Incidence of COVID-19 in general surgery emergency and complications associated in different types of management

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Background
COVID-19 disease causes complications that are classified according to likelihood to high such as venous thromboembolism, acute kidney injury, and postintensive care syndrome. Other complications are low in likelihood such as cytokine release syndrome, pancreatic injury, gastrointestinal complications, and pregnancy-related complications. Mortality and morbidity are really high when it is combined with surgical intervention especially under general anesthesia.
Objectives
To evaluate the incidence of COVID-19 in general surgery emergency and complications associated in different types of management.
Patient and method
This is a retrospective study from June 2020 to January 2021 including all COVID-19 positive cases admitted in general surgery department during previously mentioned period. Before September 2020, screening for COVID was based on swab for only clinically suspected COVID-positive patients. Starting from September 2020, routine swab to all admitted patients was done. All data collected about included cases in study underwent statistical analysis to get results.
Results
In this study, incidence of COVID-19 is 1.35%, mortality incidence is 26.4% (about 92.9% of mortality cases underwent surgery) and morbidity incidence is 30.2%. About 74% (73.6%) of positive cases improved and discharged. Management of cases is according to guidelines of management to each disease and decision of ER consultant. About 77.4% of cases are managed surgically; about 70.7% of cases operated upon underwent exploration. However, 60.4% of cases are admitted with sepsis and septic shock. Asymptomatic cases for COVID during admission are 26.4%.
Conclusion
Incidence of COVID-19 in acute general surgery emergency in Kasr Al-Ainy is not that high. However, cases operated upon in the era of COVID are associated with high incidence of mortality. Cases are presented to our institute late, which might be an effect of lock down.

Keywords:
coronavirus morbidity and mortality, emergency surgery, incidence of COVID-19

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Introduction

The coronavirus disease (COVID-19) pandemic started in Wuhan, now affecting more than 700 million all over the world according to WHO latest update in August 2023. Egypt was ranked No 31 worldwide in number of cases with more than 99 000 of cases and about 5461 deaths till September 3, 2020 [1]. Surgical intervention for COVID 19 patients is considered economic burden. During this research in Egypt, surgical intervention was limited to emergency and oncology as spread of infection was the nightmare in each health care facility [2].

Screening of the patient for COVID is a costly process and difficult in low economic countries with limited resources [3]. On other hand, not being aggressive with testing while carrying out surgical services could have catastrophic consequences [4]. Differentiation between active and recovered cases is by polymerase chain reaction (PCR) [5]. Postoperative complications among COVID patients are the clue for modification in the way of management to achieve the least morbidity and mortality.

Studies revealed high mortality of surgical patients with active and asymptomatic coronavirus infection varying from 14.3 to 38.5% and depending on whether the

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surgery was performed electively or urgently [6]. Although efforts to recognize and manage SARS-CoV-2 infections have focused primarily on respiratory complications, some patients with COVID-19 infection may experience gastrointestinal manifestation of this disease [7].

According to Aloyan *et al.* [8] COVID-19 is an independent risk factor for both early and late postoperative complications after abdominal surgery and high surgical mortality. Patients aged 45–74 years and those with one or more comorbidities have higher risk of postoperative complications. The spectrum of early complications (within first month) was paralytic ileus, small bowel ischemia, pancreatitis, and moderate (5–10 times the upper reference limit) transaminitis. All patients recovered with therapeutic treatment only. The spectrum of late complications (within second month) consisted of spleen infarction, abdominal abscess, necrotizing pancreatitis, total intestinal necrosis, and pleural empyema.

Patients and method

This retrospective study was conducted in Kasr AL-Ainy university Hospital, Cairo, Egypt between June 1, 2020 and January 31, 2021.

Inclusion criteria: all patients admitted in general surgery department, emergency hospital, tested COVID-19 positive by PCR test, in the period between June 1, 2020 and January 31, 2021.

Exclusion criteria: all cases discharged with missed data, cases admitted in other specialty rather than general surgery in emergency hospital and cases suspected to be COVID clinically with two successive negative swabs.

Methodology in details

Kasr AL-Ainy hospital has one of the largest trauma and surgical emergency Centers in the Middle East. Screening of patients during the era of COVID pandemic in our institute from June to September was based on clinical suspicion. This was done by classification of the patient based on clinical condition (history and examination), radiology (mainly CT chest) and labs (especially CBC and CRP) to low risk of COVID and high risk of COVID. Patients with high risk of COVID were admitted in isolation ward to get nasopharyngeal swab for COVID-19 PCR test and full precautions were taken. Patients with low risk were under continuous follow-up to detect any case become suspicious for COVID. From September to January 2021, swabs were routine for all patients admitted in emergency hospital. The diagnosis of COVID-19 was confirmed by PCR nasopharyngeal swab.

From June 2020 to January 2021, total number of cases admitted in general surgery department in emergency hospital were 3923 patients. After exclusion of about 4 cases with missed data and lost follow up, about 53 patients were admitted in this period in emergency hospital under care of general surgery department and tested positive for COVID-19. Retrieval of medical records from archive and files of patients was done to get all available data for statistical analysis. Approval of ethical committee was in February 1, 2021 for conducting the study. The following items were analyzed for 53 patients: age /sex distribution, previous surgical history, presence of comorbidities, diagnosis on admission, number of cases diagnosed as COVID-19, general condition on admission, clinical symptoms and signs suspicious for COVID, COVID-19 team consultation, management done, follow-up available, and prognosis and laboratory findings.

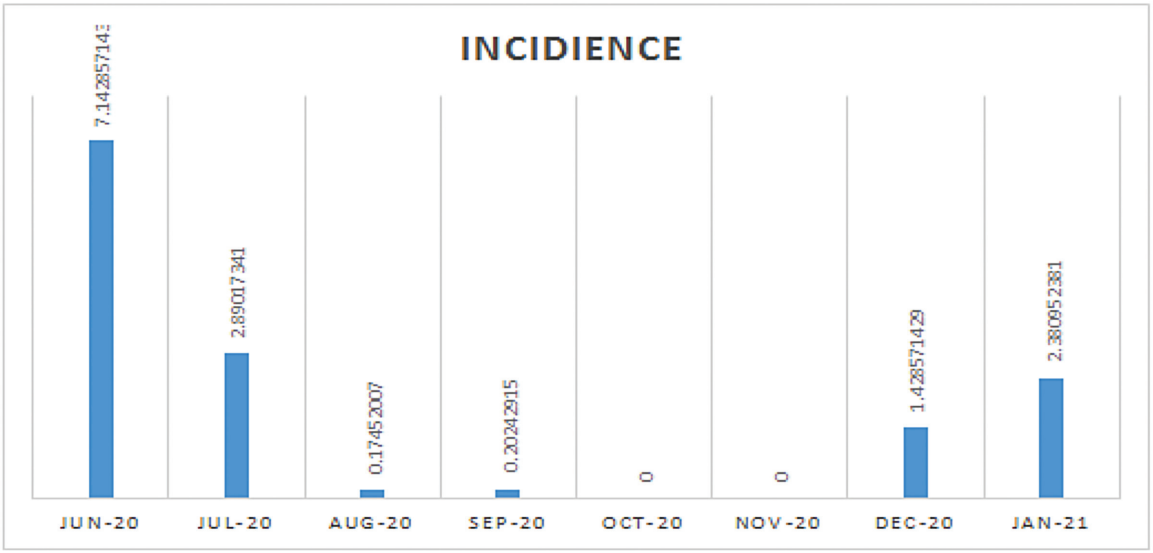
The extracted data including total number of cases admitted in general surgery department were calculated. These data underwent statistical analysis to identify the incidence of COVID-19 in general surgery emergency, postoperative complications, different surgical diseases in COVID patients, surgical intervention, morbidity, mortality, and asymptomatic cases.

The data was assembled into Statistical Package for Social Sciences (SPSS, version 25.0) for Windows (IBM Corp., Armonk, NY). The data were defined as either median, minimum and maximum, or frequency and relative percentages. Nonparametric analysis was used to interpret the disparity in descriptive statistics. Although the categorical results were compared by cross-tabulation, the degrees of significance were calculated by χ^2 test or Kruskal Wallis test according to the distribution of the data. A P value of less than 0.05 was considered significant (two-tailed).

Results

Screening to 3923 patients admitted in emergency hospital under care of general surgery department revealed 53 patients COVID-19 PCR positive with total incidence 1.35% as showed in Fig. 1. Demographic data of these 53 COVID-19 positive patients revealed that 29 were male (54.7%) and 24

Figure 1



Graph for incidence of COVID-19.

were females (45.3%) The age of the patients ranged between 16 years and 80 years, the median for them was 42 years.

Total number of cases died was 14 from 53 cases admitted with COVID-19 with pooled incidence 26.4% as illustrated in Fig. 2.

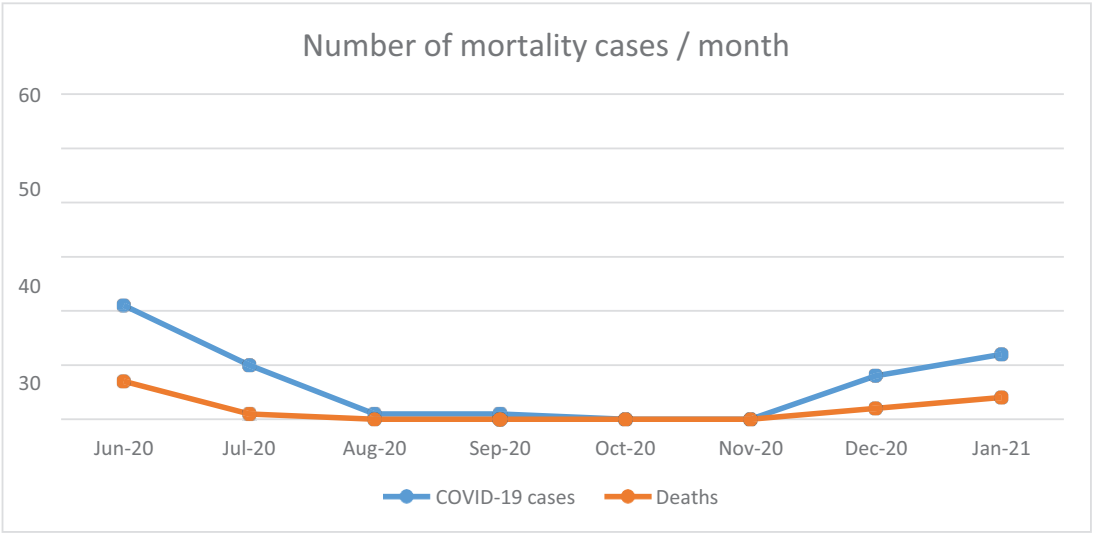
Total number of cases developed morbidity were 16 from 53 cases admitted with COVID-19 with pooled incidence 30.2%. The following two graphs (Figs. 3 and 4) show morbidity in each month.

The most common incidence of surgical diseases between patients diagnosed as COVID was intestinal obstruction and perforated viscous as presented in Table 1.

The following table (Table 2) shows the incidence of postoperative complications as a cause of readmission associated with new diagnosis of COVID 19 for the first time.

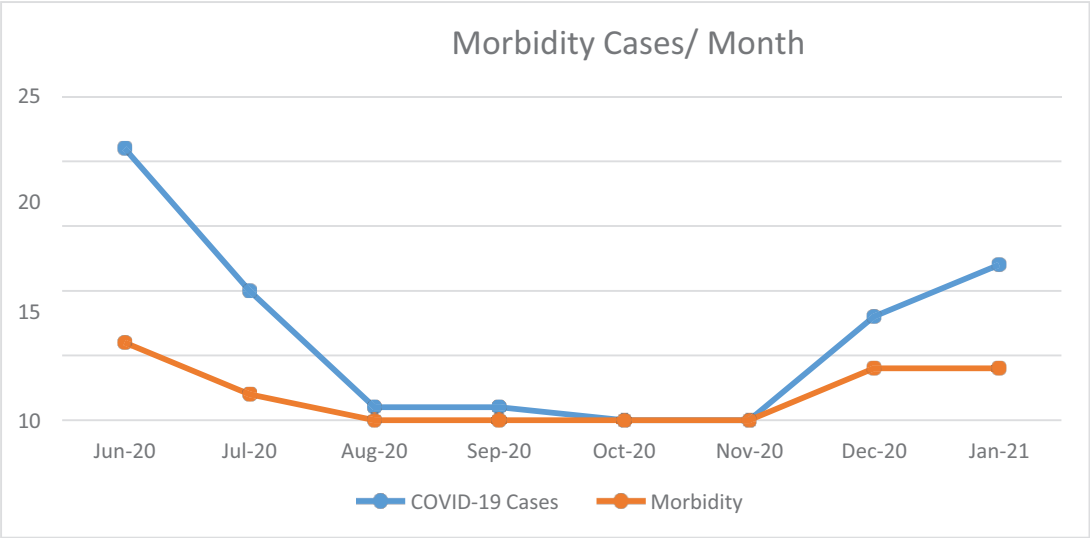
As regarding general condition on admission, most of cases presented with sepsis and septic shock (about

Figure 2



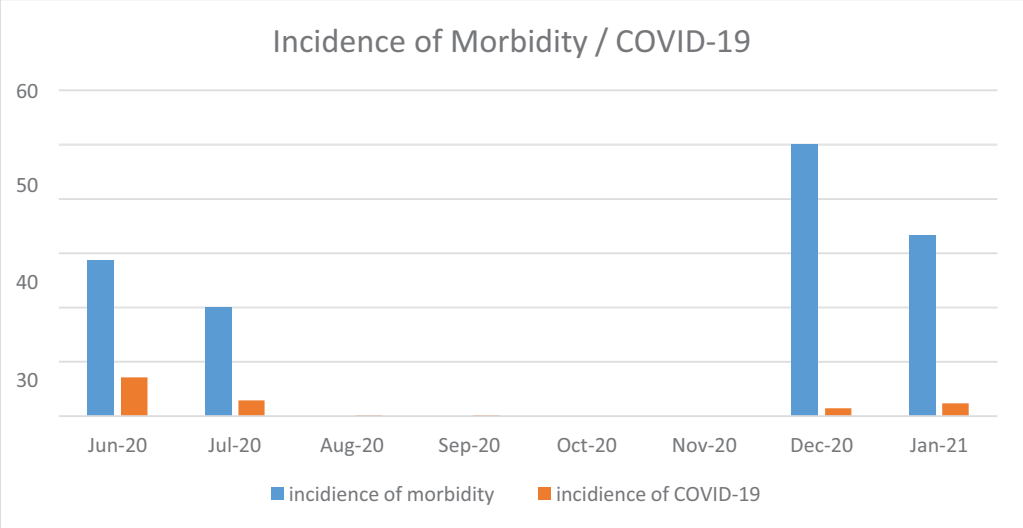
Graph for comparison between mortality cases number and COVID cases number/month.

Figure 3



Graph for comparison between morbidity cases number and COVID cases number/month.

Figure 4



Graph comparison between incidence of morbidity and incidence of COVID-19.

62.3%) and only 32.1% presented with fair general condition as depicted in Table 3.

From total number of cases included about 77.4% managed surgically. Laparoscopy was used in one case (Table 4) and it was safe and feasible. However, more cases are required to prove safety of laparoscopy in era of COVID.

The most common surgical procedure in surgically managed patient was midline exploration 70.7% (29 out of 41 patients). Eight COVID-19 positive patients (19.5%) were reoperated once and one patient was reoperated more than one time in the same hospital admission (Table 5). Two patients (from the reoperated once group) were explored due to leakage after resection anastomosis. So about 33% of cases underwent resection and anastomosis developed leakage, one of them survived and one died most probably due to sepsis and septic shock.

Readmission rate was 11.3% after discharge due to fecal fistula, wound infection and eviscerated bowel from hernia site after DAMA, stoma retraction and stoma site infection, leakage after DAMA, malignant IO and another attack of pancreatitis respectively

Table 1 Incidence of different diseases in COVID-19 +ve patients admitted in emergency general surgery department

Diagnosis	Count (53)	Percentage
Intestinal obstruction	13	24.5
Perforated viscous	12	22.6
Postoperative complications developed after discharge	6	11.3
Traumatic abdominal collection	4	7.5
Abscess and soft tissue infection	3	5.7
Acute thrombosis	3	5.7
Complicated appendicitis (abscess or perforation)	3	5.7
Appendicitis	2	3.8
Biliary pancreatitis	2	3.8
Acute abdomen due to unspecified cause	2	3.8
Cholangitis	1	1.9
Gallbladder empyema	1	1.9
Biliary injury with abdominal collection	1	1.9

Table 2 Incidence of postoperative complications as a cause of readmission associated with new diagnosis of COVID-19 for the first time

Postoperative complications	Count (6)	% total COVID cases (53)
Burst abdomen	2	3.8
Leakage	2	3.8
Wound infection	1	1.9
Stoma retraction	1	1.9

Table 3 General condition on admission

General condition on admission	Count (53)	% total cases of COVID (53)
Sepsis	23	43.40
Septic shock	10	18.9
SIRS	3	5.70
Fair	17	32.10

Regarding the outcome and prognosis of our COVID-19 positive patients, morbidity and mortality were 30.2% and 26.4%, respectively, as illustrated in Table 6.

All patients managed conservative survived and discharged. It is worth to mention that 92.9% of cases died were managed surgically as showed in Table 7. Only one case (7.1%) from mortality cases was managed minimally invasive by endoscopy. Regarding the relation between outcome and type of management, using χ^2 tests showed statistically significant. *P* value equal to 0.045.

Regarding suspected cause of death, no autopsy was done in our hospital in this period and Data regarding cause of death were suggested as in Table 8.

Discussion

The impact of COVID-19 pandemic has drastically led to a substantial change in the prioritization with respect to elective general surgery procedures. Swab could be done as there are no urgent indications for surgery. Surgery could be postponed till the patient becomes COVID free to minimize postoperative risks. On the contrary, when it comes to emergency general surgery, even if the patients get screened for COVID-19 during their admission time, these results usually get released 48–72 h later (in Egypt in 2020), fact which obliges the acute care surgeons to make judgment calls about operative versus conservative treatment of these patients without evidence regarding their COVID-19 infection status [9].

The COVID Surg Collaborative study published in lancet 2020 identified that half of the patients with perioperative SARS-CoV-2 infection developed postoperative pulmonary complications and associated with high mortality. This has direct implications for clinical practice around the world. Risk benefit should be weighted as the increased risks associated with SARS-CoV-2 infection should be balanced against the risks of delaying surgery in individual patients [10].

To the best of our knowledge, our study is the first study in the Middle East exploring the surgical input of general surgery only. Calculating incidence of COVID-19, surgical diseases associated on presentation, management and outcome in the care of COVID patients hospitalized in Kasr AL-Ainy hospital. Our study was done during the peak of the first wave in June and July and second wave in December and January of the disease in Egypt.

Our study identified that the incidence of COVID-19 was 1.35% during the period of study from June 2020

Table 4 Type of management for admitted cases

Management	Count (53)	% (from total COVID cases) (53)	Total (% from total COVID cases) (53)
Surgical	40	75.5	41 (77.4)
Laparoscopic	1	1.9	
Minimally invasive and endoscopy	4	7.5	12 (22.6)
Medical and conservative	8	15.1	

Table 5 Number of operations in last hospital admission

Number of operations in last hospital admission	Count (41)	% Total cases operated (41)
Operated once	32	78
Operated twice	8	19.5
Operated more than two times	1	2.4

Table 6 Outcome COVID-19 positive patients

Outcome	Count (53)	% (total COVID cases) (53)
No complications	23	43.4
Morbidity	16	30.2
Mortality	14	26.4

to January 2021, including the peak of the first and second wave. The peak of incidence in the first wave was 7.1% during June. The second wave peak incidence was 2.4% during January. The incidence in our hospital is relatively lower than other centers. According to Álvarez Gallego M *et al.* conducted in a tertiary hospital in Spain, the incidence of SARS-CoV-2 infection in elective surgery patients was 7% and in emergency was 11.1% [11]. Therefore in our institute, there is low incidence of COVID-19. However, according to Surek *et al.* [12] conducted in a tertiary center in turkey, results of COVID-19 screening were positive in 6 (6/103, 5.82%) patients undergoing emergency surgery in three months period. This percentage is near to our institute during the peak of the first wave.

The peak incidence was low in the first wave 7.1% in spite of clinical suspicion based screening. However, in the second we had routine PCR was done to all admitted cases, the incidence of the disease still low 2.4%. This low incidence might be due to low incidence of disease in our country in that time. During our study period, Egypt was number 68 worldwide on May 18, 2021 according to worldometer for COVID-19 coronavirus pandemic in total number of cases [13].

The mortality rate identified in our study was 26.4% which are also higher than those previously reported across international settings. According to GlobalSurg Collaborative study conducted across 58 countries, including low-income and middle income countries, reported a 30-day mortality of 14 · 9% in the high-risk subgroup who had emergency midline laparotomy [14].

Our result is going with a recent review by Nahshon and colleagues, of all published cases of asymptomatic patients before surgical treatment to detect the potential hazardous implications of COVID-19 infection on the peri-operative course. In this report, concerning the postoperative outcomes of patients diagnosed with COVID-19 during the peri-operative period, a 14/51 (27.5%) postoperative mortality rate and severe pulmonary complications [15].

To the best of our knowledge, our study mortality rate is much less than result by González-Calatayud *et al.* [16] which revealed 61.5% mortality rate in general surgery patients. Most cases presented late to our hospital. Of included cases, 43.4% of cases presented in sepsis and 17% presented in septic shock. This may be a direct effect to lock down due to COVID and fear from seeking medical advice by going to healthcare facilities.

Table 7 Effect of type of management on outcome

	Outcome			
Type of management	No morbidity or mortality	Morbidity	Mortality	Total
Conservative	7 (30.4)	1 (6.3)	0 (0.0)	8 (15.1)
Open surgery	12 (52.2)	15 (93.8)	13 (92.9)	40 (75.5)
Minimally invasive and endoscopy	3 (13)	0 (0.0)	1 (7.1)	4 (7.5)
Laparoscopic	1 (4.3)	0 (0.0)	0 (0.0)	1 (1.9)
Total	23 (100)	16 (100)	14 (100)	53 (100)

Table 8 Cause of death and general condition on admission for mortality cases

Cause of death	Count (14)	General condition on admission
Pulmonary embolism	4	2 cases (fair) 1 case sepsis 1 case debilitated with malignancy
Sepsis and septic shock	4	1 case fair 2 cases in sepsis 1 case septic shock
ARDS, respiratory failure and septic shock	3	1 case sepsis 2 cases septic shock
Multiorgan failure of unknown cause and sudden cardiac arrest	2	1 case septic shock 1 case shocked (distributive) for unknown cause
pneumonia and septic shock	1	1 case sepsis

In our study 26.4% of cases were asymptomatic, diagnosed by swab with or without suspicious CT chest. This is a significant percentage indicating routine swab to all admitted cases, rapid retrieval of results side by side with screening regarding symptomatology, and CT chest for all admitted cases.

Type of management affects the outcome. The best outcome is associated with conservative management, as 92.9% of cases died were managed surgically. Only one case (7.1%) from mortality cases was managed minimally invasive by endoscopy. therefore conservative management is the best choice if possible, then minimally invasive. The surgical management should be restricted to highly indicated cases in emergency. However, other cases died due to multi-organ failure and respiratory complications have element of sepsis and septic shock. Therefore we can consider sepsis and septic shock are the most common cause of death in our study. This finding is correlated with General condition of the patients on admission. Lack of autopsy in our hospital is a real limitation toward detecting main cause of death. Our results are matched with published studies by Nahshon and colleagues and COVIDSurg Collaborative that consider the pulmonary complications are the leading cause for death in the COVID-19 patients as a postoperative complication [10,15].

Limitations of the study also include the laboratory testing; some infected patients were excluded from the study based on false-negative laboratory test results. Added to this, the screening in the beginning of the COVID era was based on clinical suspicion due to lack of reagents for swab, which makes some cases missed and not included.

This is retrospective study with collection of founded data from database and files of patients. There were incomplete data to get some important relations. However, this study will be continued to detect the effect of different variables on the outcome. This incidence study is lightening the way toward clarification of COVID-19 secrets in general surgery emergency.

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Ethical approval: This research has received written approval from the local national ethical committee at Kasr Alainy Faculty of Medicine, Cairo University.

Data sheets and material are available with the corresponging author, Ahmed M. Ghobashy (dr.a. ghobashy@cu.edu.eg)

Each author made an equal contribution to the work.

All authors read and approved the final manuscript.

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Conflicts of interest

There are no conflicts of interest.

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