

Evaluation of Surgical Outcomes of Cholecystectomy in Children

Dr. Majed Hameed Abed¹, Dr. Riyadh Adnan Owaid², and Dr. Alaa Ahmed Kattaa³

¹M.B.Ch.B., F.I.C.M.S., F.A.C.S. \ (General Surgery), Iraqi Ministry of Health, Al-Anbar Health Directorate, Department of Surgery, Al-Ramadi Teaching Hospital, Anbar, Iraq

²M.B.Ch.B., C.A.B.S., F.A.C.S. \ (General Surgery), Iraqi Ministry of Health, Al-Anbar Health Directorate, Department of Surgery, Al-Ramadi Teaching Hospital, Anbar, Iraq.

³M.B.Ch.B., D.G.S., C.A.B.S. \ (General Surgery), Iraqi Ministry of Health, Al-Anbar Health Directorate, Department of Surgery, Al-Ramadi Teaching Hospital, Anbar, Iraq

Abstract: The present study aims to describe the clinical data of pediatric patients who underwent laparoscopic cholecystectomy in a secondary care hospital. A descriptive and retrospective observational study was conducted for 130 patients, and all clinical records of pediatric patients who underwent laparoscopic cholecystectomy were obtained. These records were obtained from January 2022 to December 2024. The data were obtained from medical records and collected in a collection sheet and included affiliation, indication for cholecystectomy, type of cholecystectomy, operative time, hospital stay, postoperative complications, concomitant procedures, and pathological outcomes. Statistical analysis was conducted utilizing frequency distribution and percentages. The patients' average age ranged from 7 to 15 years, and the prevalence of obesity was observed according to the body mass index (BMI). The genetic factor and bile duct injury were identified as the primary cause in 33 patients (25.8%). The complications were distributed across five categories: infection and bleeding, gallstone retention post-cholecystectomy syndrome, adhesion formation, and others. The most prevalent complications in this study were bleeding (3.85%) and gallstone retention post-cholecystectomy syndrome (2.27%). The study concluded that the quality of the cholecystectomy insight is statistically significant in the quality of life of pediatric patients before and after the surgical procedure.

Keywords: Cholecystectomy, QOL, Severity, Surgical procedure, Pediatric, Patients.

INTRODUCTION

Laparoscopic cholecystectomy is one of the most commonly performed surgical procedures on a global scale. Approximately 750,000 patients undergo laparoscopic cholecystectomy each year in the United States, and it is estimated that less than 5% of these patients are younger than 20 years of age [Pogorelič, Z. *et al.*, 2019; Rothstein, D. H. *et al.*, 2016]. The laparoscopic approach has been shown to result in a number of benefits, including shorter hospital stays, fewer postoperative analgesic requirements, shorter surgical time, better cosmetic outcomes, [Koebnick, C. *et al.*, 2012] lower costs, and earlier return to daily activities. 2,3 It is estimated that 10% to 20% of the general population has gallstones, which is the primary reason for this procedure. Currently, up to 30% of gallstone cases are known to be genetically related [Noviello, C. *et al.*, 2018; Jeanty, C. *et al.*, 2015]. The most well-known risk factors for gallstone formation are female sex, age over 40 years, multiple births, and a body mass index (BMI) greater than 30. [Ansaloni, L. *et al.*, 2016; Veerank, N. *et al.*, 2018] However, in paediatric patients, the indication for cholecystectomy is generally associated with blood disorders such as sickle cell anaemia, spherocytosis, and thalassaemia, which result in pigmented stones. Consequently, the prevailing treatment modality for asymptomatic gallstones in children afflicted with sickle cell anaemia is

elective laparoscopic cholecystectomy [Liberati, A. *et al.*, 2009; Tom, C. M. *et al.*, 2018; Akhtar-Danesh, G. G. *et al.*, 2018].

Non-calculous acute cholecystitis is characterized by inflamed cholecystectomy that accompanies infectious diseases, and the pain in the right upper quadrant corresponds to cholecystectomy dyskinesia if no gallstones or thickening of the cholecystectomy wall is identified, but the bile ejection fraction is less than 35% by HIDA assay [Raval, M. V. *et al.*, 2011]. The present study aims to describe the clinical data of paediatric patients who underwent laparoscopic cholecystectomy in a secondary care hospital. [National Institute for Health and Care Excellence, 2014] Cholecystitis due to gallstones usually describes acute cholecystitis caused by gallstones, i.e., inflammation of the cholecystectomy, most often due to obstruction of the cystic duct by stones. Ischemia occurs, followed by concentration of the bile acids and subjecting the cholecystectomy to bacterial infection. [Borenstein, S. H. *et al.*, 2005; Somme, S. *et al.*, 2007] (Smith *et al.*, 2023) The second most common complication in children is common bile duct obstruction, while the third is acute pancreatitis caused by obstruction of the common bile duct orifice by gallstones. (Brown *et al.*, 2021)

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MATERIALS AND METHODS

A descriptive and retrospective observational study was conducted for 130 patients where all clinical records of pediatric patients who underwent laparoscopic cholecystectomy were conducted from January 2022 to December 2024. The following variables were recorded: gender, age, nutritional status based on body mass index (BMI), indication for laparoscopic cholecystectomy, surgical time, intraoperative bleeding, complications, and hospital stay days.

The statistical analysis was descriptive, with data presented as simple frequencies and percentages, as well as median minimum and maximum values (min, max).

The data were obtained from medical records and collected in a collection sheet and included affiliation, indication for cholecystectomy, type of cholecystectomy, operative time, hospital stay, postoperative complications, concomitant procedures, and pathological outcomes. For statistical analysis, frequency distribution and percentages were used.

Laparoscopic cholecystectomy was performed with a mean operating time of 84 minutes and a mean hospital stay of 8 days. There was one complication: accidental opening of the common hepatic duct, which required conversion to an open procedure where an open cholecystectomy was

performed with a mean operative time of 103 minutes. The mean length of hospital stay was from 5 to 10 days for patients without comorbidities, while in the group with comorbidities, it was 28 days.

The primary objective of this study is to ascertain global variation according to pre-, intra-, and post-operative audit criteria. The secondary objectives of this study are as follows. To determine the quality of safe cholecystectomy, including the following rates: (i) achieving a critical view of safety; (ii) use of intraoperative imaging (e.g., cholangiography); and (iii) initiation of different salvage procedures when safe cholecystectomy is at risk.

2. To assess adverse events occurring after cholecystectomy (e.g., bile duct injury) and their management. 3. To analyse Rates and outcomes of Unexpected cholecystectomy cancer.

RESULTS

This study employed a cross-sectional research design, examining 130 Iraqi children who underwent laparoscopic cholecystectomy. The patients' average age ranged from 7 to 15 years, and the prevalence of obesity was observed according to the body mass index (BMI). The study identified the most prevalent contributing factors to gallstone formation in Iraqi children. The genetic factor was identified as the primary cause in 33 patients (25.8%), followed by mechanical disorders and obesity, which were found to be significant contributors. The study also examined the symptoms exhibited by the children. Forty patients (30.7%) presented with non-specific abdominal pain, while 40 patients (30.7%) exhibited specific abdominal pain. The severity of symptoms was categorised as follows: moderate (57 patients), mild (40 patients), and severe (33 patients). The study population was distributed according to gender, with 80 male and 50 female children included. These data are presented in Table 1.

Table 1: Description of demographic data for pediatric patients who underwent surgical resection

Variable	Value
Age (years)	12 (0.928)
Mean sd	
BMI kg/m ²	20.83 (2.2)
Mean sd	
Causes	
Genetic Factors	33 (25.8)
bile duct	37 (28.46)

Dietary Influences	20 (15.38)
Hemolytic Conditions	10 (7.69)
Obesity	30 (23.08)
Symptoms	
Asymptomatic Cases	19 (14.62)
Biliary Colic	31 (23.85)
Nonspecific Abdominal Pain	40 (30.77)
Acute Abdominal Pain	40 (30.77)
Symptom Severity	
Mild	40 (30.77)
Moderate	57 (43.85)
Severe	33 (25.38)
sex	
male	80 (59.23)
Female	50 (33.08)

In the present study, patients were categorised according to the severity of their symptoms, the urgency of their surgical intervention, and the nature of their surgery (i.e., urgent or elective). The prevalence of patients requiring urgent surgery was 80 patients, constituting 59.23% of the

total sample. In contrast, elective surgery was distributed more evenly, with 50 patients (33.08%). The data presented in Table 2 demonstrates that 80 patients had one stone, while 50 patients had two stones.

Table 2: Evaluation of surgical outcomes in children who underwent cholecystectomy

Variable	Value
Surgery	
Urgent	80 (59.23)
Elective	50 (33.08)
Number of stones	
0	0
1	80 (59.23)
2	50 (33.08)
Type of anaesthesia	
sevoflurane	
Mean operating time	
Mean (SD)	77.3±4.4
Macroscopic features during surgery.	
Cholecystectomy appearance	
Adhesions GB >50%	Yes
Distention/contraction	Yes
Unable to grasp 1	Yes
Signs of inflammation	Yes

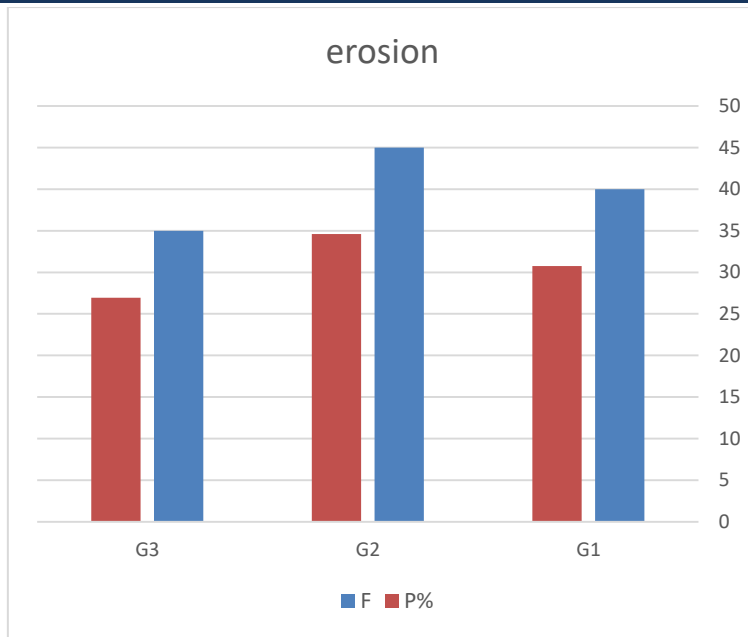


Figure 1: Distribution of patients with Histological features according to erosion

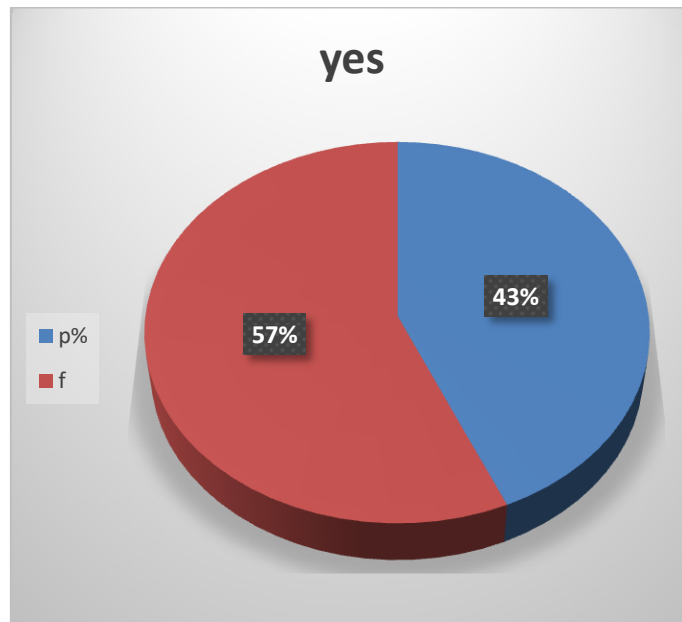


Figure 2: Distribution of patients with Histological features according to inflammatory cell infiltration

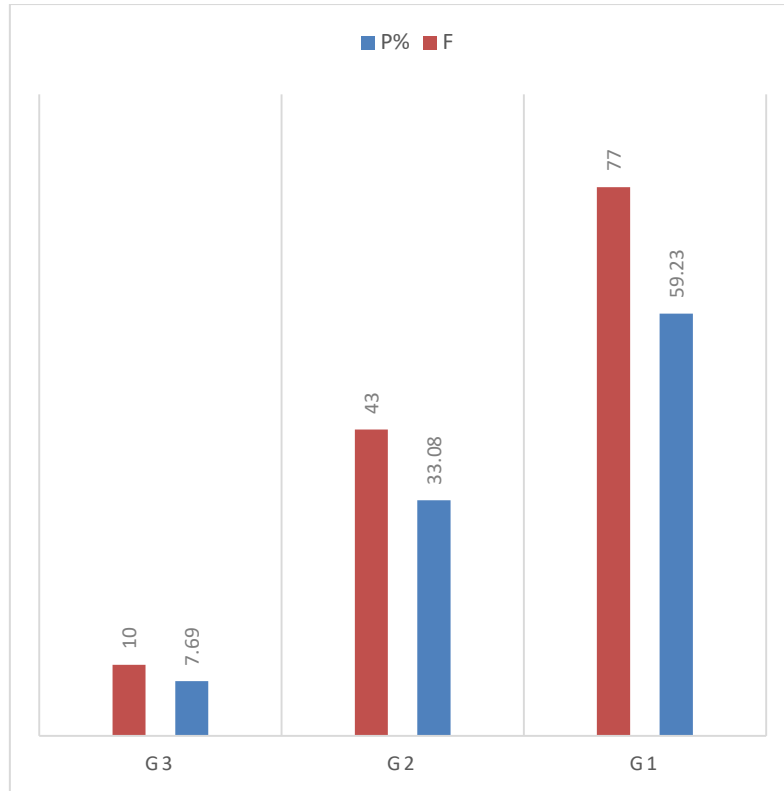


Figure 3: Distribution of patients with Histological features according to Fibrosis

As demonstrated in Table 3, the patient's quality of life was evaluated prior to the surgical procedure in order to ascertain the potential compliments that could occur post-surgery, as well as the quality of changes in all aspects, including physical, pain, mental, and social criteria, in addition to depression, anxiety, and fear. The results, ascertained through a questionnaire administered to parents prior to surgery, revealed a decline in patients' quality of life across all domains, accompanied by a substantial escalation in pain levels, as depicted in Table 3. As delineated in Figure 3, the patient's quality was appraised prior

to the examination, with the aim of determining the extent to which the patients would benefit from the procedure. The results of the examination were then compared with the patient's characteristics, and the results were found to be satisfactory. As demonstrated in Figure 3, the quality of the subjects was evaluated prior to the commencement of the study. The study's primary objective was to ascertain the extent to which the subjects would be affected by the subsequent events. The subjects were divided into two categories: those who were affected and those who were not.

Table 3: Assessment of quality-of-life patient before surgical according to CHQ-PF28

v	Mean ±SD
Physical	10.2±2.6
REB	6.9±1.9
BP (pain)	14.7±2.9
Mental health	15.7±3.4
Self-esteem	18.8±4.9
General Health	16.6±3.8
Parental impact	15.5±2.8
Family Activity	16.1±1.1

The following table details the normal complications that occurred post-surgery in children who underwent the removal of the cholecystectomy.

The complications were distributed across five categories: infection and bleeding, gallstone retention post-cholecystectomy syndrome, adhesion formation, and others. The most prevalent complications in this study were

bleeding, which occurred in five patients (3.85%), and gallstone retention post-cholecystectomy

syndrome, which occurred in three patients (2.27%).

Table 4: Final complications arising after surgical procedure to Iraqi children for 130 patients

v	f	P%
Infection	3	2.31
Bleeding	5	3.85
Retained Gallstones	2	1.54
Postcholecystectomy Syndrome	3	2.31
Adhesion Formation	2	1.54

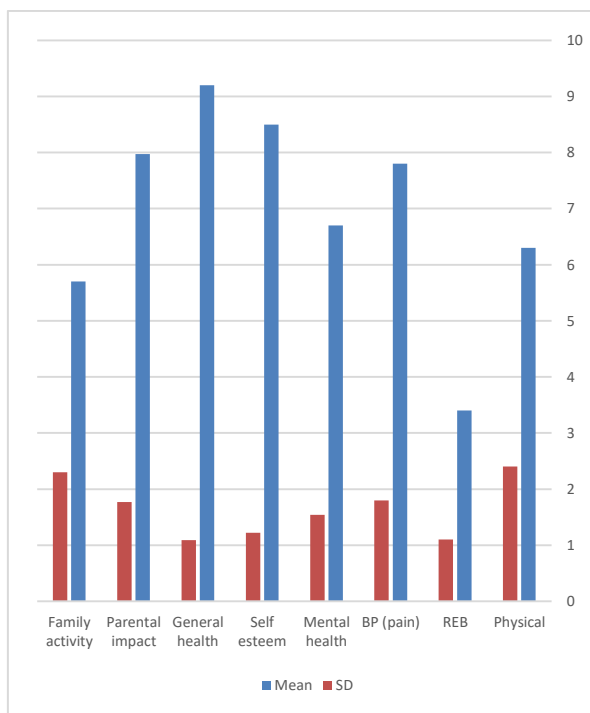


Figure 4: Patient before surgical according to CHQ-PF28

Figure 5: Logistic regression analysis to assess risk factors in this study.

v	CIO	P-Value
Urgent	1.9 (1.4-3.1)	<0.001
Elective	1.78 (1.2-2.88)	<0.001
Number of stones 2	2.3 (1.8-3.99)	<0.001
Adhesions GB >50%	1.73 (0.8-2.8)	0.00387
Distention/contraction	1.1 (0.9-1.8)	0.038
Unable to grasp 1	1.2 (0.6-1.5)	0.0827
Infection	1.4 (0.8-1.9)	0.089
Bleeding	1.6 (1.12-2.4)	0.055

DISCUSSION

Laparoscopic cholecystectomy is the preferred treatment for symptomatic gallstones in adults worldwide. However, in paediatric patients, the indication for cholecystectomy is generally associated with cholecystectomy dysmotility and hematological disorders, which lead to the development of pigmented stones secondary to hemolysis. [Bielefeldt, K. *et al.*, 2014] The prevalence of gallstones in these latter patients can be as high as 37%. 5,6 We did not observe any

cases of gallstones associated with hemolytic anaemia in our population. On the other hand, childhood obesity has contributed to the increasing incidence of symptomatic gallstones worldwide.4,10 Our population showed a high mean body mass index. Most cholecystectomies can be performed laparoscopically, with only one case requiring secondary diversion for bile duct injury. [Miltenburg, D. M. *et al.*, 2000; Yawn, B. P. *et al.*, 2014] However, this condition was resolved appropriately and timely within the same

surgical time. The incidence of bile duct injury in paediatric patients is currently 0.4%, which is similar to the rates reported in adults. Symptomatic gallstones in children are still considered a low-prevalence condition, with rates not exceeding 2%. Iraq, like other countries, has a high prevalence of bile duct stones, which ranks among the top ten in the world. 12 The prevalence of bile duct stones in our country is 14%, but in the adult population [Rothstein, D. H. *et al.*, 2016].

All patients underwent minimally invasive surgery, and the postoperative complication rate was 15 out of 130 patients, with a postoperative hospital stay of 5.7 days on average. The retrospective cross-sectional review, with its relatively small sample size and limited follow-up period of outpatient patients (meaning 1.8 months), poses limitations in generating high-powered statistical analysis; the risk factors in children differ significantly from those in adults, with the exception of obesity, which has been recognised in both populations as a factor associated with the development of gallstones. In children, our series was different, at least in terms of risk factors, as only one case had a history of hemolytic uremic syndrome and corresponded to the youngest case in the series, as is usually documented in patients with this history. The risk factors we found were very similar to those observed in adults. The cases were predominantly female.

The present study has revealed that, in general, approximately 60% of children and adolescents with CL are symptomatic, with the most common clinical manifestation of CL in this study being biliary colic. The complication rates associated with symptomatic CL in Iraqi children are up to 30%, which is even higher than that in the adult population (10-15%). The reasons in this study that could explain the high incidence of complicated CL may be the prolonged time of progression of patients until their surgical intervention. The international literature on the subject agrees that laparoscopic cholecystectomy is recommended for the treatment of symptomatic cholecystectomy cancer, regardless of associated complications. In this study, 60% of cholecystectomies were performed urgently due to symptomatic or complicated cholecystectomy abscess for reasons of timely care, as described above. The indication for early cholecystectomy is further supported by several publications reporting a 5% increase in the risk of complications for every 10 days without surgical treatment.

Consequently, this series can serve as a basis for future multicenter retrospective and prospective studies, with the aim of achieving the implementation of the most appropriate algorithm for the diagnosis and management of CL and its associated complications in the paediatric population.

CONCLUSION

Although acquired cholecystectomy disorders in children have been described very sporadically to the point that they were considered almost exclusive to adulthood where, the study carried out in our Hospital shows a total of 130 patients with cholecystectomy due to acquired biliary pathology. This leads us to accept that recurrent and acute episodes of inflammatory processes of cholecystectomy in children are not as isolated as previously believed, but they went unnoticed because this pathology was not considered probable in childhood. We cannot underestimate the improvements in the quality and quantity of diagnostic methods that today allow the correct and timely detection of this disease.

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