conclude that there is an apparent increase in the presentation of complicated appendicitis with a resultant increase in post-operative complications and morbidity. However, these changes are likely a result of our response to the COVID-19 pandemic rather than the pathology of the SARS CoV-2 virus. We suggest that with the relaxation of movement restrictions and lockdowns in most places, and availability of COVID-19 vaccines, public enlightenment is necessary to encourage an early presentation of acute abdominal conditions with a view to decreasing morbidity.

Keywords: COVID-19; appendicitis; complicated appendicitis; appendicectomy.

1. INTRODUCTION

The COVID pandemic began in Wuhan, China in December 2019 [1] has had an impact in virtually every area of medicine and healthcare. Nigeria recorded its index case on 27 February 2020 [2] and within the following month, Benue state, in North-Central Nigeria recorded its index case [3]. Since then, emergency surgical services have been disrupted worldwide due to reassignment of surgical staff to combat the pandemic and sometimes, closure of entire surgical units [4]. Acute appendicitis is the most common surgical emergency in Nigeria [5,6] and studies have suggested changing trends in the presentation of this disease occasioned by the current pandemic [7]. We have observed an unusual influx of cases of acute complicated appendicitis within a relatively short period of time in the general surgery unit of Benue State University Teaching Hospital (BSUTH), Makurdi, Nigeria compared to a similar period a year earlier. Our aim is to describe these cases and explore the literature on the relationship between complicated appendicitis and the COVID 19 pandemic.

2. METHODOLOGY

At the start of the year 2021, we observed an unusual surge in cases of complicated appendicitis between January 1 and January 28, in our department. To ascertain this, we searched the hospital records for all patients presenting with acute appendicitis (both uncomplicated and complicated) in the 4-week period and retrieved their folders to examine the patient demographics, clinical presentation, results of investigations, intraoperative details, postoperative course, and histopathologic results in a bid to explain the sudden surge within the time period. We also checked the hospital records to ascertain the number and pattern of presentation of acute appendicitis in our department, a year earlier when the COVID 19

pandemic was not present in Benue state of Nigeria. Complicated appendicitis was defined as the existence of a perforated, or gangrenous appendix or peri-appendiceal abscess during laparoscopy or laparotomy [8] and/or on review of histopathological analysis. COVID-19 tests were not done for the patients presenting within the period of the pandemic due to institutional challenges.

3. RESULTS AND DISCUSSION

A total of 20 cases of appendicitis were found comprising 12 males and 8 females with a male to female ratio of 3:2. The age range of study participants was between 14 and 45 years. Sixteen of these patients (80%) presented within the index period (January 1 to 28, 2021) and of these 15 (94%) were complicated appendicitis. In comparison, 4 (20%) of the patients presented within the same period, a year earlier (i.e., January 1 to 28 2020) and these were mostly uncomplicated (75%). There was no delay in referral in any of the participants. The mean duration of symptoms before presentation was significantly longer in the index period, compared to a year earlier ($P=0.005$). Also, the mean duration of symptoms before presentation was significantly longer in the cohort presenting with complicated appendicitis compared with those with a diagnosis of uncomplicated appendicitis ($P=0.02$). There was no difference in the mean duration of surgery between the index period and a similar period, a year earlier ($P=0.17$) however, the surgery took significantly longer to perform in the cohort presenting with complicated appendicitis ($P=0.008$). The mean length of hospital stay was also significantly longer in the index period ($P=0.04$) as well as in the cohort presenting with complicated appendicitis ($P=0.002$). Finally, postoperative complications occurred more often in the index period though this was not statistically significant ($P=0.54$). Details are presented in Table 1.

Table 1. Summary of data obtained in the index period versus one year earlier

January 1 to 28, 2021						
	Gender and age (years)	Presentation	Duration of symptoms	Duration of surgery (minutes)	Length of hospital stay (days)	Post-operative complication
Patient 1	fem/16	gangrene	4	85	9	nil
Patient 2	male/23	perforation	3	60	7	nil
Patient 3	male/40	perforation	7	120	7	wound infection
Patient 4	male/17	perforation	14	135	21	intraabdominal abscess
Patient 5	male/25	mass/abscess	4	50	10	nil
Patient 6	fem/35	perforation	3	45	8	nil
Patient 7	male/21	gangrene	5	90	8	wound infection
Patient 8	fem/22	gangrene	7	90	7	nil
Patient 9	male/26	uncomplicated	1	40	3	nil
Patient 10	male/44	perforation	3	150	8	nil
Patient 11	fem/18	perforation	4	105	7	nil
Patient 12	fem/14	mass/abscess	5	135	8	nil
Patient 13	male/35	perforation	3	120	7	wound infection
Patient 14	male/26	perforation	3	115	9	nil
Patient 15	male/17	perforation	5	95	7	nil
Patient 16	fem/30	gangrene	3	95	9	nil
January 1 to 28, 2020						
Patient 1	male/32	uncomplicated	1	20*	2	nil
Patient 2	fem/17	uncomplicated	1	90**	1	nil
Patient 3	fem/18	perforation	3	95	8	nil
Patient 4	male/45	uncomplicated	2	45	3	nil

*Laparoscopic-assisted appendectomy, **Laparoscopic appendectomy

There was a male preponderance in this study, in agreement with other authors [9,10]. The presentation and management of uncomplicated and complicated appendicitis appear to have been altered in the COVID-19 era. While there is a reduction in the presentation of uncomplicated appendicitis, there appears to be an increase in the presentation of complicated appendicitis as observed in this study [8,11]. There are several possible explanations for this apparent trend.

Firstly, in the face of the pandemic, people were reluctant to leave their homes to seek medical care due to fears of contracting the virus within the hospital environment [11–13] and movement restrictions placed by different governments in a bid to contain the spread of the virus [8]. These led to delayed presentations and hence an increased risk of complications arising in the setting of acute appendicitis. This possibility is suggested in this study by the mean duration of symptoms in the index period which was significantly greater than that a year earlier

($P=0.00$). Secondly, the COVID-19 infection is known to be pan-systemic with manifestations in the gastrointestinal (GI) tract which may mimic acute appendicitis. These GI features include anorexia, abdominal pain, vomiting and diarrhoea, [14] which are classic features seen in appendicitis. Because of the need to prevent unnecessary surgical operation in a potentially COVID-19 infected patient, it was important to rule out this differential which hitherto did not exist. This might have required screening investigations which are often not readily available, [15] with the result being a delay in referral and/or operative intervention and increased potential for developing complications. Thirdly, although appendectomy is the gold standard in the management of acute uncomplicated appendicitis, [7,16] several centres are increasingly adopting conservative management of uncomplicated and even complicated appendicitis during the pandemic [17–19]. This might have been a strategy to reduce potential contact of the surgical team and

operating room environment with the SARS CoV-2 virus. A possible outcome of this approach would be failed non-operative management and an increased rate of developing complications. Indeed, 4 (25%) of the patients presenting within the index period in this study had presented in other hospitals, where initial conservative management was attempted. There is a report of indicated surgery in a COVID-19 positive individual deferred on account of the patient's COVID-19 positive status [17]. Whether this should be an acceptable standard of care in the face of this pandemic is debatable. However, general anaesthesia and laparotomy are aerosol-generating procedures and in situations where the hospital and/or operating room environment is not equipped to deal with the increased risk to surgical and anaesthetic staff, deferment of surgery while referring to a more capable centre seems logical in the balance of risks versus benefits. This approach of referring emergency cases to centres that are better prepared and equipped to manage potential COVID-19 cases presenting with acute abdomen could potentially cause a delay in operative intervention, which is another possible reason for the apparent increase in cases of complicated appendicitis. In Nigeria, most cases of acute appendicitis are addressed at the secondary healthcare levels or private hospitals [20]. Due to lack of resources to diagnose and manage potential cases of COVID-19 as commonly observed in Nigeria, [21] these centres may now be reluctant to accept emergencies including those presenting with acute appendicitis. This may explain the four-fold increase in the number of cases of appendicitis presenting in our hospital (which is a tertiary healthcare centre) in the index period, compared to a year earlier.

The implication of delay in the operative treatment of appendicitis includes increased morbidity and post-operative complications [7] as reflected in this study, with increased operative time ($P=.00$), increased length of hospital stay ($P=.00$) and increased rate of postoperative complications ($P=.00$) in the group presenting with complicated appendicitis. This is similar to findings by other authors [22] and has undoubtedly increased the strain on health resources already stretched by this pandemic.

This study has some limitations. The data were limited to the month of January in the respective years. Exclusion of other months may have introduced some bias. Also, the use of antibiotics or other medications prior to presentation was

not compared between the two cohorts. This was because such data was not uniformly available for all participants due to the retrospective nature of the study.

4. CONCLUSION

We conclude that there is an apparent increase in the presentation of complicated appendicitis with the resultant increase in post-operative complications and morbidity. However, these changes are likely a result of our response to the COVID-19 pandemic rather than the pathology of the SARS CoV-2 virus. We suggest that with the relaxation of movement restrictions and lockdowns in most places, and availability of COVID-19 vaccines, public enlightenment is necessary to encourage an early presentation of acute abdominal conditions with a view to decreasing morbidity.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Permission to conduct the study was obtained from the Health and Research Ethics Committee (HREC) of the Benue State University Teaching Hospital (BSUTH), Makurdi.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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The peer review history for this paper can be accessed here:
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