

Postoperative Complications in Patients With the Preoperative COVID-19 Infection at King Fahad Specialist Hospital: A Retrospective Cohort Study

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Mohammed Yehya Momeeh¹, Meshal M. Alrumayh¹, Khiloud Ahmed², Fahad L. Alharbi¹

1. Anesthesia, King Fahad Specialist Hospital, Buraidah, SAU 2. Anesthesia, Maternity and Children Hospital, Buraidah, SAU

Corresponding author: Mohammed Yehya Momeeh, mohammadmomeeh@yahoo.com

Abstract

Background: Coronavirus disease (COVID-19) is an infectious disease caused by a new coronavirus strain. Indeed, the timing of COVID-19 infection before surgery plays an important role in the surgery outcomes and complications.

Objective: In this study, we aimed to assess the prevalence and predictors of postoperative complications for patients who underwent surgery with previous COVID-19 infection.

Methodology: This was a retrospective hospital-based study which was conducted on 75 patients who had been infected with COVID-19 and underwent surgery.

Results: We included 75 patients. The time between COVID-19 infection and the surgery was from one to six months in 52% of patients, 24% of patients were more than six months, and 24% of patients were less than one month. In this study, most of the patients had no complications (77.3%) while 22.7% of patients had complications that were mainly respiratory (n= 13). The overall mortality in our study was 5.3%. There was a significant association between comorbidity and postoperative complications, and the status of COVID-19 preoperative and postoperative complications ($p < 0.01$) but not patients' age as well as the type of anesthesia and postoperative complication ($p > 0.05$).

Conclusion: Respiratory complications were the most common postoperative complications in patients who had surgery after COVID-19 infection. Comorbidity and COVID-19 status were significantly associated with higher postoperative complications. Mortality was relatively small. We recommend extreme care to patients with COVID-19 infection prior to surgery to decrease the COVID-19 hazards that develop post-surgery.

Categories: Anesthesiology

Keywords: surgery during covid-19, post-operative complication, anesthesiology, surgery, covid-19

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by a new coronavirus strain. COVID-19 causes mild to moderate respiratory disease which many patients recover without requiring special treatment. On the other hand, older patients and patients with comorbidities (like diabetes, cardiovascular disease, chronic respiratory disease, and cancer) are more likely to suffer from serious types of disease [1]. To provide anesthetic and surgical care to COVID-19 patients, healthcare workers have to reorganize surgical platforms, personal protective equipment protocols, and in-hospital patient trajectories to prevent a viral spread to healthcare workers and other patients in addition to decreasing the COVID-19 hazards [2-4]. During the COVID-19 pandemic surge, many elective procedures were postponed and only emergency ones were performed in order to get the maximum beneficial outcomes for the patients and decrease the workload on the overwhelmed hospitals with many COVID-19 patients [5]. However, after the COVID-19 cases started to decrease together with the introduction of vaccination, elective procedures were done for all patients considering the COVID-19 precautions before surgery to protect them and the hospital care workers from the negative COVID-19 outcomes [6]. It is worth mentioning that COVID-19 patients had significantly higher postoperative complications than their peers without COVID-19 infection [7]. Indeed, the timing of COVID-19 infection before surgery plays an important role in the surgery outcomes and complications. In a US population-based study, patients who contracted COVID-19 infection 0-8 weeks before surgery were significantly associated with postoperative complications rather than those who were allocated to surgery after at least eight weeks of COVID-19 infection [8]. In this study, we aimed to assess the prevalence and predictors of postoperative complications for patients who underwent surgery with previous COVID-19 infection.

Materials And Methods

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This study was a retrospective hospital-based study conducted at King Fahad Specialist Hospital, which has a well-equipped emergency department and operating theatre including all the sub-specialties and also includes a COVID-19 department and intensive care unit (ICU).

Inclusion criteria

We included patients with previous COVID-19 who had surgery after the infection and aged from 19 to 80 years old.

Exclusion criteria

We excluded patients with incomplete data, paediatrics patients and those who refused to participate in this study.

Sample size

We aimed to recruit 60-80 patients from both genders, aged from 19 to 80 that were scheduled for elective and emergency general surgery, and obstetrics operations after contracting COVID-19 infection. The sampling technique was done using www.randomizer.org and a software application program called Epi Info™ (Centers for Disease Control and Prevention, USA) for calculations. We used simple random sampling to obtain our data.

After obtaining approval from the King Fahad Specialist Hospital and the National Committee of Bioethics, we included 75 patients with a confirmed preoperative COVID-19 infection who underwent surgery between October 2020 and August 2021. Data for this study was collected from the statistical and public health departments. The data collector obtained patients' phone numbers from the hospital system and contacted them or their families to conduct a survey. The survey included personal data, past medical history, details about COVID-19 infection symptoms, duration and complications preoperatively, how long the recovery took, the type of surgery, urgency of operation, the presence of signs, symptoms, complications developed after the operation, which type of complication, the course of treatment and outcome.

Data entry and analysis

Data was entered using Microsoft Excel (Microsoft® Corp., Redmond, WA) to be cleaned and coded, and then Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, IBM Corp., Version 26.0, Armonk, NY) was used to analyze the data. Data was reported in the form of frequency tables. To investigate the association between postoperative complications and other patient's data, we ran a Chi-Square test. A P-value less than .05 was considered significant.

Results

In this study, two-fifths of our patients had an age of >61 years old, 38.7% of our patients aged 19-40 years old and 21.3% had an age of 41-60 years old (Table 1).

Variable	Frequency	Percent	
Age	19-40 years	29	38.7
	41-60 years	16	21.3
	> 61 years	30	40.0
Sex	Female	48	64
Comorbidity	None	28	37.3
	Multiple comorbidities	15	20.2
	DM	13	17.3
	HTN	11	14.7
	Asthma	4	5.3
	Renal disease	1	1.3
	SLE	1	1.3
	Smoker	2	2.6
COVID-19 status	Home isolation with mild symptoms	45	60
	Home isolation with oxygen	16	21.3
	HDU	7	9.3
	ICU	4	5.3
Time from COVID-19 to surgery	Asymptomatic	3	4
	<1 month	18	24
	1-6 months	39	52
Type of surgery	>6 months	18	24
	Minor surgery	33	44
	General surgery	25	33.3
	Orthopedic	9	12.0
Surgical emergency	Obstetrics and gynecological operation	8	10.7
	Elective	50	66.7
Type of anesthesia	Emergency	25	33.3
	General anesthesia	48	64.0
	local infiltration	11	14.7
	Regional	16	21.3

TABLE 1: Characteristics of participants

DM: diabetes mellitus, HTN: hypertension, SLE: systemic lupus erythematosus, HDU: high dependency unit, ICU= intensive care unit

Most of the participants were females with a prevalence of 64%; while the males' prevalence was 36%. One-fifth of our patients had no comorbidities; while the prevalence of diabetes mellitus, hypertension, asthma, renal disease, systemic lupus erythematosus and current smoker were 17.3%, 14.7%, 5.3%, 1.3%, 1.3% and 2.6%, in order. Regarding the COVID-19 status preoperatively, most of the patients had home isolation with mild symptoms 45 (60%), one-fifth needed home isolation with oxygen, seven (9.3%) and four (5.3%)

patients needed a high dependency unit (HDU) and ICU admissions. Only three patients were asymptomatic. Regarding the time between COVID-19 infection and the surgery, 52% of patients had COVID-19 one to six months before surgery, 24% and 24% of patients were infected > six months and < one month before surgery, in order. In this study, 44% of surgeries were minor surgery, followed by general surgery at 33.3%, orthopaedic at 12% and obstetrics and gynaecological operation at 10.7%. In addition, most of the operations were elective 66.7% while the rest were emergency operations. Regarding the type of anaesthesia, general anaesthesia was the most frequent (64%), followed by regional (21.3%) and local infiltration (14.7%).

In this study, most of the patients had no complications (77.3%) while 22.7% of patients experienced complications. Most of the complications were respiratory (n= 13) (Table 2).

Variable	Frequency	Percent
Postoperative complication	No	58
	Yes	17
Respiratory complications (n= 13)	ARDS	6
	Acute lung injury	2
	Pneumonia	2
	Pulmonary embolism	2
	Postoperative hypoxia	1
	DVT	3
Non-respiratory complications	Sepsis	1

TABLE 2: Postoperative complications

ARDS: acute respiratory distress syndrome, DVT: deep venous thrombosis

Among patients with respiratory complications, nine patients received mechanical ventilation and the rest received non-invasive ventilation. Regarding the outcome of treatment of the respiratory complications, ten patients recovered and three patients died. Regarding the patients who had non-respiratory complications, three had deep venous thrombosis (DVT) and only one patient had sepsis. Considering the treatment needed for non-respiratory complications, one patient was treated in the critical care unit, whereas only three patients were treated in the ward. Three patients recovered and one patient died. The overall mortality in our study was 5.3%.

There was a significant association between comorbidity (Table 3) and the status of COVID-19 (Table 4) and postoperative complications ($p < 0.01$). In contrast, there was no significant association between patients' age and postoperative complications (Table 5) as well as the type of anaesthesia and postoperative complication (Table 6) ($p > 0.05$).

The effect of COVID-19 preoperatively		Postoperative complications		P value
		No	Yes	
HDU	Frequency	5	2	<0.001
	Percent	71.4%	28.6%	
Home isolation with mild symptoms*	Frequency	46	2	
	Percent	95.8%	4.4%	
ICU	Frequency	1	3	
	Percent	25.0%	75.0%	
Home isolation with oxygen	Frequency	6	10	
	Percent	37.5%	62.5%	

TABLE 3: Association of effects of preoperative COVID-19 and postoperative complications

*Three asymptomatic patients were added to this group.

HDU: high dependency unit

Comorbidity type		Postoperative complication		P value
		No	Yes	
Asthma	Frequency	0	4	0.008
	Percent	0%	100%	
DM	Frequency	10	3	
	Percent	76.9%	23.1%	
HTN	Frequency	8	3	
	Percent	72.7%	27.3%	
Multiple co-morbidities	Frequency	14	1	
	Percent	93.3%	6.7%	
No comorbidity	Frequency	23	5	
	Percent	82.1%	17.9%	
Renal disease	Frequency	1	0	
	Percent	100%	0%	
SLE	Frequency	1	0	
	Percent	100%	0%	
Smoker	Frequency	1	1	
	Percent	0%	100%	

TABLE 4: Association between complications and comorbidity

DM: diabetes mellitus, HTN: hypertension, SLE: systemic lupus erythematosus

Age		Postoperative complications		P-value
		No	Yes	
19-40 years	Frequency	20	9	0.20
	Percent	69.0%	31.0%	
41-60 years	Frequency	13	3	
	Percent	81.3%	18.8%	
> 61 years	Frequency	25	5	
	Percent	83.3%	16.7%	
Total	Frequency	58	17	
	Percent	77.3%	22.7%	

TABLE 5: Association between age and postoperative complications

Anesthesia type		Postoperative complications		P value
		No	Yes	
General	Frequency	35	13	0.9
	Percent	72.9%	27.1%	
Local infiltrations	Frequency	11	0	
	Percent	100%	0%	
Regional	Frequency	12	4	
	Percent	75%	25%	

TABLE 6: Association between anaesthesia type and postoperative complications

Discussion

In our study, 17% of the study population (75 patients) experienced respiratory complications. This differs from what is shown by Dimitry et al. [9], who found a higher prevalence of respiratory complications that had a prevalence of 51% of the total patients. It was much higher than the percentage we found, but in reality, their study population was larger than ours with 1128 included COVID-19 patients. Furthermore, the complications they reported were related to only the emergency surgery while in our study only 33.3% were allocated to emergency surgery.

Regarding the mortality rate, a study conducted in 2021 by Richard Shaw et al. [10], on head and neck cancer surgery during the COVID-19 pandemic in 26 countries, in which 1137 patients were enrolled. The reported overall 30-day mortality was 1.2%. Twenty-nine patients (3%) tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) within 30 days of surgery, 13 (44.8%) of these patients developed severe respiratory complications and three patients (10.3%) died [10].

We found no significant association between the type of anaesthesia and postoperative complications. This indicates that the type of anaesthesia had no impact on the postoperative complication. However, we still recommend large sample-sized studies to support our results.

Regarding comorbidity and postoperative complications, our results revealed a positive association between comorbidity and postoperative complications. It is well known that comorbidity plays a vital role in postoperative outcomes at which patients with multiple comorbidities have worse outcomes [11]. This risk was enhanced by the COVID-19 infection which shows marked hazards in patients with comorbidities [12].

Regarding the association between the course of previous COVID-19 disease treatment and postoperative complications, we found a significant association between the course of the disease and postoperative complications. ICU patients and patients who needed oxygen were more vulnerable to acquiring postoperative complications. This agrees with a cohort study that was conducted by François Martin Carrier et al. [13], in 2021 regarding the postoperative outcomes in surgical COVID-19 patients in Canada, in which 44 COVID-19 patients were included in the study. Among the 44 COVID-19 patients, 31 surgeries (71%) were urgent and 16 (36%) were major. Furthermore, in this study, pulmonary complications were frequent (25%) and 30-day mortality was high (15.9%). The latter was higher in symptomatic patients (23.1%) compared to asymptomatic ones (5.6%).

Also, a study conducted by Michael E. Kiyatkin et al. [14] in 2020 regarding the increased incidence of postoperative respiratory failure in patients with preoperative SARS-CoV-2 infection in the USA, in which 778 patients with COVID-19 were included in the study. The incidence of postoperative respiratory failure was 16% versus 7% in uninfected participants ($p = 0.001$). Among the infected individuals, 39% exhibited symptoms of COVID-19 and postoperative respiratory failure was more common in these patients compared to asymptomatic individuals (26% vs. 9%, $p = 0.04$).

Limitations

We did not involve non-COVID-19 patients in our study and their postoperative complication outcomes. Our study also had a small sample size. Furthermore, the retrospective nature of our study increased the possibility of selection bias [15].

Conclusions

Respiratory complications were the most common postoperative complications in patients who had surgery after COVID-19 infection. Comorbidity and COVID-19 status were significantly associated with higher postoperative complications. Mortality was relatively small. We recommend extreme care to patients with COVID-19 infection prior to surgery to decrease the COVID-19 hazards that develop post-surgery.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Mohammed Yehya Momeeh, Meshal M. Alrumayh, Khiloud Ahmed, Fahad L. Alharbi

Acquisition, analysis, or interpretation of data: Mohammed Yehya Momeeh, Meshal M. Alrumayh, Khiloud Ahmed, Fahad L. Alharbi

Drafting of the manuscript: Mohammed Yehya Momeeh, Meshal M. Alrumayh, Khiloud Ahmed, Fahad L. Alharbi

Critical review of the manuscript for important intellectual content: Mohammed Yehya Momeeh, Meshal M. Alrumayh, Khiloud Ahmed, Fahad L. Alharbi

Supervision: Mohammed Yehya Momeeh

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. Qassim Research Ethics Committee, Registered at National Committee of Bio & Med. Ethics (NCBE) (Registration No. H-04-Q-001) issued approval 1443-783314. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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