

# Clinical Features and Outcome of General Surgery Patients with COVID-19 Infection in General Surgery Department

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## ABSTRACT

**Background:** COVID-19 has remarkable impacts on all aspect of healthcare system. Many centres reported a decrease of emergency cases, and most of the elective cases is postponed. In this study we aimed to examine the demographic data, clinical profiles, and outcomes of subjects infected with COVID-19 in General Surgery Department. **Methods:** Seventy patients were admitted in General Surgery Department with confirmed-COVID-19 infection during May 1, 2020 – April 31, 2021. COVID-19 infection was diagnosed using quantitative reverse transcriptase polymerase chain reaction analysis. We collected patients' data from the medical records. **Results:** Sixty-one patients (87.1%) were emergency cases. Thirty-two patients (45.7%) were treated operatively. The most prevalent cases were from digestive surgery (44.3%). Most of the patients contracted COVID-19 before the admission in the hospital (74.3%). We found that 43 patients had at least 1 comorbidity (61.4%) and 67 patients developed complications during treatment (95.7%). There was a significant association between the case of ARDS and the clinical outcome ( $P < 0.0001$ ; OR = 45.000; 95% CI = 5.310–381.356). There was no significant association found between sex, age, comorbidity hypertension, and diabetes mellitus. **Conclusion:** Comorbidity and complication was found to be highly prevalent in COVID-19 patients with poor outcome in General Surgery Department.

**Keywords:** COVID-19; general surgery; SARS-CoV-2

## INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a virus first identified as the cause of pneumonia cluster in Wuhan, China at the end of 2019 [1]. Since then, the increase of COVID-19 cases worldwide is expeditious. World Health Organization (WHO) declared COVID-19 as a global pandemic in February 2020, and as of April 2021, more than 135 million cases with almost 3 million deaths has been reported [2]. Indonesia reported the first COVID-19 case on March 2, 2020 and the number has increased rapidly to more than 1.5 million cases in April 2021 [3].

COVID-19 has remarkable impacts on all aspect of healthcare system. The healthcare system all over the world was re-organized to cope with pandemic situation and to be able to maintain essential health services [4]. Many centres reported a decrease of emergency cases, and most of the elective cases is postponed to increase non-surgical COVID-19 beds. Time-to-diagnosis and time-to-intervention delay of emergency cases has been reported during the pandemic. This might be caused by the quarantine/ lockdown policies, the patient's fear of contracting COVID-19 in the hospital, or the queue for COVID-19 examination in emergency room [4]–[6].

Surgery induces a host-immune response that leads to activation of inflammatory cascade and immunosuppression [7], [8].

Patients receiving surgery are more vulnerable to get COVID-19 infection [9]. Surgery might promote and aggravate COVID-19 progression. Therefore, patient with COVID-19 infection undergoing surgery also have an increased risk of perioperative complications and mortality [9]–[11].

To date, the data on clinical features and outcomes of patient in surgery department with COVID-19 infection in Indonesia is still scarce. Therefore, in this study we aimed to examine the demographic data, clinical profiles, and outcomes of subjects infected with Covid-19. We believe that our data is important to get better understanding on COVID-19 infection in surgery department view and will provide valuable data to reduce the morbidity and mortality of surgical patient with COVID-19 coinfection by optimizing perioperative preparation, also to prevent and treat the complication of the disease.

## MATERIALS AND METHODS

### Study design and participants

This retrospective cohort study utilized data of patients admitted in General Surgery Department of Dr. Soetomo General Hospital, Surabaya, Indonesia during May 1, 2020 – April 31, 2021. In this study, we included patients from emergency room and elective admission. COVID-19 infection was diagnosed based on the Indonesian Health Ministry interim guidance [3].

In a brief, laboratory confirmation of SARS-CoV-2 was done by quantitative reverse transcriptase polymerase chain reaction (RT-PCR) analysis. The nasopharyngeal or oropharyngeal swab specimens were collected from each patient and immediately transported to the laboratory. COVID-19 test was performed by the Clinical Pathology Department or Microbiology Department of Dr. Soetomo General Hospital, Surabaya.

This study was reviewed and approved by the Medical Ethical Committee of Dr. Soetomo General Hospital Surabaya (approval number 0469/LOE/301.4.2/V/2021).

### Data collection

We collected patients' demographic data, age, case type, admission date, operation date, discharged date, RT-PCR-positive confirmation date, diagnosis, vital signs, laboratory results, radiology/ imaging findings, comorbid, treatment, complications, ICU admission, mechanical ventilation usage, and outcome. All data were obtained from the combination of paper based medical records and electronic medical records.

### Statistical analysis

Discrete variables were tested using the Chi-square test. Continuous variables were tested using the Mann-Whitney U. Spearman rank correlation model was used to determine the association between age and clinical outcome. Statistical significance was determined when the P value was less than 0.05. The statistical analysis was performed using the SPSS statistical software package version 23.0 (IBM Corp., Armonk, NY, USA).

## RESULTS

### Patient's demographic data

There were 70 patients admitted in General Surgery Department with confirmed-COVID-19 infection during May 1, 2020 – April 31, 2021, consisted of 36 females (36/70; 51.4%) and 34 males (34/70; 48.6%). The age was ranged 17 – 76 years, with median age 45 years. The average age for the males was almost similar than the females (males,  $44.9 \pm 15.0$  years vs. females,  $45.0 \pm 14.9$  years). There was no significant difference of age between males and females ( $P > 0.05$ ). Demographic characteristics of the patients are shown in Table 1.

**TABLE 1:** Demographic characteristics of general surgery patients with COVID-19 infection

Demographic data	n (%)
<b>Total</b>	70
<b>Sex</b>	
Male	36 (51.4%)
Female	34 (48.6%)
<b>Age</b>	
≤ 29	11 (15.7%)
30–39	15 (21.4%)
40–49	17 (24.3%)
50–59	15 (21.4%)
≥ 60	12 (17.1%)

### Characteristics of COVID-19 patients

We analysed the distribution of the COVID-19-positive subjects based on several characteristics (Table 2). Sixty-one patients (61/70; 87.1%) were emergency cases from the emergency room, or consulted from the other department presenting with urgent/ emergency signs and symptoms of general surgery cases, while 9 patients (9/70; 12.9%) were elective patients. Based on the therapy management, 32 patients (32/70; 45.7%) were treated operatively, while the remaining 38 patients (38/70; 54.3%) underwent non-operative management. The most prevalent cases were from digestive surgery (31/70; 44.3%),

followed by trauma patients (20/70; 28.6%), oncology (9/70; 12.9%), head and neck surgery (7/70; 10.0%), and general surgery division being the least common (3/70; 4.3%). Our data also showed that most of the patients contracted COVID-19 before the admission in the hospital (52/70; 74.3%). There were two patients that acquired the COVID-19 while getting the treatment in the hospital, and categorized as healthcare-associated infection (2/70; 2.9%). The characteristics of general surgery patients with COVID-19 infection are shown in Table 2.

**TABLE 2:** Characteristics of general surgery patients with COVID-19 infection

Characteristic	n (%)
<b>Total</b>	70
<b>Case type</b>	
Emergency	61 (87.1%)
Elective	9 (12.9%)
<b>Surgery division</b>	
Head and neck	7 (10.0%)
Digestive	31 (44.3%)
Oncology	9 (12.9%)
General	3 (4.3%)
Trauma	20 (28.6%)
<b>Management</b>	
Operative	32 (45.7%)
Non-operative	38 (54.3%)
<b>Infection source</b>	
Community associated	52 (74.3%)
Indeterminate	14 (20%)
Probable healthcare-associated	2 (2.9%)
Healthcare-associated	2 (2.9%)

### Comorbidity and complication of COVID-19 patients

We also examined the distribution of the comorbidities and complications of the patients infected with COVID-19 (Table 3). We found that around half of the patients had at least 1 comorbidity (43/70; 61.4%). Advanced stage cancer/ metastatic carcinoma (11/70; 15.7%) and non-metastatic malignancy (11/70; 15.7%) were the most common comorbidity found in this study, followed by hypertension, diabetes, and hepatitis. We also found that almost all of the patients infected with COVID-19 developed complications during treatment (67/70; 95.7%). Those patients had at least one complication, either from the primary disease, from the COVID-19, or from the surgery complication. Some of the most common complications found in this study were hypercoagulopathy (58/70; 82.9%), pneumonia (42/70; 60%), anemia (39/70; 55.6%), and hypoalbuminemia (36/70; 51.4%). Acute respiratory distress syndrome (ARDS), the need of mechanical ventilator support, electrolyte imbalance, acute kidney injury, and sepsis were also complication found in the patients.

**TABLE 3 :** Comorbidities and complications of general surgery patients with COVID-19 infection

Characteristic*	n (%)
<b>Total number of patients</b>	70
<b>Comorbidity</b>	
Any comorbidity	43 (61.4%)
Metastatic carcinoma	11 (15.7%)
Malignancy	11 (15.7%)
Hypertension	10 (14.3%)
Diabetes	6 (8.6%)
Hepatitis	4 (5.7%)
Cardiovascular disease	2 (2.8%)
Chronic kidney disease	2 (2.8%)

Characteristic*	n (%)
<b>Total number of patients</b>	<b>70</b>
<b>Complication</b>	
Any complication	67 (95.7%)
Hypercoagulopathy	58 (82.9%)
Pneumonia	42 (60.0%)
Anemia	39 (55.6%)
Hypoalbuminemia	36 (51.4%)
Acute respiratory distress syndrome	18 (25.7%)
Mechanical ventilator support	13 (18.6%)
Electrolyte imbalance	13 (18.6%)
Acute kidney injury	10 (14.3%)
Sepsis	9 (12.9%)

#### Outcome of patient

The median duration of hospitalization was 16 days, with a range of 2 – 51 days. During hospitalization, 19 patients (19/70; 27.1%) were treated in the intensive care unit (ICU) with average length of stay of 4 days (ranged 1 – 18 days). Of those 19 patients treated in the ICU, 13 patients (13/70; 68.4%) needed mechanical ventilator support.

In this study we found that 24 patients (24/70; 34.3%) died during hospitalization (Table 4), in which 14 of them were women. The age range was 30–76 year, with the mean age 51 year. 19 patient (79.2%) had at least 1 comorbidity, and the most common comorbidity of patient who died was malignancy. All of these patients developed 1 or more complications. The most common included hypercoagulopathy, anemia, hypoalbuminemia, pneumonia, and ARDS. The mean duration from the time patient admitted to death was 11 days. The outcome of patients is shown in Table 4.

**TABLE 4 :** Outcome of patient with COVID-19 in General Surgery Department

Category	n	Clinical Outcome	
		Survivors	Non-survivors
<b>All patients</b>	70	46 (65.7%)	24 (34.3%)
<b>Sex</b>			
Male	34	24 (70.6%)	10 (29.4%)
Female	36	22 (61.1)	14 (38.9%)
<b>Case type</b>			
Elective	9	6 (66.7%)	3 (33.3%)
Emergency	61	40 (65.6%)	21 (34.4%)
<b>Division</b>			
Head and neck	7	6 (85.7%)	1 (14.3%)
Digestive	31	15 (48.4%)	16 (51.6%)
Oncology	10	7 (70.0%)	3 (30.0%)
General	3	3 (100%)	0 (0.0%)
Trauma	20	16 (80.0%)	4 (20.0%)
<b>Management</b>			
Operative	32	23 (71.9%)	9 (28.1%)
Non-operative	39	24 (60.5%)	15 (39.5%)

#### Association between patient's characteristic and outcome

We analysed the association between patient's characteristics and the clinical outcome (Table 5). We found that there was a significant association between the case of ARDS and the clinical outcome ( $P < 0.0001$ ; OR = 45.000; 95% CI = 5.310–381.356). Our data showed that patient with ARDS complication was significantly associated with poor clinical outcome (non-survivor). However, there was no significant association found between sex, age, comorbidity hypertension, and diabetes mellitus ( $P > 0.05$  for all).

**TABLE 5:** Association between patient's characteristic and outcome

Characteristic	n	Outcome		OR	95% CI	P value
		Survivor (n = 46)	Non-survivor (n = 24)			
<b>Sex</b>						
Male	34	24 (70.6)	10 (29.4)	1,527	0.564–4.137	0.441
Female	36	22 (61.1)	14 (38.9)			
<b>Age</b>						
≤ 29	11	11 (100)	0 (0.0)			
30–39	15	10 (66.7)	5 (33.3)	1.000		
40–49	17	11 (64.7)	6 (35.3)	1.091	0.252–4.714	0.907
50–59	15	9 (60.0)	6 (40.0)	1.333	0.301–5.915	0.705
≥ 60	12	5 (41.7)	7 (58.3)	2.800	0.582–13.478	0.199
<b>Hypertension</b>						
Yes	10	7 (70.0)	3 (30.0)	1.000		
No	60	39 (65.0)	21 (35.0)	1.256	0.294–5.371	0.758
<b>Diabetes mellitus</b>						
Yes	5	3 (60.0)	2 (40.0)	1.303	0.203–8.383	0.780
No	65	43 (66.2)	22 (33.8)	1.000		
<b>ARDS</b>						
Yes	13	1 (7.7)	12 (92.3)	45.000	5.310–381.356	< 0.0001*
No	57	45 (78.9)	12 (21.1)	1.000		

#### DISCUSSION

In this study, we reported clinical features and outcome of 70 patient from general surgery department with COVID-19 infection during May 1, 2020 – April 31, 2021. This report, to the best of our knowledge, is the first study in Indonesia to report clinical features of patients with COVID-19 infection in General Surgery Department in Indonesia. We found that more than half of the COVID-19 patients in General Surgery Department had comorbidity or previous health problems.

We found that the most common comorbidity of general surgery patient with COVID-19 was advanced stage cancer/ metastatic carcinoma (15.7%) and malignancy (15.7%).

Our data is in concordance with previous study that reported that metastatic solid tumor was significantly associated with an increased risk of hospital[12].

In addition, our data showed that the prevalence of comorbidity is higher than previous meta-analysis study reported that prevalence of comorbidities of surgical patient with COVID-19 was 18% [13].

The Centers of Disease Control and Prevention (CDC) report in 2021 stated that 70.1% inpatients have comorbidities [12]. In addition, almost all patients developed at least 1 complication during the treatment. Common complications included hypercoagulopathy, pneumonia, anemia, hypoalbuminemia, ARDS, need of mechanical ventilator support, electrolyte imbalance, acute kidney injury, and sepsis. More than half of the patients had pneumonia which was characterized by pulmonary infiltrates on chest X-ray.

The length of stay (LOS) of patients during the pandemic is tend to be shorter to reduce nosocomial COVID-19 infections and increase hospital bed capacity [5], [14]. From this study, we revealed that the average LOS for surgical patients with COVID-19 infection was 16 days. This data was similar to previous studies reported that the mean LOS for COVID-19 patients was reported at around 7 days [15], while the mean LOS for surgical patients with COVID-19 infection was longer at around 10 days [13], [16]. In addition, we found that 27.1% of the patients needed intensive care in the ICU, with average LOS of 4 days in the ICU. Based on a retrospective cohort study of 64,781 COVID-19 patients in the United States, more than 35,000 patients were hospitalized, 19.4% had to be admitted to the intensive care unit (ICU), and 15.9% needed invasive mechanical ventilation [12]. The higher rate of patients needed intensive care in this study might be caused by several factors, such as worse initial condition of patients when they arrived at the hospital, patient's comorbidity, and the virulence of the infecting virus.

There were very few patients who were presumed to have nosocomial COVID-19 infection in this study, consisted of 2 patients categorized as healthcare associated COVID-19 and 2 categorized as probable healthcare-associated infection according to European Centre for Disease Prevention and Control, 2021 [17]. This rate is lower than some reports from another study reported that the rate of hospital-acquired COVID-19 is 12-15% [18]. From a study in the early phase of the pandemic in Wuhan, China, there were 41.3% cases presumed to be a nosocomial transmission of COVID-19, in which 12.3% patients were from surgical department [19]. A different result reported from a study by Rhee et al, which reported 1.7% patients were first diagnosed on more than 3 days after admission, and only 1 patient confirmed after 15 days admission [15]. The high rate of nosocomial infection in early pandemic phase in China might be related to the lack of information regarding the SARS-CoV-2 virus, leading to the high rate of transmission. The lower nosocomial infection rate in recent studies showed that the management of COVID-19 is getting better to prevent the transmission of the virus. In addition, nosocomial infection has become a serious public health issue, because a lot of patients avoid coming to the hospital because they were afraid of contracting COVID-19 from the hospital [15], [18]. This might be the cause of the drop in the number of patients visit to hospital and the increase of disease severity.

Indeed, the number of patients underwent operative management is higher in this study, due to the sampling that were done in the surgery department. The most common cases were digestive cases, followed by trauma and oncology cases.

The median age of the patient was 45 years, with a range of 17-76 years, showed that SARS-CoV-2 is capable to infect subjects from a wide range of age. In addition, the prevalence of women contracted COVID-19 infection is slightly higher than men in this study. These result corresponds to a meta-analysis study by Peckham et al, that man and woman are at similar risk of COVID-19 infection, although men are at a relatively higher risk of severe COVID-19 and death than woman [20].

In this study, the mortality rate was considerably high (34.3%), higher than reports from several other studies with a range of 16-21%. The mortality of surgical patients undergoing surgery with COVID-19 infection was higher than negative COVID-19 (16.7% vs 1.4%) [11]. Lei et al (2020) also reported a fairly high mortality rate, 20.5% COVID-19 patients who underwent surgery [21]. Based on the CDC's 2021 report, 20.3% of COVID-19 patients died during hospitalization [12]. Surgical procedures can cause morbidity and mortality to patients. Identification of high-risk surgical patients aims to reduce post-operative morbidity and mortality [22]. Surgery can impair immune function and trigger a systemic inflammatory response and suppression of the cellular immune response that persists for several days after surgery [7], [8]. Morbidity, mortality, and perioperative complications of COVID-19 patients are higher than non-COVID-19 patients [9], [11], [13]. COVIDSurg Collaborative reported that 51.8% perioperative COVID-19 patients suffers from post-operative pulmonary complication (pneumonia, ARDS, or unexpected need of post-operative mechanical ventilation support) [10]. In a 2020 study in Wuhan, it was reported that all surgical patients with COVID-19 who underwent surgery developed pneumonia after surgery, and 44.1% of patients required ICU treatment because of the need for mechanical ventilation [21]. The most common complications are acute respiratory distress syndrome (ARDS), secondary infections, arrhythmias, acute heart failure, acute renal failure, and increased post-operative oxygen demand [11], [21].

This study has several limitations. First, the number of subjects included in this study is relatively low. Therefore, further study with bigger number of samples is needed to be able to provide more accurate data related to the clinical feature and outcome of patients treated in surgery department. Second, patient outcome could not be determined whether patient died because of COVID-19 or the primary disease.

## CONCLUSION

In summary, comorbidity and complication was found to be highly prevalent in COVID-19 patients with poor outcome in General Surgery Department.

## CONFLICTS OF INTEREST

No competing interests declared.

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