Postoperative Outcomes of Emergent Gastrointestinal Surgical Interventions in COVID-19 Positive versus COVID-19 Negative Patients: A retrospective Study

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Introdution: The worldwide spread of Corona Virus-19 (COVID-19) since 2020 has affected healthcare systems around the world, this study discusses the postoperative outcomes of emergent alimentary tract interventions in COVID-19 positive and COVID-19 negative patients at the same center receiving the same standard postoperative surgical care during the pandemic era.

Aim of work: To compare the postoperative outcomes for emergent gastrointestinal surgeries in patients who tested positive for COVID-19 with those patients who tested negative for the virus and to identify the most significant predictors of morbidity and mortality in COVID-19 positive patients undergoing such procedures.

Patients and methods: A total of 100 patient were enrolled. Preoperative data included PCR test result, CO-RAD score, pre-existed comorbidities; intraoperative data included pathologic findings and operation type; and postoperative outcomes included hospital stay, ICU admission, sepsis, pulmonary complications, hospital mortality that occurred during the patient's hospital stay and discharge mortality.

Results: Respiratory failure was the most common cause of death, occurring in 15 cases; hospital mortality was significantly higher among COVID-19 positive group of 19 (38.0%) vs. 1 (2.0%) and overall mortality rate was 21 (42.0%) vs. 1 (2.0%). Furthermore, it was found that the hospital stay was statistically longer in the COVID-19 negative group.

Conclusion: Compared to recent patients without COVID-19 infection, patients with COVID-19 infection who had emergent gastrointestinal surgical interventions had higher hospital mortality and overall death rates. Compared to prepandemic controls, COVID-19-negative patients who had surgery during the COVID-19 pandemic stayed in the hospital for a longer period.

Key words: COVID-19, emergent gastrointestinal surgeries, CO-RAD score, respiratory failure.

Introduction

An enveloped, single-stranded RNA virus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the source of the unique corona virus disease-2019 (COVID-19) pandemic. The primary mechanism of transmission for SARS-CoV-2 is respiratory droplets; however, new research indicates that the fecal/oral route may also be involved in the disease's transmission. These raises concerns over the disease's gastrointestinal (GI) symptoms.[1]

One of the biggest decisions throughout this epidemic was whether to continue with surgical operations and whether to safely postpone them. It is postulated that surgical outcomes for emergency gastrointestinal operations are negatively impacted by perioperative SARS-CoV-2 infection.

COVID-19 infection is associated with increased postoperative mortality. Mortality was related to increased age, severity of the surgical condition, CO-RADS score, and anesthesia type. It is advised to postpone unnecessary surgical intervention in patients with COVID-19 infection owing to high incidence of perioperative complications. However, it was noticed that unnecessary delay may worsen the outcome. Continuous evaluation of the surgical condition as well as the pulmonary and general condition is key to achieving the best outcome in COVID-19-infected patients.[2]

Study design

Patients' data was categorized into three types: pre-operative data as PCR test results, CO-RAD score, ASA score, anesthetic type, age, sex, morbid obesity, diabetes mellitus, chronic kidney diseases, chronic liver diseases, and ischemic heart illnesses, Intra-operative findings as pathologic diagnosis and the operation type. While the hospital stay period, intensive care unit admission, sepsis, surgical site infection, pulmonary complications, repeated surgical intervention, thrombo-embolic events, discharge, and death were the postoperative outcomes.

Patients and methods

This retrospective single center, three-years study was conducted at General Surgery Department, Faculty of Medicine, Ain Shams University Hospital El Obour city (ASOH) and Ain Shams University Hospital (El Demerdash) from July 2019 until July 2022.

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Patients

Inclusion and exclusion criteria

Patients eligible for inclusion in this study were the patients who presented with acute abdomen, and underwent emergency gastrointestinal operations including those both Covid-19 negative patients and Covid-19 positive confirmed by PCR test or by high susceptible Chest computed tomography (CT) scan with a high clinical suspicion of infection during the period from July 2019 to July 2022.

All patients who had undergone any other emergent operations like diabetic foot infection debridement or amputations or minor procedures as abscess drainage, patients with acute abdomen from non-surgical causes or those who received conservative treatment were excluded from this study.

Information was gathered from medical records and the data registry. Once each patient gave their agreement, a total of 100 patients were enrolled.

Ethical considerations

Prior to being included in the clinical trial, the patient's information and informed permission were obtained. The patient gave their agreement to participate after being given a clear explanation of the purpose, scope, and potential outcomes of the study.

In order to maintain patient privacy, the investigators stored any documents including the patient's name in a safe location. Only the patient's initials were included in the case report. To make records identifiable, the investigators kept a personal patient identification list consisting of patient initials matched to matching patient names. The protocol and all related documentation were declared for ethical and research clearance by the general surgery department council at Ain Shams University prior to the start of the study, and any compliance with local regulations was followed. Regarding effectiveness and safety, there is no proof that the study's methods are harmful.

Patients and methods

Elective procedures and laparoscopic interventions were excluded, but emergency re-interventions to treat complications of elective operations were included. If patients had multiple emergency operations, the first was considered as the index procedure.

Perioperative prophylactic measures

Beginning in March 2020, participating institutions devised a systematic preoperative quantitative RT-PCR method for detecting viral RNA in nasopharyngeal samples. Every patient who visited the Ain Shams University Hospitals Emergency Department (ED) had a screening chest computed tomography scan with a COVID susceptibility score of CORADS 1, 2, 3, 4, and 5. Patients then had a chest consultation to determine if they needed to be sent to the isolation hospital and what level of COVID-19 infection they had.

Following the patients' hospitalization, either before surgery or following it, PCR testing was conducted in ASOH. A chest physician evaluated PCR-negative patients, made revisions to their clinical picture and chest CT scan, and determined their COVID-19 status.

Patients with confirmed COVID-19 infections were sent to Ain Shams University Obour Hospital (ASOH). Limiting the number of surgeons, helpers, and scrub nurses in the operating room was a mandated infection control precaution.

Following a negative result, the test was repeated the following day. Patients who were stable after two consecutive negative tests were sent to Demerdash Hospital

All of the preoperative infection control measures were taken as forementioned by Abdelrahman et al., 2022 under the guidance of infection control unit professionals.

Statistical analysis

The statistical software for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA), was used to evaluate the recorded data. When the distribution of the quantitative data was parametric (normal), they were shown as ranges and as mean +/- standard deviation. Additionally, percentages and numbers were used to represent qualitative characteristics. Data were examined for normalcy using the Shapiro-Wilk and Kolmogorov-Smirnov tests.

Results

This study included 100 patients who underwent emergent gastrointestinal surgical interventions in Ain Shams University El Obour Hospital (ASOH) and) and Ain Shams University Hospital (El Demerdash) from July 2019 until July2022. Regarding the demographic data, middle to elder age groups were the most susceptible for intervention with the mean range of age (37-42) year's old, male patients were significantly more than female patients (66% vs. 34%).

Regarding the pre-operative comorbidities, the COVID-19 negative group had no morbidly obese patients while the covid-19 positive group had 3

(6%) patients with morbid obesity; of the negative group 2 (4%) patients were diabetic while in the positive group 7 patients (14%) were diabetic; only 1 (2%) patient had chronic kidney disease (CKD) in the covid-19 negative group while there were 3 (6%) patients with CKD in the positive group; the covid-19 positive group had 5 (10%) with chronic live disease (CLD) while there was no patients with such condition in the other group; the positive group had 7 (14%) patients with ischemic heart disease (IHD) while the negative group included 4 (8%) patients with IHD.

So, the preoperative previously mentioned comorbidities were present in 18 out of 50 patients in the covid-19 group (36%) while present in only 6 out of 50 patients of the negative group (12%).

this shows statistically significant higher frequency of CLD, DM and comorbidity in positive COVID-19 group than Negative COVID-19 group, while there is no statistically significant difference between groups according to morbid obesity, chronic renal diseases & IHD.

According to **(Table 1)** the most common surgical diagnosis was appendicitis: 22 (22.0%) and Traumatic splenic injury: 22 (22.0%), followed by Retroperitoneal bleeding: 14 (14.0%), then malignant large bowel obstruction: 12 (12.0%) followed by Acute Mesenteric ischemia: 7 (7.0%), there was a statistically significant difference between the two groups.

(Table 2) shows there is statistically significant higher frequency of positive PCR and CT Corad 4-5 in positive COVID-19 group than Negative COVID-19 group.

(Table 3) shows statistically significant higher frequency of ASA 3 & ASA 4 in positive COVID-19 group than Negative COVID-19 group.

While **(Table 4)** shows no statistically significant difference between groups according to anesthesia type.

(Table 5) shows that the most common procedure done was Exploration packing and depacking 22 (22.0%), followed by Appendectomy by McBurney's incision 12 (12.0%) followed by Exploration and resection anastomosis 11 (11.0%), then Exploration and appendectomy 10 (10.0%) and Exploration splenectomy 10 (10%), there was a statistically significant difference between the two groups.

While **(Table 6)** shows statistically significant higher mean value in negative group and positive group according to ICU admission and hospital stay "days"; and the higher frequency of reoperation in positive group than negative group, post-operative sepsis, Wound infection, Pulmonary complications & Thrombotic complications show significant difference between the two groups.

(Table 7) shows statistically significant higher mortality rate in hospital mortality and overall mortality in positive group than negative group. **(Table 8)** shows statistically significant higher frequency of respiratory failure in positive COVID 19 group, while there were no cases of respiratory failure in negative COVID 19 group. While, the rest parameters have insignificant difference between two groups.

Table 1: Comparison between groups according to surgical diagnosis at time of presentation

Surgical diagnosis	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)
Acute appendicitis	22 (22.0%)	13 (26.0%)	9 (18.0%)
Perforated peptic ulcer	9 (9.0%	2 (4.0%)	7 (14.0%)
Malignant Large Bowel Obstruction	12 (12.0%)	4 (8.0%)	8 (16.0%)
Adhesive small bowel obstruction	4 (4.0%)	2 (4.0%)	2 (4.0%)
Acute mesenteric ischemia	7 (7.0%)	5 (10.0%)	2 (4.0%)
Obstructive jaundice with failed ERCP and PTC	2 (2.0%)	2 (4.0%)	0 (0.0%)
Retroperitoneal bleeding	14 (14.0%)	13 (26.0%)	1 (2.0%)
Gall stone ileus	1 (1.0%)	1 (2.0%	0 (0.0%)
Sigmoid volvulus	2 (2.0%)	1 (2.0%)	1 (2.0%
Bezoar-induced Small Bowel Obstruction	2 (2.0%)	1 (2.0%)	1 (2.0%)
TB peritonitis	1 (1.0%)	1 (2.0%)	0 (0.0%)
Palliative feeding jejunostomy	2 (2.0%)	2 (4.0%)	0 (0.0%)
Traumatic splenic injury	22 (22.0%)	3 (6.0%)	19 (38.0%)

Table 2: Comparison between groups according to PCR and Chest CT CORAD score

	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)	Test value	P-value
PCR					
Positive	41 (41.0%)	41 (82.0%)	0 (0.0%)	69.492	<0.001**
Negative	59 (59.0%)	9 (18.0%)	50 (100.0%)		
Chest CT CORAD Score					
Corad 1-2	51 (51.0%)	14 (28.0%)	37 (74.0%)		
Corad 3	30 (30.0%)	17 (34.0%)	13 (26.0%)	29.906	<0.001**
Corad 4-5	19 (19.0%)	19 (38.0%)	0 (0.0%)		

Using: x2: Chi-square test for Number (%) or Fisher's exact test, when appropriate.

**p-value <0.001 is highly significant.

Table 3: Comparison between groups according to ASA

ASA	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)	Test value	P-value
ASA 2	76 (76.0%)	32 (64.0%)	44 (88.0%)		
ASA 3	18 (18.0%)	13 (26.0%)	5 (10.0%)	8.117	0.017*
ASA 4	6 (6.0%)	5 (10.0%)	1 (2.0%)		

Using: x2: Chi-square test for Number (%).

*p-value <0.05 is significant.

Table 4: Comparison between groups according to anesthesia type

Anesthesia type	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)	Test value	P-value
Spinal	10 (10.0%)	5 (10.0%)	5 (10.0%)	0.000	1.000
General	90 (90.0%)	45 (90.0%)	45 (90.0%)		

Using: x2: Chi-square test for Number (%).

p-value >0.05 is insignificant.

Table 5: Comparison between groups according to operation type

Procedure	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)
Appendectomy	12 (12.0%)	7 (14.0%)	5 (10.0%)
Exploration and adhesiolysis	4 (4.0%)	2 (4.0%)	2 (4.0%)
Exploration and appendectomy	10 (10.0%)	6 (12.0%)	4 (8.0%)
Exploration resection and stoma	9 (9.0%)	7 (14.0%)	2 (4.0%)
Exploration and resection anastomosis	11 (11.0%)	2 (4.0%)	9 (18.0%)
Exploration packing	2 (2.0%)	2 (4.0%)	0 (0.0%)
Exploration packing and depacking	22 (22.0%)	11 (22.0%	11 (22.0%)
Exploration splenectomy	10 (10.0%)	2 (4.0%)	8 (16.0%)
CBD exploration	2 (2.0%)	2 (4.0%)	0 (0.0%)
Feeding jejunostomy	2 (2.0%)	2 (4.0%)	0 (0.0%)
Exploration and omental patch	9 (9.0%)	2 (4.0%)	7 (14.0%)
Colectomy and colostomy	6 (6.0%)	4 (8.0%)	2 (4.0%)
Gastro-jejunostomy	1 (1.0%)	1 (2.0%)	0 (0.0%)

Table 6: Comparison between groups according to postoperative outcome

Postoperative Outcome	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)	Test value	value
ICU Admission					
No	28 (28.0%)	11 (22.0%)	17 (34.0%)	0.421	0.517
Yes	72 (72.0%)	39 (78.0%)	33 (66.0%)		
Hospital stay (days)					
Mean±SD	5.17±1.62	4.50±1.71	5.84±1.36	-2.636	0.010*
Range	1-14	1-14	2-14		
Post Operative Sepsis					
No	87 (87.0%)	42 (84.0%)	45 (90.0%)	0.796	0.372
Yes	13 (13.0%)	8 (16.0%)	5 (10.0%)		
Surgical site infection					
No	88 (88.0%)	47 (94.0%)	41 (82.0%)	3.409	FE0.065
Yes	12 (12.0%)	3 (6.0%)	9 (18.0%)		
Pulmonary complications					
No	88 (88.0%)	42 (84.0%)	46 (92.0%)	1.515	0.218
Yes	12 (12.0%)	8 (16.0%)	4 (8.0%)		
Reoperation					
No	88 (88.0%)	39 (78.0%)	49 (98.0%)	9.470	FE0.002*
Yes	12 (12.0%)	11 (22.0%)	1 (2.0%)		
Thrombotic complications					
No	97 (97.0%)	47 (94.0%)	50 (100.0%)	3.093	FE0.079
Yes	3 (3.0%)	3 (6.0%)	0 (0.0%)		

Using: t-Independent Sample t-test for Mean±SD; x2: Chi-square test for Number (%).

p-value >0.05 is insignificant; *p-value <0.05 is significant; **p-value <0.001 is highly significant.

Table 7: Comparison between groups according to mortality rate

Mortality rate	Total (n=100)	Positive COVID-19 Group (n=50)	Negative COVID-19 Group (n=50)	Test value	P-value
Hospital mortality					
No	80 (80.0%)	31 (62.0%)	49 (98.0%)	20.250	FE<0.001**
Yes	20 (20.0%)	19 (38.0%)	1 (2.0%)		
Discharge mortality					
No	98 (98.0%)	48 (96.0%)	50 (100.0%)	2.041	0.153
Yes	2 (2.0%)	2 (4.0%)	0 (0.0%)		
Overall mortality					
No	78 (78.0%)	29 (58.0%)	49 (98.0%)	23.310	FE<0.001**
Yes	22 (22.0%)	21 (42.0%)	1 (2.0%)		

Using: x2: Chi-square test for Number (%) or Fisher's exact test, when appropriate.

p-value >0.05 is insignificant; *p-value <0.05 is significant; **p-value <0.001 is highly significant.

Table 8: Comparison between groups according to cause of death

Cause of death	Total (n=22)	Positive COVID-19 Group (n=21)	Negative COVID-19 Group (n=1)	Test value	P-value
Pulmonary complications					
Respiratory failure	15 (68.2%)	15 (71.4%)	0 (0.0%)	4.140	0.013
Thrombotic complications					
Pulmonary embolism	6 (27.3%)	5 (23.8%)	1 (100.0%)	2.668	0.102
Spontaneous retroperitoneal bleeding	1 (4.5%)	1 (4.8%)	0 (0.0%)	0.048	0.627

Discussion

This study was conducted to compare the postoperative outcomes for emergent gastrointestinal procedures in COVID-19 positive patients and covid-19 negative patients at Ain Shams University El Obour Hospital (ASOH) and Ain Shams University Hospital (El Demerdash) from July 2019 until July2022 and to find out the most common morbidity and mortality predictors in covid-19 positive patients who underwent emergent gastrointestinal operations.

WHO declared coronavirus disease 2019 (COVID-19) a pandemic on March 11, 2020, this pandemic is linked to the coronavirus 2 severe acute respiratory syndrome, Surgery carries unique risks and precautions for patients infected with COVID-19. There is a correlation between higher postoperative mortality and COVID-19 infection. Increased age, the degree of the surgical ailment, the CO-RADS score, were all associated with mortality. Due to the increased rate of perioperative complications, patients with COVID-19 infection are advised to delay needless surgical surgery. It was noted, nevertheless, that needless delay could make the situation worse.[2]

In addition, all patients were at risk of unfavorable outcomes during the pandemic: hospitals' workload may have made it difficult to rescue patients from postoperative complications, and patients' fear of or difficulty accessing hospitals may have allowed surgical pathologies to progress to a more advanced stage at consultation.[3]

However, non-delayable procedures have continued to be performed, sometimes in patients infected by COVID-19.[4]

It was found that COVID-19 patients had longer hospital stays, but there was no difference in surgical complications or death rates between the two groups. According to Zhao et al. (2020),[5] urgent surgery aided in the early resolution of pulmonary inflammation and assisted in treating surgical pathology. Therefore, it was advised that, in the event that emergency surgery was necessary, all necessary safety measures should be taken to stop the spread of SARS-CoV-2 to other patients and medical personnel.

Pulmonary complications and mortality were reported in 51.2% and 23.8% of the 1128 surgical patients in an international multicenter study by COVIDSurg Collaborative 2020,[6] who had perioperative SARS-CoV-2 infection (Within 7 days before surgery) in 294 patients and postoperative (Up to 30 days after surgery) in 834 patients. Male sex, age greater than 70 years, American Society of Anesthesiologists (ASA) grade greater than 3, malignant illness, urgent surgery, and major surgery were the factors linked to 30-day mortality. The authors came to the conclusion that patients who have the aforementioned risk factors have a higher threshold for adverse outcomes upon undergoing surgery.

Our study reported a mortality rate of 22%. This was near to the outcome reported in COVIDSURG Collaborative study which reported 27% mortality among 1142 patients. It is considered one of largest global studies. However, our mortality rate was higher than the mortality rate of 19% reported by Doglietto et al., 2020,[7] and only a 16.6% 30-day mortality rate by Jonker et al., 2021,[8] on the contrary, Farouk and Gad,[9] reported 40% mortality in emergency surgical patients; this difference between our results could be due to that their study included both COVID and non-COVID patients, and their study discussed both elective and emergency cases in different subspecialities like vascular and pediatric surgery which carry a high mortality risk like ruptured aortic aneurysm repair, diabetic foot amputations and congenital anomalies while our study focused on gastrointestinal surgeries.

The National Emergency Laparotomy Audit of England and Wales (NELA) group, 2020,[10] recently used a population-based register to analyze outcomes and reported a 30-day death rate of 12.5% for emergency laparotomy in patients who tested positive for COVID-19. This rate was somewhat lower than what the COVIDSurg group had reported.

Contradictory findings were found in three prior studies that compared the outcomes of concurrent surgery in patients with and without COVID infection: COVID-19 infection was linked to worse postoperative outcomes in two trials,[8,11] however, in Zhao et al., 2020,[5] it was not.

In a 2020 study conducted in Spain, Cano-Valderrama et al.[4] examined the results of emergency abdominal surgeries performed on 285 patients prior to the COVID epidemic and 117 patients during the same period. Of the 117 individuals treated during the COVID-19 pandemic, four had probable SARS-CoV-2 infection, and three had confirmed infection. While the reoperation rate (12.8% vs. 17.9%, p = 0.212) and mortality rate (4.3% vs. 6.7%, p = 0.358) were similar in the two groups, the total morbidity rate was greater (47.1% vs. 34.7%, p = 0.002).

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In the COVID-19 era, emergency abdominal surgery was performed on 25 patients between March and April 2020, according to a Turkish study by Bozkurt et al., 2020.[13] Two patients had suspected COVID-19, and none of the patients had preoperative COVID-19. The authors came to the conclusion that, with the right safety measures in place, emergency procedures might be carried out in COVID pandemic hospitals.

Therefore, it is advised that during the COVID-19 pandemic, emergency surgeries be carried out. Before surgery, preoperative SARS-CoV-2 testing ought to be carried out. To stop the patient from contracting SARS-CoV-2 during surgery, the COVID-free surgical approach should be used if the patient is not infected.[14]

Conclusion

Patients with COVID-19 infection who underwent emergency gastrointestinal surgery had greater hospital and overall mortality rates than contemporary patients without COVID-19. Patients who underwent surgery during the COVID-19 pandemic who tested negative for the virus spent more time in the hospital than prepandemic controls. Perioperative SARS-CoV-2 infection has an adverse effect on postoperative outcomes. However, patients with COVID-19 shouldn't be denied urgent abdominal surgery.

Postoperative morbidity and mortality were correlated with high CO-RADS scores, ASA score, and pulmonary complications. Despite our study being conducted in a developing country, our morbidity and mortality rates were nearly similar to the studies conducted in developed countries.

A more conservative management is advised in COVID-19-positive acute surgical patients. The decision and timing of surgery must take into consideration the CO-RADS status, pulmonary status, comorbidities, and ASA scoring of the patient. However, delay of surgical intervention may worsen the prognosis in certain cases. That is why, continuous evaluation of the patient's surgical and COVID-19- related condition is mandatory.

Study limitations

Our study was limited by relatively small sample size.

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Conflict of interest

No conflict of interest.

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