



Research Article

Predicting Difficulty in Laparoscopic Cholecystectomy: A Prospective Observational Study

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Abstract	Manuscript Information
<p>Introduction: Laparoscopic cholecystectomy (LC) is the gold standard for treating symptomatic gallstone disease. However, some cases present challenges, leading to conversions to open cholecystectomy. Identifying predictive factors for difficult LC can improve surgical planning and patient outcomes.</p> <p>Methodology: A prospective observational study was conducted at a tertiary care center in Raipur, Chhattisgarh. Patients undergoing LC were evaluated using the Randhawa and Pujahari scoring system, incorporating clinical and sonographic parameters. Intraoperative findings, including operative time and conversion rates, were recorded.</p> <p>Results: A total of 75 patients were included. Gallbladder wall thickness >4 mm and the overall Randhawa and Pujahari scores were predictors of difficult LC. Patients with these factors had a higher conversion to open cholecystectomy.</p> <p>Conclusion: The Randhawa and Pujahari scoring system is a valuable tool for the preoperative risk stratification of LC. Identifying patients at risk for difficult surgery can aid in surgical planning, counseling patients, and optimizing resource allocation.</p>	<ul style="list-style-type: none"> ▪ ISSN No: 2583-7397 ▪ Received: 07-01-2025 ▪ Accepted: 29-01-2025 ▪ Published: 19-02-2025 ▪ IJCRM:4(1); 2025: 141-146 ▪ ©2025, All Rights Reserved ▪ Plagiarism Checked: Yes ▪ Peer Review Process: Yes
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KEYWORDS: Laparoscopic Cholecystectomy, Predictive Factors, Randhawa and Pujahari Scoring System, Conversion to Open Cholecystectomy, Gallbladder Wall Thickness

1. INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the treatment of choice for symptomatic gallstone disease since it is less invasive, produces less pain, and results in faster recovery [1]. Gallstone

disease is one of the most common digestive tract disorders and may cause acute cholecystitis. Indeed, even though symptomatic gallstones are found in only 10 to 15% of the disease population, more than 80% of the patients have asymptomatic diseases [2].

The lifetime recurrence rate of symptoms or complications in these patients is about 35% [1]. One of the key indicators of cholecystitis in patients presenting with gallstone disease symptoms is gallbladder wall thickening [3]. Gallstone disease is reportedly occurring in about 4% of the Indian population [4], with a recent rise attributed to the westernization of diet, changes in socioeconomic structure, and increased availability of ultrasound for diagnosis in both rural and urban areas. The incidence of gallstones varies according to factors such as age, gender, and, geography [5]. Currently, LC is considered the gold standard for the treatment of symptomatic gallstones and benign gallbladder disease both in elective and acute cases [6]. Asymptomatic gallstone disease should not be treated with gallstone removal. The percentage rates of conversion to open range from 2 to 15% [7]. Hence, it is crucial to investigate predictive factors for a difficult laparoscopic cholecystectomy. The advantages of LC over OC include lower postoperative pain, shorter ileus, an earlier oral intake, faster return to normal activity, better cosmesis, and shorter hospital stay [8]. Whatever surgical procedure it is, any surgical process must have a preoperative assessment of complexity factors in advance to avoid complications and delays for an efficient surgical course. Poor LC may be suspected based on history, clinical examination, and sonographic features including age 50 years or more, males, history of recurrent cholecystitis, a BMI of more than 25, any history of prior abdominal surgical scars, palpable gall bladder, the presence of impacted stones, pericholecystic collection, and thickening of the gallbladder [9]. A predictive score is used to predict difficult laparoscopic cholecystectomy, using it as a tool that can help in identifying risky procedures, improve counseling to patients, optimize surgical planning and operating room efficiency, identify at-risk patients for complications, adjust operative techniques or surgeons involved, and determine eligible outpatients and resident training [10]. Better communication with the patient is one of the inferences of the possibility of predicting difficulty in laparoscopic cholecystectomy; it helps the surgeon prepare mentally and assemble a capable surgical team, plan for an intraoperative cholangiogram, and manage the timing of the procedure, which translates into better postoperative outcomes. The present study predicted the likelihood of conversion based on preoperative factors using the Randhawa and Pujahari scoring system [11], which incorporates a patient's history, clinical examination, and ultrasonographic findings. These preoperative scores are then matched against intraoperative outcomes.

2. METHODOLOGY

Study Design: This is a prospective observational analytical study.

Study Site: The study was conducted at the Department of General Surgery at PT. J.N.M. Medical College & Dr. BRAM Hospital, Raipur, Chhattisgarh.

Study Population: The study includes all patients undergoing laparoscopic cholecystectomy.

Duration of Study: The study period spans from December 2022 to May 2024.

Sample Size: All cases of patients undergoing lap cholecystectomy were considered, with an estimated 75 patients each year. The sample size was calculated using the following formula for sensitivity:

$$n = \frac{Z_{1-\frac{\alpha}{2}}^2 \cdot Sn(1 - Sn)}{d^2}$$

Here, $Z_{1-\frac{\alpha}{2}} = 1.96$ at 95% confidence interval, $Sn =$ expected sensitivity = 0.75 (75%), and $d =$ margin of error = 5%. Given the estimated annual number of patients undergoing cholecystectomy at Dr. BRAM Hospital, Raipur ranges between 100-120, the minimum number of required subjects is calculated as:

$$nf = \frac{n}{1 + n/n}$$

The minimum number of required subjects is set at 75. So, the total number of patients included in this study was 75.

Inclusion & Exclusion Criteria: The inclusion criteria for this study encompassed all patients undergoing laparoscopic cholecystectomy who provided consent at Dr. BRAM Hospital, Raipur. In contrast, the exclusion criteria included patients experiencing an acute attack of cholecystitis for more than 72 hours, those with a history of ERCP (fibrosis), previous malignant lesions or clinically palpable lumps, patients unfit for general anesthesia, pregnant patients, individuals with obstructive jaundice, patients with coagulation disorders, and those who refused to provide consent. By clearly defining these parameters, the study aims to ensure a focused and relevant patient population for evaluating the predictive scoring method for difficult laparoscopic cholecystectomy.

Data Collection: The methodology involved applying the Randhawa and Pujahari Scoring System preoperatively to all 75 patients, assessing them based on history, clinical examination, and sonographic findings. Scores less than 5 were predicted as easy, 6-10 as difficult, and 11-15 as very difficult. Risk factors were evaluated for each patient to determine the practicality of the preoperative predictive score. Preoperative risk stratification was categorized as follows: no risk for scores 0-5, moderate risk for scores 6-10, and high risk for scores 11-15. All laparoscopic cholecystectomy cases were operated by a single surgeon. The surgery was performed using CO2 pneumoperitoneum with 10mm Hg pressure, utilizing two 5mm and two 10mm ports. The time was recorded from the first port site incision until the last port closure. Preoperative scores were then validated and compared with intraoperative findings. Key parameters included the time taken for surgery, with easy cases taking less than 60 minutes, difficult cases between 60-120 minutes, and very difficult cases more than 120 minutes. The presence of bile or stone spillage was noted as no for easy cases and yes for difficult cases. No injuries to the duct or artery were reported for easy and

difficult cases. Conversion to open surgery was noted as no for easy and difficult cases, and yes for very difficult cases.

Statistical Analysis

Data were double-entered using Microsoft Excel and analyzed using SPSS version 22. Data were summarized in frequency tables, pie charts, and histograms. Categorical variables were reported as proportions. Continuous data were described as means (standard deviation) or medians (interquartile range), depending on the distribution of data. The t-test was applied where necessary, with a p-value considered significant if <0.05.

Ethical Considerations

The study was approved by the scientific and ethical committee of the institute.

3. RESULTS

In the study, we validated the Randhawa and Pujahari Scoring System with a total of 75 patients who were categorized preoperatively as easy, difficult, or very difficult based on this scoring system. Among the 75 patients, 45 (60%) were female and 30 (40%) were male. Difficulty in laparoscopic cholecystectomy was more common among males, with 13 out of 20 difficult or very difficult cases (65.11%) being male. Of the 55 easy cases, 36 were female (65.45%) and 19 were male (34.55%). The age distribution of the patients in our study shows that younger patients tend to have fewer difficulties with laparoscopic cholecystectomy. Overall, 55 patients (73%) were classified as easy, 18 (24%) as difficult, and 2 (3%) as very difficult. Among the 75 patients, 65 (86%) had a normal BMI, with 50 easy, 14 difficult, and 1 very difficult case. In contrast, 10 patients (14%) were obese, with 5 easy, 4 difficult, and 1 very difficult case.

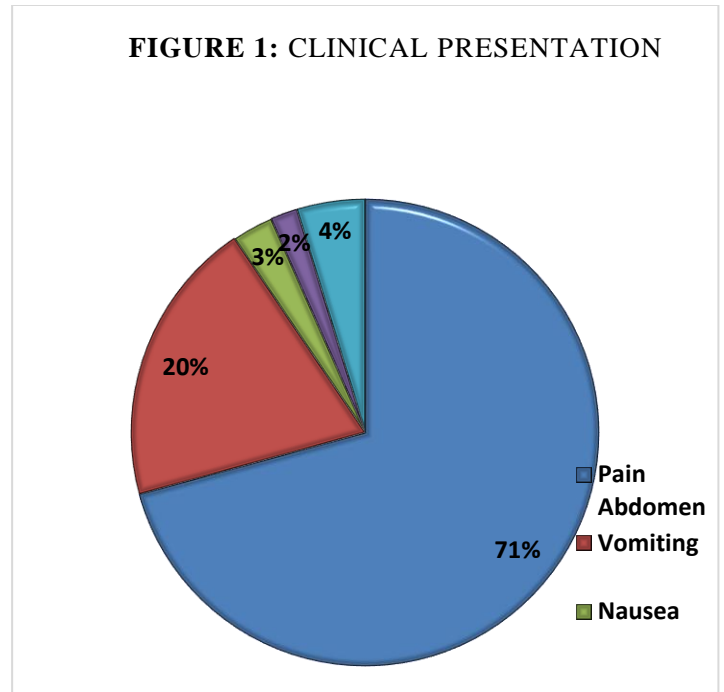
Table 1: Demographic Characteristics

Characteristics (n=75)	Easy (n=55)	Difficult (n=18)	Very Difficult (n=2)
Age Group			
<30	10 (18.18)	1 (5.56)	0 (0.0)
31-40	15 (27.27)	4 (22.22)	1 (50.0)
41-50	14 (25.45)	5 (27.78)	0 (0.0)
51-60	12 (21.82)	6 (33.33)	1 (50.0)
>60	4 (7.27)	2 (11.12)	0 (0.0)
Sex			
Female	36 (65.45)	7 (38.89)	0 (0.0)
Male	19 (34.55)	11 (61.11)	2 (100.0)
BMI Category			
Normal	50 (90.91)	14 (77.78)	1 (50.0)
Obese	5 (9.09)	4 (22.22)	1 (50.0)

The most common symptoms observed in patients who underwent laparoscopic cholecystectomy were abdominal pain

and vomiting. Notably, the pain predominantly occurred in the hypogastric region, followed by the epigastric region.

FIGURE 1: CLINICAL PRESENTATION



Patients with a history of cholecystitis requiring hospitalization were more likely to face difficulties during laparoscopic cholecystectomy. Out of 75 patients, 72 (96%) had no prior cholecystitis, with 56 categorized as easy and 16 as difficult cases. Conversely, all 3 patients with a previous attack were classified as difficult. Abdominal pain was the most common symptom (100%), followed by vomiting (28%), nausea (4%), bloating (2.67%), and dysphagia (6.67%). The study also found that 6 patients (8%) had a palpable gallbladder, with 4 classified as difficult. Among the 69 patients (92%) without a palpable gallbladder, 52 were easy, 15 were difficult, and 2 were very difficult. The gallbladder wall thickness of ≤4 mm was observed in 51 patients (68%), with 42 classified as easy, 8 as difficult, and 1 as very difficult. For the 24 patients (32%) with a wall thickness >4 mm, 13 were easy, 10 were difficult, and 1 was very difficult, with 55% of difficult cases having a wall thickness >4 mm. The presence of multiple stones was seen in 21 patients (28%), with 15 easy, 5 difficult, and 1 very difficult case. Single stones were observed in 54 patients (72%), with 40 easy, 13 difficult, and 1 very difficult case. Impacted gallstones were found in 8 patients (10.7%), with 4 easy, 4 difficult, and 2 very difficult cases. Among the remaining 67 patients (89.3%), 51 were easy and 14 were difficult. Pericholecystic collections were present in only 2 patients (2.7%), both classified as difficult. The other 73 patients (97.3%) did not have pericholecystic collections, with 55 easy, 17 difficult, and 1 very difficult case. Comorbidities like diabetes mellitus (9 patients), cardiac anomalies, coronary artery disease, previous pancreatitis, and ERCP history were linked to increased difficulty.

Table 1: Clinical Characteristics

Characteristics (n=75)	Easy (n=55)	Difficult (n=18)	Very Difficult (n=2)
Previous Attack of Cholecystitis			
No	56 (100.0)	16 (84.0)	0 (0.0)
Yes	0 (0.0)	3 (16.0)	0 (0.0)
Abdominal Scar			
No	48 (87.27)	15 (83.33)	1 (50.0)
Yes	7 (12.73)	3 (16.67)	1 (50.0)
Palpable Gallbladder (GB)			
No	52 (94.5)	15 (83.4)	1 (50.0)
Yes	2 (5.5)	3 (16.6)	1 (50.0)
Gallbladder Wall Thickness (mm)			
≤ 4 (Normal)	42 (76.36)	8 (44.44)	1 (50.0)
> 4 (Abnormal)	13 (23.64)	10 (55.56)	1 (50.0)
Number of Stones			
Multiple	15 (27.27)	5 (27.78)	1 (50.0)
Single	40 (72.73)	13 (72.22)	1 (50.0)
Impacted Gallstone			
Yes	4 (7.27)	4 (22.22)	2 (100.0)
No	51 (92.73)	14 (77.78)	0 (0.0)
Pericholecystic Collection			
Yes	0 (0.0)	1 (5.56)	1 (50.0)
No	55 (100.0)	17 (94.44)	1 (50.0)

Among 72 patients scoring 0-5 (96% of the total), 55 were easy cases, 17 were difficult, and 1 was very difficult, with no conversions to open surgery. In the 6-10 score range, comprising 3 patients (4%), none were classified as easy; 2 were difficult, and 1 was very difficult, with all requiring conversion to open surgery. No patients were scoring 11-15. Overall, out of 75 patients, 55 (72.37%) were easy, 18 (24%) were difficult, and 2 (2.63%) were very difficult intraoperatively, with 3 patients (4%) requiring conversion to open cholecystectomy.

Table 2: Preoperative Score and Intraoperative Findings

Categorization Based on Preoperative Score		Categorization Based on Intraoperative Findings			
Randhawa And Pujara (Score Out of 15)		Easy	Difficult	Very Difficult	Conversion (%)
Score	Frequency	Percent			
0-5	72	96	55 (75%)	17 (1.39%)	1 (1.39) -
6-10	3	4	-	2 (66.66)	1 (33.33) 3 (4)
11-15	0	0	-	-	- -
Total	75	100.0	55 (72.37%)	18 (24.0%)	2 (2.63%)

The reasons for conversion to open cholecystectomy in our study were varied. One case (1.3%) involved a CBD stricture with empyema and adhesions, which necessitated the conversion.

Another patient (1.3%) had an inflamed gallbladder with collection, spillage, and gallbladder perforation, prompting the need for an open procedure. Additionally, severe adhesion with bile spillage was observed in one case (1.3%), resulting in the conversion to open surgery.

4. DISCUSSION

In our study, the mean age of patients was 43.63 years with a standard deviation of 12.953. Most patients undergoing laparoscopic cholecystectomy were between 30 to 50 years old, indicating a middle-aged group, while difficulties in laparoscopic cholecystectomy were more prevalent in those over 50 years. According to the study by Karim *et al.*, age ≥50 years is a significant factor contributing to difficult laparoscopic cholecystectomy [12]. Similarly, Agrawal *et al.* found age to be a risk factor for difficult gallbladder surgery, though they observed no significant correlation between age and surgery difficulty [13]. Santharaj *et al.* also reported that age above 50 years is significant, possibly due to repeated attacks of cholecystitis and diabetes mellitus [14]. Randhawa and Pujahari noted that age above 60 years increases the difficulty in laparoscopic cholecystectomy and the conversion rate, although this was statistically insignificant [15]. The increased difficulty in cholecystectomy among patients over 50 may be due to the higher likelihood of multiple attacks of acute cholecystitis and increased frequency of abdominal surgeries, leading to fibrosis and adhesions in the hepatic hilum. Studies from the Western world have also associated ages over 65 with difficulties in the dissection of Calot’s triangle and adhesiolysis [16]. In our study, 60% of the patients were female (45 out of 75), while 40% were male (30 out of 75). However, difficulties in laparoscopic cholecystectomy were more common among males, with 61% of male patients having trouble compared to 38% of female patients. Randhawa and Pujahari found that male sex increases the difficulty and conversion rate of surgery, although this was statistically insignificant [15]. Karim *et al.* observed that male patients have more intense inflammation and fibrosis, leading to denser adhesions and more difficult dissections [12]. Agrawal’s study indicated that male sex is associated with difficult laparoscopic cholecystectomy, although there was no significant difference in total procedure time between the sexes [13]. Santharaj found higher rates of conversion and mortality in male patients, though these findings were not significant [14]. Several studies have shown that the male gender is a significant factor in difficult laparoscopic cholecystectomy due to more intense inflammation and fibrosis, a higher percentage of intra-abdominal and visceral adipose tissue, and a tendency for men to seek medical attention less frequently than women [17]. In our study, 4% of patients had a previous attack of cholecystitis or a history of hospitalization, and all of these patients’ required conversion to open cholecystectomy. Karim *et al.* attributed this to difficult anatomy resulting from repeated cholecystitis, causing adhesions and increased gallbladder wall thickness [12]. Agrawal *et al.* found a strong correlation between previous hospitalization and difficult laparoscopic cholecystectomy [13]. Santharaj *et al.* also noted that a history of acute cholecystitis

requiring hospitalization increases the risk of conversion to open surgery and common bile duct injury [14]. Additionally, 14.7% of our patients had an abdominal scar due to previous surgery, with 36% of these patients' having trouble and 11% requiring conversion to open cholecystectomy. Randhawa and Pujahari found previous surgery to be a significant predictor of difficult laparoscopic cholecystectomy [15]. Karim *et al.* also identified previous abdominal scars as a significant factor due to the challenges in creating pneumoperitoneum and accessing the peritoneal cavity, leading to higher rates of adhesions and complications [12]. In our study, 8% of patients had a palpable gallbladder, with 66.66% of them having trouble. Randhawa and Pujahari found this factor to be statistically significant [15], and Karim *et al.* identified palpable gallbladder as a significant predictor of difficult laparoscopic cholecystectomy due to potential distension, mucocele, or inflammation [12]. Gallbladder wall thickness >4 mm was observed in 32% of patients, with 42% of these cases being difficult and 4% very difficult. This factor was statistically significant in our study (p-value of 0.0100). Karim *et al.* linked increased wall thickness to inflammation or fibrosis from previous attacks of acute cholecystitis, making dissection at Calot's triangle difficult [12]. Randhawa *et al.* also found wall thickness to be significant [15]. Impacted gallstones were present in 10.7% of cases, with 50% of these cases being difficult intraoperatively. Randhawa *et al.* noted impacted stones as a factor contributing to difficulty, though not statistically significant. Karim *et al.* and Agrawal *et al.* found impacted stones to complicate gallbladder handling and retraction, increasing procedural difficulty [12,13]. Pericholecystic collections were observed in 2.7% of patients, with 50% of these cases being difficult. Randhawa and Pujahari recognized this factor as important but not statistically significant. [15] Karim *et al.* and Agrawal *et al.* highlighted the challenges posed by inflamed fields with adhesions during dissection and achieving the critical view of safety. [12,13]

5. CONCLUSION

Cholelithiasis, the most common biliary pathology, affects 10 to 15% of the general population. However, more than 80% of these cases are asymptomatic. Each year, approximately 1-2% of asymptomatic individuals develop symptoms that necessitate a cholecystectomy, making this one of the most frequently performed surgeries. In about 5 to 10% of laparoscopic cholecystectomy cases, a conversion to open cholecystectomy is required for the safe removal of the gallbladder. Reviews of previous studies, as well as our findings, highlight several risk factors for conversion: age over 50 years, male gender, BMI ranges of 25-27.5 and over 27.5, previous hospitalization, abdominal scars, palpable gallbladder, gallbladder wall thickening, impacted stones, and pericholecystic collections. Among these, gallbladder wall thickness and the overall scoring system were significant predictors of difficulty during laparoscopic cholecystectomy in our study.

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