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Effects of the COVID-19 pandemic on the treatment outcome of acute cholecystitis in an academic teaching hospital

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ABSTRACT

Introduction: The COVID-19 (coronavirus disease 2019) pandemic has impacted all medical services, including admissions for elective and acute surgeries. Patients tended to wait longer since the origin of symptoms which led to more severe conditions at the time of hospital admission. This study compares the frequency and outcomes of surgery in acute cholecystitis before and during the first year of the pandemic.

Materials and methods: The data was retrospectively collected from patients who underwent surgery for acute cholecystitis at an academic centre between March 2019 and March 2021. The patients were divided into two groups: the year before the COVID pandemic (Group I) and the first year of the COVID pandemic (Group II). Compared were the number of deaths, complications, length of hospital stay and severity of the patients' condition upon admission.

Results: The study involved 92 patients admitted for emergency surgery due to acute cholecystitis. Each group consisted of 46 individuals. Patients from Group II were presented with longer medical history (3.50 days vs 5.52 days; $p = 0.043$). The number of complications, such as wound abscesses (8.70% vs 17.39%; $p = 0.353$), septic shock (2.07% vs 13.04%, $p=0.116$) and admission to the ICU (intensive care unit) (4.35% vs 6.52%; $p = 1$) was higher in Group II but did not achieve statistical significance. The only statistically significant difference observed between Group I and II was the number of deaths. (6.52% vs 23.91%, $p = 0.020$).

Conclusions: This study reveals that during the COVID-19 pandemic, patients with acute cholecystitis were reluctant to report to the hospital. They were admitted for emergency cholecystectomy with more severe disease than before the pandemic and thus were prone to major and lethal complications.

Keywords: cholecystectomy, emergency, cholecystitis, COVID-19, pandemic

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Introduction

The COVID-19 (coronavirus disease 2019) pandemic arrived in Europe at the beginning of 2020. At the time all medical effort was focused on dealing with a new unknown problem. Elective surgery was postponed. In the first 3 months, almost all the hospitals in Poland performed only emergency surgeries. In the following months, few facilities decided to reinstate elective procedures, but only for the most urgent cases. Patients with symptomatic gallbladder stones did not have access to

scheduled surgical treatment. Only those patients who could not wait for elective surgery because of acute symptoms, insufficient response to pharmacological treatment, and frequently recurring attacks were qualified for emergency surgeries.

The benefits of elective cholecystectomy over emergency surgery have been reported numerously. In 2003, Lawrentschuk et al. performed a study on 322 patients who underwent gallbladder surgery. They associated prolonged waiting times with a rise in morbidity and significant costs [1]. Later To et al.

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Table 1. Factors compared in the study

	Before COVID-19	During first year of COVID-19	p-value
Mean age	66.04	67.09	0.783
Sex:			
Male	23 (50.00%)	23 (50.00%)	0.402
Female	19 (41.30%)	27 (58.70%)	
Mean duration of symptoms (days)	3.50 (±3.02)	5.52(±5.01)	0.043
Mean hospital stay (days)	9.02 (±8.18)	9.80 (±7.17)	0.298
Tokyo Guidelines [3] (%)			0.030
I	36 (78.26%)	25 (54.35%)	
II	7 (15.22%)	10 (21.74%)	
III	3 (6.52%)	11 (23.91%)	

Table 2. Postoperative complications according to the Clavien–Dindo classification [4]

Clavien–Dindo	Postoperative complications			
	Total	Group I	Total	Group II
I	0	–	0	–
II	5	Pneumonia, wound infection	10	Wound infection, blood loss
III a)	0	–	3	Operation site haematoma
b)	2	Wound dehiscence, gastric ulcer perforation	4	wound dehiscence, jaundice
IV a)	1	Respiratory failure	0	–
b)	0	–	3	Multiorgan failure
V	3	Death	11	death

noticed higher conversion rates, morbidity and mortality in patients who underwent emergency cholecystectomy [2].

The study aimed to evaluate the effect of the COVID-19 pandemic on the treatment process and its outcomes in acute cholecystitis at the University Teaching Hospital in central Poland.

Material and methods

We retrospectively collected data from the patients who underwent surgery for acute cholecystitis between March 2019 and March 2021. The study included patients over 18 years old, who were treated surgically due to acute cholecystitis diagnosed at the emergency room or during hospitalization for another disease. The patients were divided into two groups, the year before the COVID-19 pandemic (Group I) and the first year of the COVID-19 pandemic (Group II). When reporting to the ER (emergency room), each patient requiring hospitalization was tested for SARS-CoV-2 infection using

a nasopharyngeal smear and RT-PCR test. Those who turned out to be positive were transported to facilities designated for treating COVID-19-positive patients.

The diagnosis of acute cholecystitis was based on clinical judgment and laboratory and imaging tests, mostly ultrasonography. The diagnosis was then confirmed by the histopathology examination of the excised gallbladder. The majority of patients underwent surgery on the day of admission. A few operations were delayed a day or two due to more urgent cases.

This study compared the number of deaths, complications, length of hospital stay, duration of symptoms and severity of the patients' condition upon admission according to the 2018 Tokyo Guidelines [3] (Tab. 1 and Tab. 3). The Clavien–Dindo Classification [4] was used to rank complications (Tab. 2).

Statistical analysis

The data were analysed using the Statistica 13.1 software (StatSoft, Inc., United States). Results were expressed as means ± standard deviation.

Table 3. Major complications compared in the study

Complications	Group I	Group II	p value
Wound infection	4 (8.70%)	8 (17.39%)	0.353
Wound dehiscence	1 (2.17%)	3 (6.52%)	0.609
Admission to the Intensive Care Unit	2 (4.35%)	3 (6.52%)	1
Multiorgan failure	1 (2.17%)	3 (6.52%)	0.609
Septic shock	1 (2.17%)	6 (13.04%)	0.116
Cardiac arrest	1 (2.17%)	2 (4.37%)	1
Death	3 (6.52%)	11 (23.91%)	0.042

Qualitative variables were presented as numbers and percentages. Shapiro–Wilk’s test was used to test the distribution of the variables. Comparisons between groups were performed using the non-parametric Mann–Whitney U-test and χ^2 test. Correlations were evaluated using Spearman’s rank correlation coefficient ® test depending on the normality of distribution. A $p < 0.05$ was considered significant.

Results

The total number of patients included in this study was 46 in Group I and 46 in Group II. None of the patients had a history of COVID-19 infection before admission. The percentage of acute operations among all cholecystectomies performed during those two one-year periods was 34% (46/135) in Group I and 59% (46/78) in Group II. The mean age of patients was 66 years vs 67 years. Male to female ratio was 23/23 vs 19/27.

The mean duration of symptoms before presenting to the emergency room was 3.50 (\pm 3.02) days in Group I vs 5.52 (\pm 5.01) days in Group II. The mean hospital stay was 9.02 (\pm 8.18) days in Group I vs 9.80 (\pm 7.17) days in Group II. According to Tokyo Guidelines in Group I 78.26% of patients were grade I, 15.22% were grade II and 6.52% were grade III. In Group II 54.35% of patients were grade I, 21.74% were grade II and 23.91% were grade III. In Group I complications were observed within 8 (17.39%) patients, in which 2 (4.35%) were admitted to the ICU, 1 (2.17%) went into septic shock, and 1 (2.17%) presented with multiorgan failure. In Group II total number of complications was 20 (43.48%), in which 3 (6.52%) were admitted to the ICU (intensive care unit), 6 (13.04%) went into septic shock, 3 (6.52%) presented with multiorgan failure and 2 (4.35%) went into cardiac arrest. Group comparisons with p-values are included in Tables 1–3.

Two female patients from Group II were diagnosed with COVID-19 within days after the surgery. One of them had a mild course of disease and was discharged home. The other one was transferred to the facility designated for treating SARS-CoV-2-positive patients, where she died from pulmonary complications a few days later. The number of surgery or disease-related deaths in Group I was 3 (6.52%) and 11 (23.91%) in Group II. Of those 11, 7 had a long-term history of cardiovascular disease; 5 suffered from advanced diabetes. One patient was primarily admitted to the hospital because of diabetic ketoacidosis and was diagnosed with cholecystitis 2 days later. Another patient suffered from Duchenne muscular dystrophy and after surgery was admitted to the ICU, where he died from respiratory failure. 5 of those 11 patients died within the first day after surgery.

There were also less severe complications included. Wound infection was observed in 4 (8.70%) patients in Group I and 8 (17.39%) patients in Group II. In Group I only 1 patient presented with wound dehiscence, whereas in Group II wound dehiscence occurred in 3 patients (2.17% vs 6.52%).

Discussion

From the results of this study, one can clearly conclude that COVID-19 had an unfavourable effect on the patients requiring emergency cholecystectomy. Murphy et al. indicated a 63% increase in cases of acute cholecystitis during the pandemic [5]. In an observational study focusing on the impact of COVID-19 Farber et al. found that fewer patients visited ER for less severe symptoms of cholelithiasis [6]. Those patients remained untreated and were more likely to develop acute cholecystitis. Additionally, limited access to medical care and patients’ fear of reporting to the hospital had led to prolonged duration of acute symptoms before reporting and more severe conditions upon admission measured

by Tokyo Criteria. Perez-Rubio et al. investigated the incidence of surgical abdominal emergencies during the COVID-19 pandemic and registered a 14% reduction in emergency hospital admissions due to acute abdomen [7]. Surek et al. reported a 59% decrease in emergent surgeries during the pandemic [8].

In the following study, the waiting time before presenting to the emergency department with acute symptoms was significantly higher during the pandemic. It varied from 3.5 days in Group I to 5.5 days in Group II. Ongen et al. reported increased waiting time before admission to the hospital in patients with simple cholecystitis. However, the waiting time in patients with complicated cholecystitis was similar between the pandemic and pre-pandemic groups [9].

This study shows that prolonged time of untreated cholecystitis in Group II has led to more severe conditions upon admission, which was graded and presented according to Tokyo Guidelines. The number of patients with grade III was significantly higher in Group II. In Group I percentage of patients with grade III severity was only 6.52%, while in Group II it was 23.91%. This states that almost four times more patients postponed the admission to hospital until their illness became severe. However, Valles et al. showed no significant difference in the severity of the disease between patients referred during and before the pandemic [10].

Complications overall were more frequent in Group II, but most of the results didn't have statistical value. Wound infection in Group II occurred in twice as many patients as in Group I. There was a slight predominance of complications such as wound dehiscence, multiorgan failure, cardiac arrest and admission to the ICU in Group II, but these were isolated cases that didn't make a significant difference. The number of septic complications in Group II was six times higher than in Group I, but it wasn't statistically significant as well. The major difference was noticeable in the number of surgery and disease-related deaths. In Group II it occurred almost four times as often as in Group I. Surek et al. reached a similar conclusion in their study comparing emergency surgeries before and during the COVID-19 pandemic [8]. While the total postoperative complications and reoperations were similar between the two groups, the rate of mortality was statistically higher in the Pandemic Group.

Limitations of the study

The main limitation was the small sample size as it was a single-institution study. Another was a retrospective character of the data gathering which revealed several deficiencies in patients' charts.

Conclusions

This research sheds light on the impact of the COVID-19 pandemic on patients with acute cholecystitis, highlighting a concerning trend of reluctance to seek medical attention. Despite experiencing symptoms, patients were hesitant to present to healthcare facilities. Consequently, when they did seek help, their condition had often progressed to a more advanced stage, resulting in a higher severity of disease compared to pre-pandemic cases. This increased severity predisposed them to a greater risk of experiencing major and potentially fatal complications during emergency cholecystectomy procedures.

Article information

Data availability statement: Raw data were generated at the Department of General and Oncological Surgery, Medical University of Lodz. Derived data supporting the findings of this study are available from the corresponding author [IB] on request.

Ethics statement: This is a retrospective study evaluating the outcomes of the treatment. The study had no impact on the course of treatment. Patients were included anonymously. No sensitive data are submitted.

Author contributions: IB and AD designed the study and collected the data. IB wrote the manuscript. MW performed the analytic calculations. MW and ŁD supervised the study. All authors contributed to the final manuscript.

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