SHORT TERM OUTCOMES OF ACUTE CHOLECYSTITIS MANAGED AT A UNIVERSITY HOSPITAL

Munirah Fetaini¹, MBBS, Hatan Mortada¹, MBBS, Wafa AlQethmi¹, MBBS, Shahd Al Aslany¹, MBBS, Nora Trabulsi², FRCPC, Mohammed Nassif ², FRCPC

¹ Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia.
² Department of Surgery, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia.

Abstract:
The aim of our retrospective study was to assess the different outcomes of early (performed on the patient’s first admission for acute cholecystitis) and delayed cholecystectomy (done on a second admission) at King Abdulaziz University Hospital in Jeddah, Saudi Arabia.

Methods: Data were collected retrospectively from our hospital electronic medical records data system. All adult patients presented to the emergency department with acute cholecystitis, between January 2010 to April 2018 were included in the study. The data were composed of 37 variables divided into four main parts: demographics, current presentation related variables, hospitalization and type of surgical procedure, progress while in hospital and patient’s outcome after discharge.

Results: Eighty-eight patients (70.5% females) were included in the study. Sixty-six patients received surgery in their first admission (mean age 42.56 years; median BMI 24.22 kg/m²). Twenty-two patients underwent surgery during their second admission (mean age 43.68 years; median BMI 26.89 kg/m²). The median duration of surgery was the same for both admission groups (120 min). Time from admission to surgery was longer in the first admission group, 48 h, compared to 36 h in the second admission group. Length of hospital stay after surgery was very similar in both groups: median (range) in the first admission group was 2 (1–30) days, and in the second 1.5 (1–14) days.

Conclusion: We found that patients who are overweight are more likely to have their surgery during a second admission, likely indicating that surgeons shy away from operating on patients with higher body mass indexes.

Keywords: Acute cholecystitis; Cholecystectomy; overweight; BMI; early; delayed.

Corresponding author:
Munirah Fetaini,
Medical Intern, Faculty of Medicine,
King Abdulaziz University, Jeddah, Saudi Arabia.
Email: Munirahfetaini@gmail.com.

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INTRODUCTION:
Acute cholecystitis (AC) is a common gastrointestinal disease requiring hospital admission [1,2]. It is more frequent in women, during pregnancy, and with obesity, rapid weight loss, exogenous estrogens, hemolytic disease, hepatic cirrhosis, biliary tree infections, and hypercholesterolemia [3]. Approximately 10% of patients with gallstones will exhibit biliary symptoms within five years after diagnosis, and one quarter will eventually undergo surgery [4,5].

The options for managing AC include early cholecystectomy, which remains the only definitive treatment, and conservative management with antibiotics and interval cholecystectomy within 6 to 8 weeks, and patients who fail to improve are referred to either percutaneous cholecystostomy or surgery [6,7]. Percutaneous cholecystectomy is preferred for elderly and high-risk patients with severe comorbidities such as chronic obstructive pulmonary disease, ischemic heart disease, and uncontrolled diabetes mellitus [8-11]. The choice depends on patient condition, surgical expertise and hospital policy [12].

Early laparoscopic cholecystectomy is difficult because of edema, exudate, friability of tissues, adhesions with adjoining structures, and unclear vascular and ductal anatomy. These factors predispose patients to higher conversion rates to open cholecystectomy [13,14]. Delayed cholecystectomy, on the other hand, increases the risk for gallstone complications and additional hospital admissions [15].

The aim of this study was to assess the difference in characteristics and outcome between patients who had early versus delayed cholecystectomy for acute cholecystitis at King Abdulaziz University Hospital (KAUH) in Jeddah, Saudi Arabia.

MATERIALS AND METHODS:
Study design and data collection:

The data were collected retrospectively from the electronic medical records data system at KAUH. We included all adult patients who presented to the Emergency Department of KAUH with an acute cholecystitis between January 2010 and April 2018. The variables were formulated on the basis of our own study objectives and available articles with similar objectives. This study was approved by the Institutional Review Board of KAUH and the Research Ethics Committee of King Abdulaziz University, Jeddah, Saudi Arabia.

Patient- and disease-related variables:

The collected data were composed of 37 variables divided into four main parts: demographics, presentation-related variables, hospitalization and type of surgical procedure, and progress and patient outcome after discharge. The first part focused on demographic information, such as sex, age, nationality, marital status, level of education, and smoking status. The second part included variables related to the patient’s presentation at admission. The third part included hospital course and type of surgical procedure, if done. The fourth part related to the patient’s progress and outcome after discharge.

Statistical methods:

Statistical analysis was performed using IBM SPSS statistics version 20.0. Shapiro-Wilk test was used to test the normality of the study sample. Non-parametric Mann-Whitney Test was applied to determine statistical significance.

RESULTS:

The number of patients included in our study was 88. Sixty-six patients had surgery in their first hospital admission: mean (SD) age 42.56 (15.66) years, median BMI 24.22 kg/m2 (range, 13.77 – 41.55). Twenty-two patients had surgery during their second admission: mean (SD) age 43.68 (14.22) years, and median BMI 26.89 kg/m2 (range, 15.66 – 37.73). The majority of patients in our study were women, 62 (70.5%), and of Saudi nationality 62 (70.5%). Only 34 (38.6%) patients had a chronic illness, diabetes being the most frequent, 14 (15.9%).

For the purpose of comparison, we grouped the patients based on when they had their surgery (during first admission or second). Table 1 shows a detailed comparison of patient demographics and characteristics between first and second-admission groups. When comparing patient BMI between the two groups, most patients in the first-admission group fell into the normal BMI range. However, most patients in the second group were overweight (Figure 1).

When patients were grouped by BMI cutoff of 25 kg/m2, a much higher proportion of patients in the second-admission group had a BMI ≥ 25 kg/m2,  P = 0.073, likely because of the small sample size (figure 2). This was also evident when we compared readmission within 30 days, P =0.03, (Figure 3).
Clinical and radiological presentation:
When comparing clinical and radiological characteristics (Tables 2 and 3, respectively), there was no significant difference except for wall thickening which was found more frequently in patients who underwent surgery during their second admission, 16 (72.7%), compared to those who had it in their first admission, 28 (42.4%), $P = 0.014$.

Table 4 shows variables related to the surgical procedure. The median duration of surgery was the same for both admission groups (120 min), with varying ranges, and the time interval from admission to surgery was longer in the first-admission group. The majority of the patients in both groups underwent laparoscopic cholecystectomy without requiring conversion to open surgery. Postoperative ICU admission, blood transfusion, and length of hospital stay after surgery are also shown.

DISCUSSION:
Despite the evidence and the consensus of the experts on the timing of cholecystectomy, there is still a considerable variation in practice[16]. The factors that contribute to patients undergoing cholecystectomy during a second hospital admission include the experience of the surgeon; the presentation of the patient to hospital, whether during day or night; duration of symptoms more than 72 hours; operating theater availability; as well as skilled staff availability[6,15].

Consistent with findings by Barceló et al.[17], we found no statistically significant difference in patient demographics and characteristics between the first- and second-admission groups, which likely did not affect the decision for cholecystectomy in the first-admission group.

The majority of patients in our study who underwent surgery during their first admission had normal BMI indexes. More patients who had surgery in their second admission were overweight. Other studies showed no great difference[18-20].

In a prospective, randomized study by Agrawal et al.[12], no statistically significant difference in clinical and radiological characteristics was found between first- and second-admission groups except for gallbladder-wall thickening ($P = 0.032$). Our study also found wall thickening more frequently in patients who had surgery during their second admission ($P = 0.014$).

The median duration of surgery in the first-admission group was the same as for the second-admission group. This was consistent with a number of past studies that found no statistically significant difference in the duration of surgery between both groups[12,21]. One meta-analysis, however, concluded that surgery took longer in the first admission[22].

The majority of patients in both groups underwent laparoscopic cholecystectomy without requiring conversion to open cholecystectomy. Several studies support this finding[12, 21-23]. More patients required blood transfusion in the first-admission group compared to the second, however the difference was not significant, other studies have shown similar results[12,22]. Length of hospital stay after the operation was almost the same for both admission groups in our sample. The literature[12, 21-24], however, shows studies where patients who had surgery during their first admission had significantly shorter hospital stays.

Six patients needed readmission within 30 days in the second-admission group, four of them required emergency cholecystectomy during their interval waiting time, this disadvantage was also found by other studies[12, 21-23].

The limitations of this study include that it was based on retrospective review of patient records and that the sample size was small—KAUH is an educational hospital with limited capacity and not all types of cases are accepted for admission as in public hospitals.

CONCLUSION:
We found that patients who are overweight are more likely to have their surgery on a second admission which likely indicates that surgeons shy away from operating on patients with higher body mass indexes.

Conflict of Interest
The authors report no conflicts of interest

Disclosure
None of the authors received any type of commercial support either in form of compensation or financial for this study. The authors have no financial interest in any of the products, devices, or drugs mentioned in this article.

Ethical Approval

Conflict of Interest
The authors report no conflicts of interest

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Ethical Approval
This study was approved by the Institutional Review Board of KAUH and the Research Ethics Committee of King Abdulaziz University, Jeddah, Saudi Arabia.

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Table 1: Demographic characteristics of patients

|                                | First Admission N (%) | Second Admission N (%) | P value |
|--------------------------------|-----------------------|------------------------|---------|
| Gender:                        |                       |                        |         |
| - Female                       | 44 (66.7%)            | 18 (81.8%)             | 1.39    |
| - Male                         | 22 (33.3%)            | 4 (18.2%)              |         |
| Nationality:                   |                       |                        |         |
| - Saudi                        | 50 (75.8%)            | 12 (54.5%)             | 0.055   |
| - Non-Saudi                    | 16 (24.2%)            | 10 (45.5%)             |         |
| Marital status:                |                       |                        |         |
| - Single                       | 10 (15.2%)            | 5 (22.7%)              |         |
| - Married                      | 47 (71.2%)            | 13 (59.1%)             | $       |
| - Other                        | 9 (13.6%)             | 4 (18.2%)              |         |
| BMI Group:                     |                       |                        |         |
| - Underweight                  | 6 (10.0%)             | 1 (4.8%)               |         |
| - Normal                       | 24 (40.0%)            | 5 (23.8%)              | $       |
| - Overweight                   | 12 (20.0%)            | 8 (38.1%)              |         |
| - Obese Class I               | 8 (13.3%)             | 5 (23.8%)              |         |
| - Obese class II/III          | 10 (16.7%)            | 2 (9.5%)               |         |
| BMI Group:                     |                       |                        |         |
| - ≤ 24.99                      | 30 (50.0%)            | 6 (28.6%)              | 0.073   |
| - > 25                         | 30 (50.0%)            | 15 (71.4%)             |         |
| Smoking:                       |                       |                        |         |
| - Yes                          | 6 (12.2%)             | 1 (6.2%)               | 0.445   |
| - No                           | 43 (87.8%)            | 15 (93.8%)             |         |
| Chronic Illness:               |                       |                        |         |
| - Yes                          | 26 (39.4%)            | 8 (36.4%)              | 0.800   |
| - No                           | 40(60.6%)             | 14 (63.6%)             |         |
| Diabetes:                      |                       |                        |         |
| - Yes                          | 10 (15.2%)            | 4 (18.2%)              | 0.484   |
| - No                           | 56 (84.8%)            | 18 (81.8%)             |         |
| Sickled Cell:                  |                       |                        |         |
| - Yes                          | 3 (4.5%)              | 1 (4.5%)               | 0.741   |
| - No                           | 63 (95.5%)            | 21 (95.5%)             |         |

$, P value could not be computed as >20% of cells had counts less than 5; BMI, body mass index.
### Table 2: Symptoms and signs documented during patient presentation to the hospital

|                      | First Admission N (%) | Second Admission N (%) | P value |
|----------------------|-----------------------|------------------------|---------|
| **Abdominal Pain:**  |                       |                        |         |
| - Yes                | 61 (92.4%)            | 22 (100%)              | 0.228   |
| - No                 | 5 (7.6%)              | 0 (0%)                 |         |
| **Nausea:**         |                       |                        |         |
| - Yes                | 33 (50%)              | 13 (59.1%)             | 0.460   |
| - No                 | 33 (50%)              | 9 (40.9%)              |         |
| **Vomiting:**       |                       |                        |         |
| - Yes                | 41 (62.1%)            | 16 (72.2%)             | 0.367   |
| - No                 | 25 (37.9%)            | 6 (27.3%)              |         |
| **Fever at Home:**  |                       |                        |         |
| - Yes                | 12 (23.1%)            | 4 (21.1%)              | 0.566   |
| - No                 | 40 (76.9%)            | 15 (78.9%)             |         |
| **Fever at Hospital:** |                   |                        |         |
| - Yes                | 5 (7.6%)              | 1 (4.5%)               | 0.530   |
| - No                 | 61 (92.4%)            | 21 (95.5%)             |         |
| **Relation to Food:** |                    |                        |         |
| - Yes                | 30 (66.7%)            | 16 (84.2%)             | 0.154   |
| - No                 | 15 (33.3%)            | 3 (15.8%)              |         |
| **Tachycardia:**    |                       |                        |         |
| - Yes                | 15 (22.7%)            | 2 (9.1%)               | 0.136   |
| - No                 | 51 (77.3%)            | 20 (90.9%)             |         |

### Table 3: Comparison of radiological findings between first- and second-admission groups

|                      | First Admission N (%) | Second Admission N (%) | P value |
|----------------------|-----------------------|------------------------|---------|
| **Stones or Sludge:** |                      |                        |         |
| - Yes                | 49 (86.0%)            | 20 (100%)              | 0.079   |
| - No                 | 8 (14.0%)             | 0 (0%)                 |         |
| **Dilated CBD**     |                       |                        |         |
| - Yes                | 14 (24.6%)            | 7 (35.0%)              | 0.367   |
| - No                 | 43 (75.4%)            | 13 (65.0%)             |         |
| **Pericholecystic Fluid:** |                |                        |         |
| - Yes                | 14 (21.2%)            | 5 (22.7%)              | 0.548   |
| - No                 | 52 (78.8%)            | 17 (77.3%)             |         |
| **Size of largest stone (cm)** |              |                        |         |
|                      | 1.7600                | 2.0000                 | 0.926   |
| **Wall Thickening:** |                       |                        |         |
| - Yes                | 28 (42.4%)            | 16 (72.7%)             | 0.014   |
| - No                 | 38 (57.6%)            | 6 (27.3%)              |         |
| **GB Distension:**  |                       |                        |         |
| - Yes                | 29 (43.9%)            | 12 (54.5%)             | 0.388   |
| - No                 | 37 (56.1%)            | 10 (45.5%)             |         |
| **US Murphy’s sign:** |                     |                        |         |
| - Yes                | 15 (22.7%)            | 4 (18.2%)              | 0.452   |
| - No                 | 51 (77.3%)            | 18 (81.8%)             |         |

Abbreviations: CBD, common bile duct; GB, gallbladder; US, ultrasound.
Table 4: Comparison of variables related to the surgical procedure between both groups

|                          | First Admission N (%) | Second Admission N (%) | P value |
|--------------------------|-----------------------|------------------------|---------|
| **Type of surgery:**     |                       |                        |         |
| - Laparoscopic cholecystectomy | 62 (93.9%)            | 20 (90.9%)             | 0.470   |
| - Laparoscopic cholecystectomy converted to open | 4 (6.1%)            | 2 (9.1%)              |         |
| **Blood Transfusion:**   |                       |                        |         |
| - Yes                    | 4 (6.6%)              | 1 (4.5%)               | 0.600   |
| - No                     | 57 (93.4%)            | 21 (95.5%)             |         |
| **ICU admission:**       |                       |                        |         |
| - Yes                    | 0                     | 1 (4.5%)               | 0.250   |
| - No                     | 66 (100%)             | 21 (95.5%)             |         |
| **Duration of Surgery**  |                       |                        |         |
| Minutes (range)          | 120 (15-285)          | 120 (45-300)           | 0.547   |
| Time to OR (hours)       | 48                    | 36                     | 0.503   |
| **Length of stay after surgery** | 2 (1-30)            | 1.50 (1-14)            | 0.484   |

Abbreviations: OR, operating room; ICU, intensive care unit

Figure 1: Body mass index distribution and comparison between both groups.
Figure 2: Distribution of patients according to body mass index cutoff of 25 kg/m².

Figure 3: Patient readmission within 30 days according to body mass index cutoff of 25.