

Incidence of COVID – 19 in patients with acute abdomen

Taqi Saadoon Atiyah

Prof.Dr. :Consultant Surgeon

Abstract:

Background: Patients presented to the emergency department with acute abdomen may harbor COVID-19 virus without respiratory symptoms. Acute abdomen may be due to COVID-19 which causes thrombosis of mesenteric and renal vessels; peritonitis and pancreatitis.

Objective: To study the incidence of COVID-19 in patients with acute abdomen tested negative for COVID-19 virus.

Patients and methods: A cross sectional study in Baghdad private hospitals was performed in the period from January 2020 – January 2022. The patients had negative laboratory tests for COVID-19 virus, but they developed respiratory symptoms of COVID-19 during their course of management in the hospital. The operative findings of other patients raise the suspicion of COVID-19 (mesenteric thrombosis and pancreatitis) and their repeated laboratory tests reveals the COVID-19 virus infection, and were managed according to their surgical conditions. Diagnosis of COVID-19 virus was proved by repeated laboratory tests and CT scan of the chest.

Results: The total number was 575 patients; their age ranged from 13-76 years, their mean age was 36.16±76 years. Male patients were 264(45.91 %), and the females were 311 (54.08%) patients. All the patients had negative laboratory test for COVID-19 before admission to the hospital, but 52 (9.20%) patients develop positive test during the course of their management in the hospital. COVID-19 was not the cause of acute abdomen in 32 (5.66%) patients, while 17 (3.00%) patients had mesenteric ischemia and 3 (0.53%) patients of them had pancreatitis proved to be due to COVID-19. The mortality in patients with acute abdomen due to COVID-19 was 5 (0.88%) patients while there was no mortality in non - COVID-19

Conclusion: Mesenteric ischemia and gangrene of the bowel may be due to COVID-19 which carries high morbidity and mortality.

Key Words: COVID 19. Acute abdominal Pain, Mesenteric thrombosis, Pancreatitis; Mortality.

Introduction

The presentation of patients with Coronavirus disease 2019 COVID-19 varies from asymptomatic to severe respiratory, thromboembolic, shock, multi-organ dysfunction including the gastrointestinal system which may have a worse prognosis^(1,2). The COVID-19 virus infects host cells through the angiotensin-converting enzyme 2 (ACE2) receptor that are present in the lungs, heart, kidneys, and intestine. Once the virus enters the cell, it generate a release of cytokines and chemokines, which triggers an acute intestinal inflammation characterized by infiltration of neutrophils, macrophages and T cells which explain the microvascular dysfunction associated with tissue edema and pro-coagulant state or bleeding and these are the pathophysiological changes behind the clinical manifestations of this pandemic disease^(1,3).

The causes of acute abdomen in patients with COVID-19 may be due to referring pain from the lower lungs involved by pneumonia due to COVID-19, thrombotic, omental infarcts, non-thrombotic causes like (peritonitis, colonic distension, colitis and pancreatitis)⁽⁴⁾. So, it is important to keep these pathophysiological changes as a possible cause of acute abdomen in mind and to have a wide differential diagnosis in the management of the patients⁽⁵⁾.

Acute respiratory syndrome is typically characterized by dyspnoea and fever⁽⁶⁾, some patients were presented with acute abdominal pain similar to pancreatitis⁽⁷⁾. The presence of cellular angiotensin-converting enzyme 2 (ACE2) in several abdominal organs, making them susceptible to viral infection as the virus binds to ACE2⁽⁸⁾. There are several recommendations on safe practice to reduce the risk of infection during surgery⁽⁹⁾.

The gastrointestinal symptoms due to COVID-19 may include diarrhea, nausea, vomiting, and mild abdominal pain. However, few reports of COVID-19 resulting in an acute abdomen-like picture have been published^{10, 11}. The consequences of the COVID-19 infection in patients undergoing emergency surgery are still poorly known⁽¹²⁾. In severely affected COVID-19 patients, the incidence of gastrointestinal complications is high (73.8%), including the occurrence of gastrointestinal ischemia (3.8%)⁽¹³⁾. Pathophysiological hypotheses include pharmacological side effects, microvascular thrombotic events, and viral enter-neuropathy. Common gastrointestinal symptoms include nausea, vomiting, abdominal pain, and diarrhea⁽¹⁴⁾.

The aim of the study is to evaluate COVID-19 status in patients with acute abdomen who had negative laboratory test for COVID-19, and their response to management, complications and outcome.

Patients And Methods:

After ethical approval of the study by Institution Review Board in the College of Medicine Al-Nahrain University, a cross sectional study was performed at a private hospital in Baghdad – Iraq in the period from February 2020 - February 2022. All the patients attending the hospital had no respiratory or other clinical manifestations of COVID-19, their laboratory tests were negative for COVID-19 on admission, but some patients either their operative findings raise the suspicion of COVID-19 (like mesenteric ischemia and other thromboembolic phenomena), or the patients were developed symptoms suspicious of COVID-19, and their laboratory tests becomes positive for COVID-19 during the period of management in the hospital.

All the patients were managed as a case of acute abdomen according to the scientific bases by proper history and clinical examinations, the required investigations (abdominal ultrasound, chest and abdominal X_RAY, ECG done, Blood sample was taken for investigation of CBC, blood glucose, renal function, d-dimer, S. Lactate, COVID-19 IgG and IgM titer and PCR. CT angiography in certain patients). Appropriate treatment was done to the patients according to their pathologies (whether open or laparoscopic operations or conservative management for pancreatitis). Personal protective equipment (PPE) was applied in the management of all the patients. Patients who developed COVID-19 during their admission to the hospital were isolated in isolation surgical ward in the hospital, and if they need respiratory support were admitted to the respiratory care unite according to their clinical picture.

The laboratory tests for COVID-19 and D. Dimer were repeated for those patients who developed the clinical picture of COVID-19 after their admission to the hospital and proved to be positive (after their admission to the hospital). Those patients who developed

COVID-19 during their stay in the hospital had intestinal ischemia due to mesenteric thrombosis, gangrene and resection of bowel, or other causes of acute abdomen like appendicitis, pancreatitis, obstructed hernia...etc.

Inclusion criteria:

Patients with acute abdomen and their tests were negative for COVID-19.

Exclusion criteria:

1- Patients with positive test for COVID-19 before admission to the hospital

2- Patients with abdominal trauma.

3- Children up to 12 years old (because they were managed by pediatric surgeon).

Statistical analysis:

IBM SPSS version 26 was used for this study statistical analysis. Patient's characteristic data are presented as mean, SD, range, percent. Independent samples t-test was used to measure the age mean difference between COVID-19 and Non- COVID-19 patients, significant P -value < 0.05 .

Results:

The total number of patients was 575 patients had acute abdomen attending the hospital, 264(45.91 %) patients of them were males and 311 (54.08%) patients were females, their age ranged from 13-76 years, their mean age was 36.16 ± 76 years.

Operations were done for 565 (98.62%) patients, their operations were appendectomy for 279(49.38%) patients, perforated peptic ulcer 13(2.30%) patients, obstructed hernias 64(8.31%) patients (different types of obstructed hernias), colorectal tumors 47 (8.31%) patients, and small bowel obstruction 32 (5.56%) patients, peritonitis 9 (1.59%) patients (due to diverticulosis of sigmoid 1 (0.17%) patient and primary peritonitis 8 (1.39%) patients), laparoscopic cholecystectomy for acute calculus cholecystitis 89(15.75%) patients, intestinal ischemia and resection of the gangrenous bowel 32 (5.66%) patients. Table 1 shows the operations done for the patients.

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Type of management	Number of patients
Appendectomy	279(48.5%)
Laparoscopic cholecystectomy for acute calculas cholecystitis	89 (15.5%)
Obstructed different types of hernias	64(11.1%)
Colorectal tumors	47 (8.2%)
Small bowel obstruction	32 (5.6%)
Intestinal ischemia and resection of the gangrenous bowel	32(5.6%)
Perforated peptic ulcer	13(2.3%)
Conservative	10 (1.7%)
Peritonitis	9 (1.6%)
Total	575

Conservative treatment was done for 10 (1.73%) patients, their pathological causes of acute abdomen were acute pancreatitis 8 (1.39%) patients, diabetic ketoacidosis 2 (0.34%), patient.

The patients who become positive tests for COVID-19 during their management in the hospital were 52 (9.04%) patient (fig 1). COVID-19 was not related to the pathological causes of acute abdomen in 32 (5.66%) patients of them, like {obstructed hernia 9

(1.59%) patients, appendicitis 12 (2.08%), acute calculus cholecystitis 9 (1.59%), perforated peptic ulcer 2 (0.35%) patients. Those patients were developed mild respiratory symptoms and their laboratory tests becomes positive for COVID-19 during their management in the hospital for their acute abdomen, and they improve with the proper management of COVID-19 under supervision of a team work of consultant of different specialties.

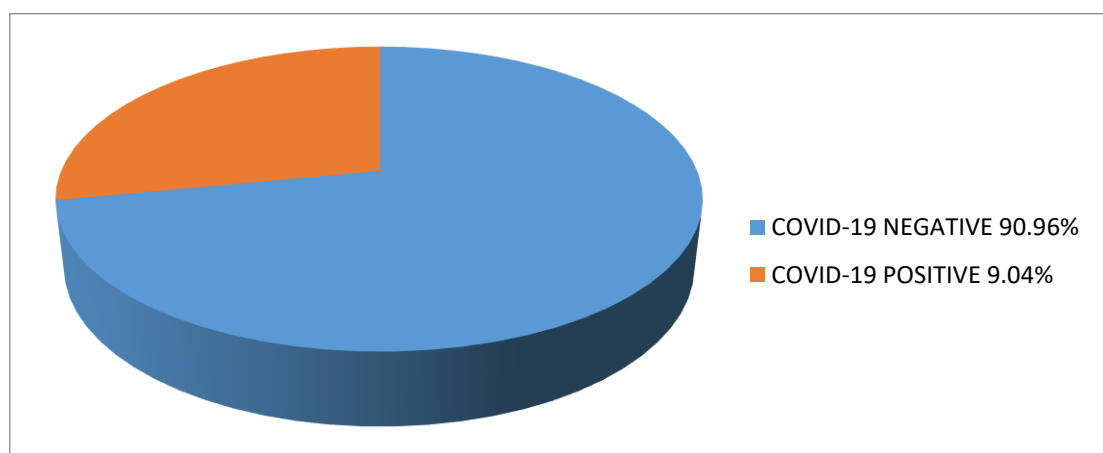


Fig.1: The number of COVID19- positive patients

The other 20 (3.53%) patients who become positive laboratory tests for COVID-19 during their admission to the hospital and the COVID-19 was the main pathological cause of their acute abdomen, 3 (0.53%) patients of them had pancreatitis, 17 (3.00%) patients had mesenteric ischemia and they were underwent

resection of the gangrenous bowel (different lengths of the small bowel).

The total mortality was 5 (0.88%) patients in COVID-19 patients, while there was no mortality in Non COVID-19 patients. Table 2 shows the mortality in COVID-19 positive and Non COVID-19 patients.

Table2: shows the mortality in COVID-19 positive and Non COVID-19 patients.

Pathological causes of acute abdomen	COVID 19 positive patients Mortality	Non - COVID-19 patients Mortality
pancreatitis	2 (0.35%)	Non
Intestinal ischemia(with resection of the gangrenous bowel)	3 (0.53%)	Non
Total	5 (%0.88)	Non

Discussion

Acute abdomen is a common surgical emergency, there are a lot of surgical abdominal pathologies that cause acute abdomen in addition to many other non-surgical diseases (abdominal and extra-abdominal) causes of acute abdomen like diabetic ketoacidosis and many other differential diagnose.

In the last few years and during the pandemic of Coronavirus disease, there were awareness of COVID-19 as a cause of acute abdomen and may be the presentation of some patients without respiratory symptoms.

In this study, laboratory tests for COVID-19 were done for all the patients attending the hospital with acute abdomen, but because the incubation period of COVID-19 is two weeks, so some asymptomatic patients may harbor the disease during that incubation period and their laboratory tests were negative for COVID-19, and then they exhibit the clinical picture of COVID-19 during their admission to the hospital for management of acute abdomen; while the other patients who were negative for COVID-19, but their pathological findings during surgical exploration raise the suspicion of COVID-19 (severe mesenteric ischemia) which is proved on repeating the laboratory tests for COVID19.

When COVID-19 was not the cause of acute abdomen and it is just accidental finding with mild respiratory flue like symptoms, there were no significant difference in the response to treatment, complications and outcome when

comparing with identical Non COVID-19 patients, (patients identical in their age, gender, past history, family history, and their clinical pictures); but when the COVID-19 was the cause of acute abdomen specially in severe cases of mesenteric ischemia and acute pancreatitis, the prognosis was significantly better in Non COVID-19 patients (P value < 0.05).

There were 3 (0.52%) patients with COVID-19 positive presented with acute abdomen had sever mesenteric ischemia and gangrene of the bowel and they died in the third, sixth, and eighth postoperative days in the respiratory care unit due to COVID-19, respiratory failure, and multiple organ failures, and this was significant (P value < 0.05) comparing with Non COVID-19 patients. Another two patients 2 (0.35%) with COVID-19 were presented with acute abdomen and they had severe acute pancreatitis were died in the respiratory care unite due to respiratory failure and sepsis, and also it was significant (P value < 0.05) comparing with Non COVID-19 patients; so the total mortality was 5(0.88%) patients in COVID-19 patients, while there was no mortality in Non COVID-19 patients.

The patients whom develop positive tests for COVID-19 during their management in the hospital were 52 (9.20%) patient. COVID-19 was not related to the pathological causes of acute abdomen in 32 (5.66%) patients of them, like obstructed hernia 9 (1.59%), appendicitis 12 (2.08%), acute calculus cholecystitis 9 (1.59%), and perforated peptic ulcer 2 (0.35%)

patients. Those patients were developed mild respiratory symptoms and their laboratory tests becomes positive for covid19 during their management in the hospital for their acute abdomen, they were improved and discharged well.

The other 20 (3.53%) patients whom becomes positive tests for COVID-19 during their admission to the hospital for management of acute abdomen; the COVID-19 virus was the cause of acute abdomen and the laboratory test proved that; 3 (0.53%) patients of them had pancreatitis, 17 (3.00%) patients had mesenteric ischemia and they were underwent resection of the gangrenous bowel (different lengths of the bowel).

Selecting the identical Non COVID-19 patients (identical in their age, gender, past history, family history, and their clinical pictures) with COVID-19 positive patients; there were no significant difference in the response to treatment, complications and outcome between the two groups when the cause of acute abdomen was not COVID-19, (like obstructed hernia, appendicitis, perforated peptic ulcer, and colorectal tumors; but when the cause of acute abdomen was COVID-19 the progress and outcome is different like mesenteric thrombosis and intestinal ischemia due to COVID-19. There were 3 (0.53%) patients with COVID-19 positive presented with acute abdomen had mesenteric thrombosis and intestinal ischemia and gangrene died in the third, sixth, and eighth postoperative days in the respiratory care unit due to COVID-19, respiratory failure, and multiple organ failures, and this was significant P value < 0.05 comparing with identical Non COVID-19 patients (identical in the age, gender, surgical pathology, the length of the resected gangrenous bowel and other clinical pictures) . Another two patients 2 (0.34%) with COVID-19 were presented with acute abdomen and they had acute pancreatitis were died in the respiratory care unite due to respiratory failure and sepsis, and also it was significant (P value < 0.05) comparing with identical Non COVID-19 patients (identical in their age, gender, and the severity of pancreatitis and other clinical picture); so the total mortality was 5 (0.88%) patients in COVID-19 patients, while there were no mortality in identical Non- COVID-19 patients (P value < 0.05).

In this study there were no patient with acute appendicitis due to COVID-19; but it is mentioned in the literatures that there are reported cases of acute appendicitis due to coronavirus, the virus was detected with RT-PCR analysis of the appendix, and acute

abdomen have been reported in COVID-19 positive patients ⁽¹⁵⁾.

COVID-19 virus binds to angiotensin-converting enzyme 2 (ACE-2) receptors which are present in the gastrointestinal system resulting in terminal ileitis, recent meta-analysis, which contained 17 studies and 2477 patients, found that 13% of COVID-19 patients had gastrointestinal symptoms; anorexia, diarrhea, nausea and vomiting and the patient may present with acute abdomen ⁽¹⁶⁾.

In the literatures it is mentioned that COVID-19 patients may present with abdominal pain due to acute pancreatitis and increased serum amylase and lipase ^(17,18).

Ashraf et al. presented three cases of COVID-19 with acute abdomen. There are other studies showed the gastrointestinal involvement by COVID-19 and clinical picture of acute abdominal pain ^(19,20).

The attachment of COVID-19 to the angiotensin converting enzyme 2 (ACE2), in the GIT leads to inflammation, cell damage, dysfunction of the microcirculation, and bleeding in the intestine which are the causes of abdominal pain; so it is important to remember that in patients with acute abdomen before bring the patient for inappropriate surgery ⁽²¹⁾.

The gastrointestinal symptoms of COVID-19 are more insidious than respiratory, and there may be excretion of the virus in the stool with negative respiratory samples, which make the situation confusing and more difficult to control ^(19,22). Patients with COVID-19 are more susceptible to developing micro-thrombosis and even ischemia of the vascular bed of the gastrointestinal tract ^(22,23) due to the coagulopathy process that is triggered ⁽²⁴⁻²⁶⁾. Thus it is better to look for gastrointestinal manifestations of COVID-19 in all the patients attending the emergency room with acute abdominal pain. ^(19,20,27).

One of the studies showed that in a systematic review with meta-analysis of more than 6000 patients, the grouped prevalence of digestive symptoms and digestive comorbidities of COVID-19 was 15% and 4% respectively. Higher rates of gastrointestinal symptoms were found in severe COVID-19 infections, and their exclusive presentation (about 10% of patients) resulted in delayed diagnosis ⁽²⁸⁾. The new onset of gastrointestinal symptoms was predictive of a severe disease course ⁽²⁸⁾. Consistent with the higher sensitivity of chest CT scan as compared with RT-PCR ⁽²⁹⁾, CT scan revealed COVID-19 disease in patients with negative RT-PCR ⁽²⁹⁾.

COVID-19 infection may mimic an appendicular syndrome, CT scan of the

abdomen and chest confirmed the diagnosis of acute appendicitis concurrent with COVID-19, and histopathological analysis confirmed an appendicular perforation⁽³⁰⁾.

In this study 17(3.00%) patient presented with acute mesenteric ischemia and intestinal gangrene, 3(0.53%) of them were died. Visceral infarction should be considered in COVID-19 patients with severe acute abdominal pain⁽³¹⁾, and CT scans of chest and abdomen were performed in case of acute abdomen⁽³²⁾.

COVID-19 can entail hypercoagulability, and the small bowel ischemia may be due to portal vein and mesenteric vein thrombosis leading to small bowel necrosis in some patients⁽³²⁾. While other studies showed that peritoneal fluid sampling did not reveal any COVID-19 virus and no causality between COVID-19 and gastrointestinal symptoms⁽³³⁾.

Studies showed that COVID-19 infection even during the incubation period may complicate the postoperative period with disease exacerbation and progression, and with a higher postoperative mortality⁽³⁴⁾. For mildly infected or asymptomatic patients, postoperative recovery did not appear to be affected⁽³⁵⁾. Other studies showed that high titer of D-dimer > 20,000 µg/l (N < 500), and old age (above 80 years) were considered to be early poor prognostic factors⁽³⁶⁾. In the peak period of COVID-19 special efforts were made in order to perform surgery safely, with strict hygienic measures and separation of COVID-19 and Non-COVID areas, as recommended by Flemming et al.⁽³⁷⁾. Mild co-infection with COVID-19 did not appear to cause more complications for emergency abdominal surgery. However, an acute abdomen during severe COVID-19 infection was part of an unfavorable prognosis.

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