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The Effect of COVID-19 Pandemic on Acute Appendicitis Presentation

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ABSTRACT

Background: Acute appendicitis is the most frequent emergency abdominal condition in general surgical practice. Appendectomy can be performed as open surgery or laparoscopically. Coronavirus disease 2019 (COVID-19), the highly contagious viral illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), differing in the diagnosis.

Aim of the study: To analyze the impact of the 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.

Methods: A prospective study was conducted in the Department of General Surgery at surgical ward in Baghdad Teaching Hospital during the period of one year from first of July 2020 till first of July 2021. A hundred patients were enrolled in this study.

Results: This study included 100 patients complained from acute appendicitis, divided into two groups 52 of them were COVID-19 positive and 48 of them COVID-19 were negative patients. The mean time elapsed from onset of symptoms to surgical intervention was (73.44 hours) in COVID-19 positive patients versus mean (28.56 hours) in COVID-19 negative patients, and the results were statistically significant ($p<0.0001$). Total patients who presented with complicated appendicitis were (36), 26 of them were COVID-19 positive, of them 8 patients presented with perforation.

Conclusion: The increase in complicated cases of acute appendicitis seems to be associated with the delay from time of symptoms onset to surgical intervention.

KEYWORDS: Appendicitis, SARS-CoV-2, Perforated appendix, COVID-19

ARTICLE DETAILS

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INTRODUCTION

Coronavirus disease-19 (COVID-19) is an infectious respiratory disease caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). Respiratory symptoms and flu-like presentation are the most defined clinical manifestations.

Coronavirus Disease 2019 (COVID19), was declared a pandemic by the (WHO) on March 11, 2020, constituting a global public health emergency .[1]

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. 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.[2]

For appendicitis, an increased prehospital delay during the pandemic has been reported, a shift towards a higher proportion of complicated appendicitis cases has been described .[3]

Aim of the study

The aim of this study was to:

- Analyze the impact of the COVID - 19 pandemic on the time elapsed between onset of symptoms and diagnosis of AA.
- The effect of this delay on disease progression, appendicitis severity the surgical approach, the length of stay and postoperative complications.
- Compare the proportions of uncomplicated and complicated appendicitis in adult patients during the pandemic.

PATIENTS AND METHODS

A prospective study was conducted in the Department of General Surgery at surgical wards in Baghdad Medical City during the period of one year from first of July 2020 till fist of July 2021.

A hundred patients were enrolled in this study.

Inclusion criteria

- Patients attended the outpatient clinic or the emergency department with signs and symptoms suggestive of acute appendicitis.
- Patients with the age above 14 years old.
- Some of them Covid-19 positive patients and other Covid-19 negative patients.

Exclusion criteria

- Patients aged below fourteen years.
- Those who had full blown picture of generalized peritonitis.
- Patients who refused to participate in this study.

Written consent was obtained from each patient prior to collecting data. A questionnaire was applied to all enrolled patients to collect the needed information as the following: Epidemiological questions, such as history of exposure to COVID-19 patients or pandemic areas, were also asked. Clinical signs and symptoms of respiratory tract infection such as fever and cough were recorded.

We also carefully identified gastrointestinal symptoms of COVID-19 and appendicitis. The patients were classified according to COVID – 19 severities.

Sociodemographic information, time of presentation, past medical and surgical history, symptoms which included fever, vomiting, anorexia, diarrhea, and pain with details of site, severity, and shifting. Examination was done for all patients including general and vital signs,

body temperature was checked, abdominal examination and bowel sound. Work up with investigation results as complete blood count, CRP, imaging investigation ultrasound scan, chest X ray and CT chest. COVID-19 screening was performed prior to admission by PCR and Covid-19 titer. Covid-19 tests for (SARS -COV - 2 RNA) were taken by trained health care assistants. The patient was temporarily placed in special surgical wards before the PCR test result was available. A PCR test was required before and after surgery. If any of the two results were positive, the patient was admitted to a special isolation ward for the simultaneous treatment of COVID-19. If the result was negative, the patient was sent to the surgical wards, and the PCR test was repeated on the basis of the status of the illness. The test sample was selected using a nasopharyngeal swab. The results were obtained after 24 hours.

Management of patients were conducted as any COVID-19 positive patients according to Iraqi ministry of health protocol for COVID19 management (oxygen, anticoagulant, steroids and antiviral according to severity).

Conservative treatment with antibiotics (third generation cephalosporin and metronidazole) used for cases of suspected appendiceal phlegmon based on clinical and sonographic features.

On the other hand for patients need surgery; Intraoperative protective measures were taken. Appendectomy was performed under standard precautions (hand washing, gloves and surgical gown and mask wearing) if the COVID-19 screening was negative, Patients with suspected or confirmed COVID-19 were scheduled for surgery in the operating room under tertiary protection with personal protective equipment (PPE), N95 mask, eye protection. Most of the COVID-19 positive or suspected positive patients underwent an open appendectomy. The number of surgical assistants was controlled based on the type of surgery. Prophylactic antibiotics were given 30 min before surgery.

Surgery was performed under general or spinal anesthesia in supine position. Either open or via laparoscopy.

Statistical analysis was performed using GraphPad Prism version 6 for Windows (GraphPad Software, La Jolla, CA, USA). For the descriptive analysis, percentages or the mean ± standard deviation (SD) were recorded. All investigated variables were analyzed statistically using the Chi square test, or Fisher's exact test. The differences were considered significant at P-value <0.05.

RESULTS

This study included 100 patients complained from lower abdominal and/or right iliac fossa pain suggestive of acute appendicitis, divided into two groups 52 COVID-19 positive and 48 COVID-19 negative patients.

A total of 100 patients (median age, 25.5 years; age range 15 - 67 years) with a mean of (28.8 years and (SD) of ±11.30 years). The highest proportion of study patients was aged < 40 (79%). Regarding gender, proportion of males was slightly higher than females (53% versus 47%) with a male to female ratio of (1.12:1).

The majority of COVID-19 positive patients were below the age of 40 years, similarly to COVID-19 negative patients.

	COVID-19 Positive	COVID-19 negative	Total No.	p-Value
AGE				
<40 years.	37(71%)	42(87%)	79	Fisher's exact test 0.1396
>40 years	15(29%)	6(13%)	21	
Total	52	48	100	
Gender				
Male	26(50%)	27(56%)	53	Fisher's exact test 0.4230
Female	26(50%)	21(44%)	47	
Total	52	48	100	

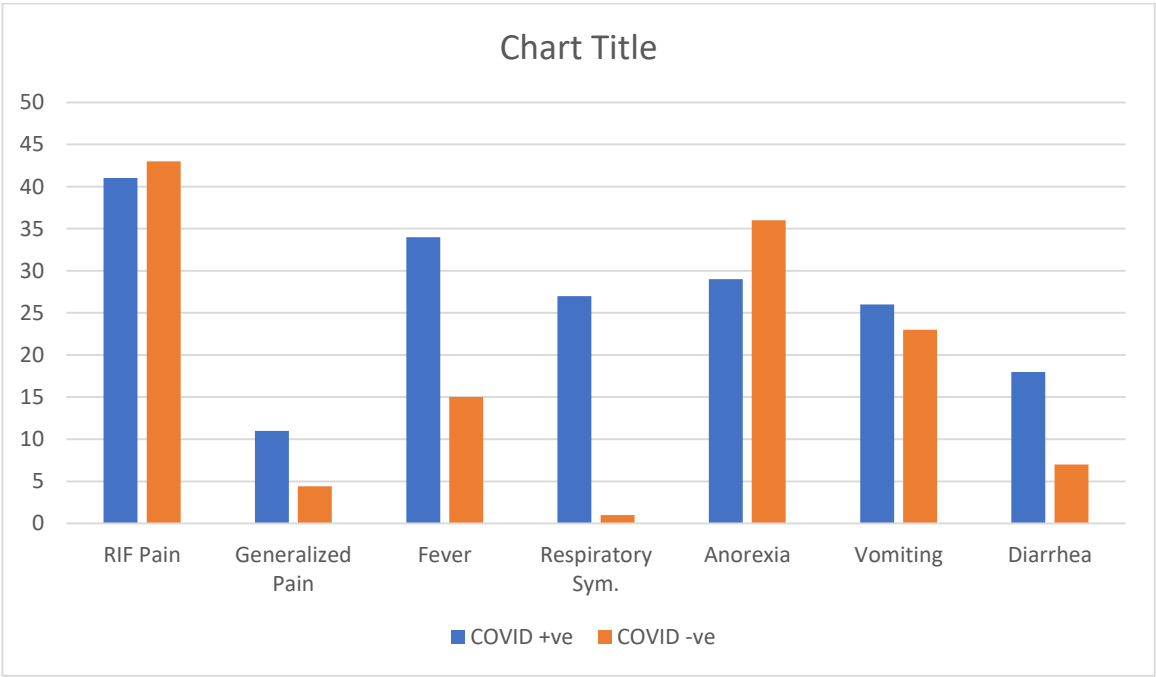
The mean of WBC was 13000 with (SD) of ± 3531, Leukocytosis more than 10000/mm3 was seen in 40 patients with COVID-19 positive and in 39 patients with COVID-19 negative, which was statically non-significant (p = 1.0000).

WBC count	COVID-19 Positive	COVID-19 negative	Total No.	p-Value
>10000	40(77%)	39(81%)	79	Fisher's exact test 1.0000
<10000	12(23%)	9(19%)	21	
Total	52	48	100	

The mean time elapsed from onset of symptoms to surgical intervention was (73.44 hours) and the (Median 72 hours, range, 24- 168 hours) in COVID19 positive patients versus mean (28.56 hours). While the (Median 24 hours, range, 24-168 hours) in COVID-19 negative patients, and the results was statistically significant (p<0.0001).

Time of presentation	COVID-19 Positive	COVID-19 negative	Total No.	p-Value
<24 hours	11 (21%)	30(62%)	41	< 0.0001 Fisher's exact test
>24 hours	41(79%)	18(38%)	59	
Total	52	48	100	

A higher percentage of the COVID-19 positive patients had fever compared to COVID-19 negative (65%vs 31%); the same was the case when it came to diarrhea (36% vs14%). The majority of patients with right iliac fossa pain (79% in COVID-19 positive vs 90% in COVID-19 negative). (Fig. 3-2) The difference of signs and symptoms between the two groups was statically significant= (p<0.001).



In COVID-19 negative patients, 63% of them underwent open appendectomy and 35% of them underwent laparoscopic appendectomy, 2% remained for conservative treatment with antibiotics. And 88% of in COVID-19 positive patients underwent open appendectomy with 12% remained

for conservative treatment with no laparoscopic surgery done.
That was statically significant (p<0.001).

	Conservative	Open	Laparoscopy	Total	p-Value
COVID-19 positive	6(12%)	46(88%)	0	52	< 0.0001 Chi-square
COVID-19 negative	1(2%)	30(63%)	17(35%)	48	
Total	7	76	17	100	

The operative time increased in COVID-19 positive in comparison to COVID-19 negative patients and the difference was statically significance (p<0.001).

Operative time	COVID-19 positive open	COVID-19 negative open	Total	p-Value
<35 min.	22(48%)	25(83%)	47	0.0019 Fisher's exact test
>35 min.	24(52%)	5(16%)	29	
Total	46	30	76	

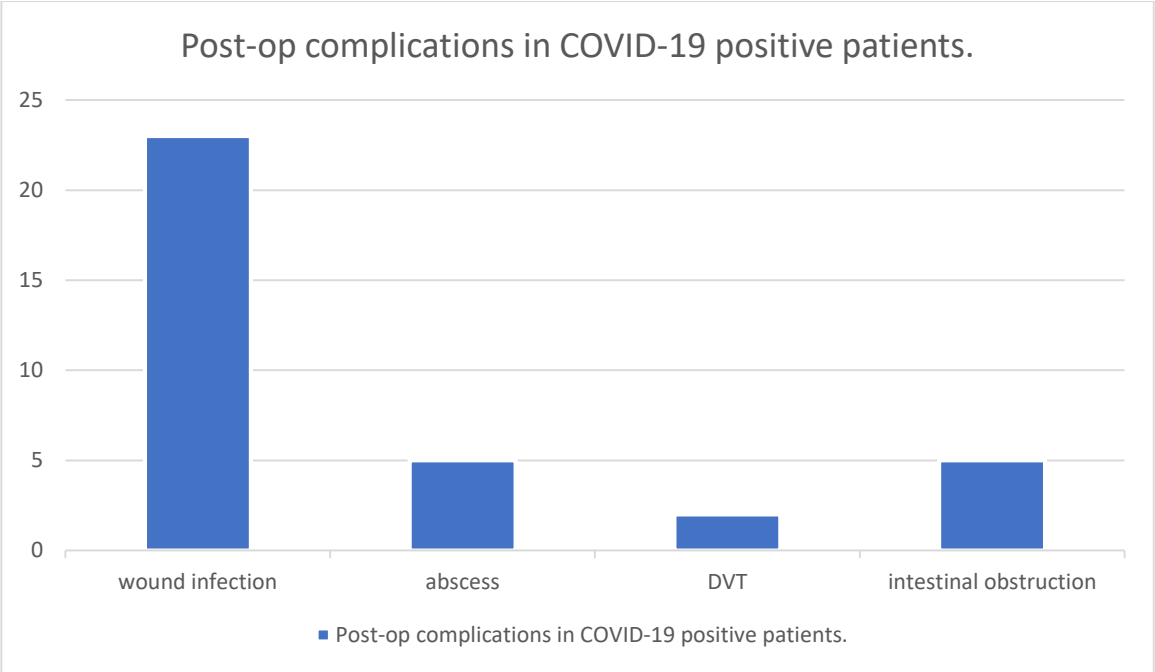
Total patients who presented with complicated appendicitis were (36), 26= of them were COVID-19 positive, of them 8 patients presented with perforation. Regarding COVID-19 negative complicated appendicitis were in diabetic patients with comorbidities, and the difference was statistically significant (p<0.0006).

	Uncomplicated appendix	Gangrenous	Phlegmon	Abscess	Perforated appendix	Total	p-Value
COVID-19 positive	19 (41%)	6 (13%)	4 (9%)	9 (20%)	8 (17%)	46 (100%)	0.0006 Chi-square
COVID-19 negative	38(80%)	0 (0%)	4 (9%)	4 (9%)	1 (2%)	47 (100%)	

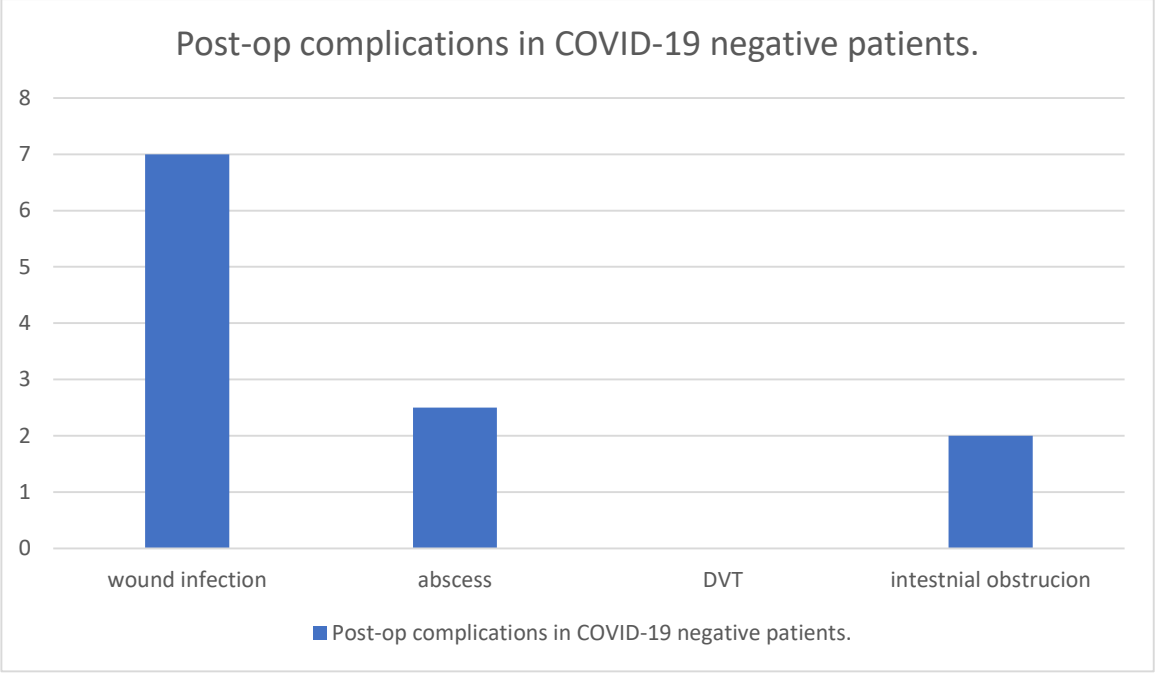
The duration tended to decrease in COVID-19 negative patients (median one day) (SD) of ± 0.88 while in COVID-19 positive patient the duration of stay increases (median 2.5 day, SD of ±1.38) the difference was statistically significant (p<0.0001).

Duration of hospitalization	COVID-19 positive	COVID-19 negative	Total	p-Value
1 day or less	14 (27%)	38 (80%)	52	< 0.0001 Fisher's exact test
>1 day	38 (73%)	10 (20%)	48	
Total	52	48	100	

In COVID-19 positive patient there were 40 (77%) re - attendances in the first 3 months of follow up period (57.5%) with surgical site infection (SSI) required wound care and antibiotics. Five patients had intra-abdominal abscess requiring interventional radiological drainage, two patients complained from deep venous thrombosis (DVT), and 5 patients with intestinal obstruction.



While for COVID-19 negative, there were 35 (73%) re-attendance, 7 (20%) of them had SSI, 3 of them were diabetic patients. Two patients had intestinal obstruction and 2 with intra-peritoneal abscess collection during the 3 months follow up periods there were no reported deaths.



DISCUSSION

In the COVID-19 pandemic, several variables of patients with acute appendicitis changed compared to those in the pre-pandemic era. The time from the presentation to surgery was almost prolonged because preoperative COVID19 tests were required. Although more patients were admitted via emergency department.[4]

The results of this study showed that, appendicitis is more commonly diagnosed in young patients (mainly males); in fact, almost 79% concerns those under 40, these results are inconsistent with previous study by Lisi et al., in 2022.[5] When comparing between the groups, there was no significant difference in the distribution of age or gender of the patients, and this is in line with a study presented by Tankel et al., in 2020.[6]

Leucocyte count is the most frequently used laboratory test in diagnosing appendicitis. It is found easily in every medical center, the results of the current study showed insignificant difference between COVID-19 positive and negative patients, as in both groups the majority of the patients showed WBC count greater than 10000 mm3. A similar result regarding wbc

counts of patients with acute appendicitis was obtained by another study conducted by Şahbaz et al..[7]

The prolonged delay from the onset of symptoms to diagnosis and surgery, can be attributed to possible reason of the fear from exposure to the confirmed coronavirus cases in hospital. On the other hand, several previous studies reported that, infection by SARS-COV-2 may present with gastrointestinal manifestations in some cases which could interfere with the diagnosis of acute appendicitis and causes confusion in the diagnosis.[8]

In this study, time elapsed from onset of symptoms to hospital admission in COVID-19 positive patients was longer than that reported in COVID-19 negative patients, and this is in line with study by Baral et al.[9] in 2021, who found delay presentation to the healthcare centers during the pandemic. A report from Germany showed that appendectomies decreased by 13.5%, and the severity of appendicitis increased in the first 2020 COVID-19 lockdown compared to

2019. The authors explained that patients' fear of an in-hospital COVID-19 infection might result in a delay to contact a surgeon, and subsequently, the inflammation would progress or a self-limiting course might occur. Other investigators in the UK reported a similar phenomenon, with higher inflammatory markers and more severe disease of the appendix during the pandemic than before.[4]

Dreifuss et al. found complicated appendicitis in seven (46.7%) out of 15 adult Argentinian patients with acute appendicitis during April 2020 compared to 11 (16.9%) out of 65 patients during April 2018 and 2019, and COVID-19 positive patients showed a longer delay in presentation than COVID-19 negative patients (58.4 vs. 32.8hours).[10]

These differences are confirmed by Gao et al., in 2020, who analyzed a Chinese study of 163 patients who presented with appendicitis, they found

complicated appendicitis in 51.7% of patients and a mean prehospital delay of 65.0 hours in the epidemic study, compared to 12.4% complicated appendicitis and a mean delay of 17.3 hours in the pre-epidemic study (both p <0.001).[11]

The present study illustrated that, COVID-19 positive patients had higher percentage of the fever compared to COVID-19 negative (65%vs 31%), as confirmed by Guan et al., in 2020, who reported fever in 42.8% at the time of admission and 88.7% of the COVID-19 patients at the time of hospitalization.[12]

Significantly, in COVID-19 positive patients were treated conservatively 12%, compared to 2% remained for conservative treatment with antibiotics in COVID-19 negative patients, similarly, Dutch national guideline (2019), recommended conservative treatment to be considered for uncomplicated appendicitis. In the Netherlands, the national guideline was not changed to discourage the surgical treatment of acute appendicitis during the COVID-19 pandemic, which was done in some other countries, e.g. the UK. The current study is also in line with the study by Scheijmans et al.[3] in 2021. However, the increase of conservative treatment was much lower than the increase reported by Emamghissi et al.[13] in 2021, as 54% of their patients were treated conservatively. However, we could see a surge of open surgeries in comparison to laparoscopy, Potential advantages of early return to work, minimal hospital stay, minimized post-operative surgical site infections have been documented in literatures as the beneficial outcomes of laparoscopy in comparison to open appendectomies. No any laparoscopic appendectomy during lockdown was evident in our clinical practice. The main reason behind this was due to various controversies existed regarding aerosol generating procedures and safety of the health care workers too.[14]

The mean operative time duration increased significantly in COVID-19 positive in comparison to COVID-19 negative patients. This could be due to extra precautions taken by the operating surgeons, virtually limiting chances of prick injuries while trying the best to limit complications to occur. Similarly, operating while wearing (PPE) with a foggy visibility along with complicated appendicitis encountered mandated extra cautiousness to take into account, this goes in line

with Baral et al.[9], in 2021. Our results indicated that patients with acute appendicitis were more likely to be complicated with gangrene, abscess formation or perforation in

COVID-19 positive patients as well the length of hospital stay increase accordingly, due to increase in the interval between the onset of symptoms and admission this in line with Finkelstein et al. [15], in 2021 and Bickel et al.[16] , in 2022.

Patients were followed up for a minimum period of three months, (57.5%) of COVID-19 positive patients developed (SSI) while only (20%) in COVID-19 negative. The prevalence of SSI reported by Koumu et al.[17] , in 2021 among post-appendectomy patients reached 7.2% of the total. When comparing this result to different studies, a wide variation in the prevalence of SSI postappendectomy is found. Varela et al.[18] , study found a significant relationship between the type of procedure either by a laparoscopic or open appendectomy and getting SSI (p>0.001), where open procedures have a higher risk of getting a postoperative wound infection. This can be explained by the larger size of the incision associated with it. And more reasonable cause, that

laparoscopic approach is known to have less hospitalization time. The current study, COVID19 negative had a median one day (SD) of ± 0.88 while in COVID- 19 positive patient the duration of stay increases (median 2.5 day, SD of ± 1.38) the difference was statistically significant. Aranda-Narvaez et al.[19] , in 2014 had an overall SSI rate of 13.4%. Other study in Egypt found a rate of 21.9%.[20]

A local study revealed the rate of SSI prevalence to reach 52% following perforated appendectomy.[21] The high rate of SSI is contributed due to, prolonged duration of the surgery, and a more advanced stage of appendix pathology perforated, abscess, gangrenous. Taking other preoperative and postoperative factors into consideration.[17]

Giving prophylactic antibiotics has been stated as an important risk factor and a higher rate of infection in patients with co-morbidities including hypertension, diabetes, immune compromised and poor nutrition status.[17]

LIMITATIONS OF THE STUDY

There are several limitations to this study. This is a single center study. Also, relatively small number of patients admitted with acute appendicitis after declaration of COVID -19 pandemic, which may not cover all the demographic and clinical aspects of the disease and lesser time of duration for follow up period as COVID -19 is a new disease and we could not find many similar studies from the region to compare and discuss the findings.

CONCLUSIONS

• During the SARS-CoV-2 pandemic, the time elapsed between onset of symptoms and diagnosis of AA was prolonged.

• The increase in cases of acute appendicitis presenting at more advance stages along with complicated cases and perforation rate seems to be associated with the delay in surgical intervention from the time of symptoms onset, due to both the initial delay in seeking emergency care avoiding the hospitals to lessen the exposure to COVID-19 and further delay during waiting the SARS- COV- 2 PCR test result.

• The length of hospital stays along with postoperative complications increased in COVID-19 positive patients compared with COVID-19 negative patients.

RECOMMENDATIONS

• Ensure a high safety care to the patients attending the emergency department when needed, to relieve their concerns about getting COVID19 infection.

• Allow the proper diagnosis of acute appendicitis with the use of further investigations as soon as possible such as CT abdomen, MRI, etc. to avoid unnecessary delay.

• Conducting similar study with larger sample size and in multiple centers across the country with longer follow-up period as COVID-19 is a new disease and its long-term complications is still unknown.

REFERENCES

I. Bonilla L, Galvez C, Medrano L, Benito J. [Impact of COVID-19 on the presentation and course of acute appendicitis in paediatrics]. An Pediatr (Engl Ed). 2021;94(4):245-51.

II. Orthopoulos G, Santone E, Izzo F, Tirabassi M, Perez-Caraballo AM, Corriveau N, et al. Increasing incidence of complicated appendicitis during COVID-19 pandemic. Am J Surg. 2021;221(5):1056-60.

III. Scheijmans J, Borgstein A, Puylaert C, Bom W, Bachiri S, Bodegraven E, et al. Impact of the COVID-19 pandemic on incidence and severity of acute appendicitis: a comparison between 2019 and 2020. BMC Emergency Medicine. 2021;21.

IV. Kim CW, Lee SH. Impact of COVID-19 on the care of acute appendicitis: a single-center experience in Korea. Ann Surg Treat Res. 2021;101(4):240-6.

V. Lisi G, Campanelli M, Mastrangeli MR, Spoletini D, Menditto R, Grande S, et al. The treatment of acute appendicitis in two age-based groups during COVID-19 pandemic: a retrospective experience in a COVID-19 referral hospital. International journal of colorectal disease. 2022;37(2):323-8.

VI. Tankel J, Keinan A, Blich O, Koussa M, Helou B, Shay S, et al. The Decreasing Incidence of Acute Appendicitis During COVID-19: A Retrospective Multi-centre Study. World journal of surgery. 2020; 44(8):2458-63.

VII. Sahbaz NA, Bat O, Kaya B, Ulukent SC, Ilkgul O, Ozgun MY, et al. The clinical value of leucocyte count and neutrophil percentage in diagnosing uncomplicated (simple) appendicitis and predicting complicated appendicitis.Ulus Travma Acil Cerrahi Derg. 2014;20(6):423-6.

VIII. Wang Y, Li Y, Zhang Y, Liu Y, Liu Y. Are gastrointestinal symptoms associated with higher risk of Mortality in COVID-19 patients? A systematic review and meta-analysis. BMC Gastroenterol. 2022;22(1):106.

IX. Baral S, Chhetri RK, Thapa N. Comparison of acute appendicitis before and within lockdown period in COVID-19 era: A retrospective study from rural Nepal. PloS one. 2021;16(1):e0245137.

X. Dreifuss NH, Schlottmann F, Sadava EE, Rotholtz NA. Acute appendicitis does not quarantine: surgical outcomes of laparoscopic appendectomy in COVID-19 times. Br J Surg. 2020;107(10):e368-e9.

XI. Gao Z, Li M, Zhou H, Liang Y, Zheng C, Li S, et al. Complicated appendicitis are common during the epidemic period of 2019 novel coronavirus (2019-nCoV). Asian journal of surgery. 2020;43(10):1002-5.

XII. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. The New England journal of medicine. 2020;382(18):1708-20.

XIII. Javanmard-Emamghissi H, Boyd-Carson H, Hollyman M, Doleman B, Adiamah A, Lund JN, et al. The management of adult appendicitis during the COVID-19 pandemic: an interim analysis of a UK cohort study. Tech Coloproctol. 2021;25(4):401-11.

XIV. Gupta N, Agrawal H. COVID 19 and laparoscopic surgeons, the Indian scenario - Perspective. Int J Surg. 2020;79:165-7.

XV. Finkelstein P, Picado O, Muddasani K, Wodnicki H, Mesko T, Unger S, et al. A Retrospective Analysis of the Trends in Acute Appendicitis During the

COVID-19 Pandemic. Journal of laparoendoscopic & advanced surgical techniques Part A. 2021;31(3):243-6.

XVI. Bickel A, Ganam S, Abu Shakra I, Farkash I, Francis R, Karra N, et al. Delayed diagnosis and subsequently increased severity of acute appendicitis (compatible with clinical-pathologic grounds) during the COVID-19 pandemic: an observational case-control study. BMC Gastroenterol. 2022;22(1):19.

XVII. Koumu MI, Jawhari A, Alghamdi SA, Hejazi MS, Alturaif AH, Aldaqal SM.Surgical Site Infection Post-appendectomy in a Tertiary Hospital, Jeddah,Saudi Arabia. Cureus. 2021;13(7):e16187.

XVIII. Varela JE, Wilson SE, Nguyen NT. Laparoscopic surgery significantly reduces surgical-site infections compared with open surgery. Surg Endosc.2010; 24:270–276.

XIX. Aranda-Narvaez JM, Prieto-Puga Arjona T, Garcia-Albiach B, MontielCasado MC, Gonzalez-Sanchez AJ, Sanchez-Perez B, et al. [Post-appendectomy surgical site infection: overall rate and type according to open/laparoscopic approach].Enferm Infecc Microbiol Clin.2014;32(2):76-81.

XX. Mohamed AA, Mahran KM. Laparoscopic appendectomy in complicated appendicitis: Is it safe? J Minim Access Surg. 2013;9(2):55-8.

XXI. Mahmoud M. Al-Mukhtar. Post-appendectomy Infected Wounds and Ideal Management A Retrospective Study. Iraqi Medical Journal. 2014; 10(17):118-124.