

Evaluation & Outcome of the Risk Factors for difficult Cholecystectomy**Pankaj Kumar Choudhary¹, Kumar Ratnesh², Anamica Arya³, Sushmita⁴, Pratibha⁵, Muhammed Faisal Khan⁶**¹Junior Resident (Academic) Department of General Surgery, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India²Senior professor & Academic Incharge, PG Department of Surgery, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India³Trust Doctor, NHS, Guildford Hospital, Surrey, England, UK⁴Junior Resident (Academic) Department of General Surgery, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India⁵Junior Resident (Academic) Department of General Surgery, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India⁶Junior Resident (Academic) Department of General Surgery, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

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Conflict of interest: Nil

Abstract:

Aim: This study's main goal was to evaluate how medical diseases (like diabetes mellitus, impacted calculi, and pericholecystic collection) and demographic characteristics (like age, gender, and BMI) affected the degree of difficulty associated with laparoscopic cholecystectomy. In order to enhance surgical planning and patient outcomes, the research also sought to uncover preoperative risk variables that would predict the procedure's difficulties.

Purpose: The study's goal was to pinpoint certain variables that raise the possibility of a challenging laparoscopic cholecystectomy, which would enhance preoperative evaluations and lower the risk of problems. In the long run, this would maximize patient care, lower risks associated with surgery, and improve overall surgical results.

Method: This retrospective observational research examined patient data from Department of General Surgery, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India for one year and focused on patients who had laparoscopic cholecystectomy and were between the ages of 20 and 60. Medical history (diabetes, impacted calculi, prior abdominal operations, and adhesions) and demographic data (age, gender, and BMI) were among the information gathered. Both "Easy" and "Difficult" were the classifications used by the surgeon in his intraoperative notes. The association between laparoscopic difficulties and risk variables was assessed using descriptive and comparative statistical techniques, such as chi-square tests.

Result: The results of the research showed a significant association between a few variables and more challenging surgery. Important demographic risk variables were identified as being older, male, and having a higher BMI. More challenging operations were also substantially associated with diseases including diabetes mellitus, adhesions in the Triangle of Calot, impacted calculi, and pericholecystic collection. These parameters may be good indicators of procedural complexity, according to the results.

Conclusion: The research came to the conclusion that the difficulties during laparoscopic cholecystectomy is greatly influenced by age, gender, BMI, and certain medical problems including diabetes and impacted calculi. Early identification of these risk variables helps surgical teams better anticipate problems, tailor patient care, and enhance surgical results. Finding these risk variables may also help save healthcare costs by lowering the need for long recovery periods and emergency treatments.

Keywords: Laparoscopic Cholecystectomy, Emergency Treatments, Healthcare, BMI, Medical History, Diabetes Mellitus.

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Introduction

The tiny, hollow organ that stores bile for your digestive system, the gallbladder, may be surgically removed during a cholecystectomy [1]. Many forms of gallbladder illness are often treated with

gallbladder removal surgery. This is due to the fact that the risks associated with gallbladder removal are often lower than those associated with the

conditions it cures. The gallbladder is not necessary for a healthy existence [2].

The gallbladder may be removed surgically in two different ways:

- **Open (traditional) method.** This technique involves making a Kochi's incision in the upper right side of your abdomen that is between 4 and 6 inches long. Through the incision, the surgeon removes the gallbladder [3].
- **Laparoscopic method.** This technique involves three to four ports. A laparoscope, a

long, thin tube, is used in it. Along with surgical instruments, the tube features a small video camera. Through the incisions, the tube, camera, and instruments are inserted. Under the gaze of a television monitor, the surgeon performs the procedure. Through one of the incisions, the gallbladder is taken out [4].

A cholecystectomy performed laparoscopically is less intrusive. In other words, it makes tiny cuts in your abdomen. Less bleeding is occurring. Additionally, the recuperation period is often less than that of open surgery [5].

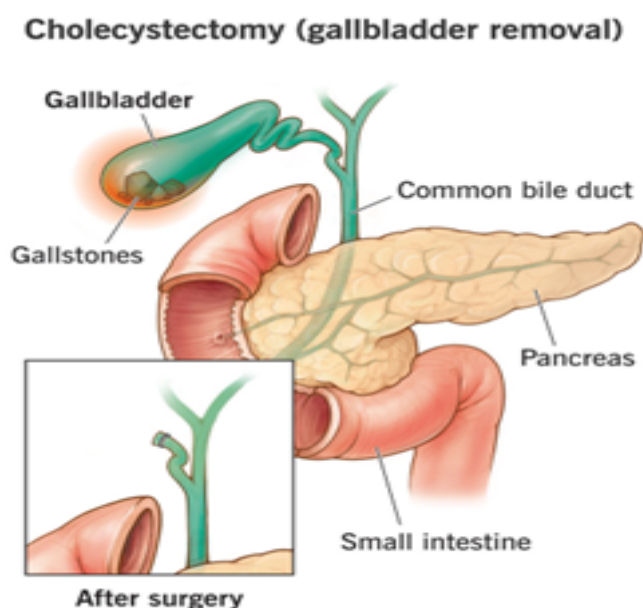


Figure 1: Cholecystectomy (gallbladder removal)

The laparoscope may sometimes reveal severe gallbladder disease. Or it can indicate more issues. In order to properly remove your gallbladder, the surgeon may then need to perform an open surgery [6].

Importance of Identifying Risk Factors in Cholecystectomy

- **Improved Surgical Outcomes:** Surgeons may foresee possible difficulties, such as anatomical or concomitant issues, by identifying risk factors prior to surgery. Early detection of these hazards allows them to modify surgical methods or choose the best course of action, improving results and lowering complications.
- **Enhanced Preoperative Planning:** Better patient preparation is made possible by early risk factor identification, which aids in comprehensive preoperative evaluation. In order to reduce problems before and after surgery, this may include optimizing comorbidities (such as diabetes, hypertension) or offering specialist care [7].
- **Personalized Patient Care:** Healthcare professionals may customize treatment to meet each patient's unique requirements by having a thorough understanding of the hazards they encounter. For instance, extra monitoring and assistance might be implemented to improve patient safety if a patient is at increased risk because of obesity or prior abdominal surgery.
- **Reduction in Surgical Complications:** Risk factors that raise the possibility of complications including bleeding, bile duct damage, or infection include adhesions, challenging anatomy, or the presence of acute cholecystitis. The surgical team may reduce these unfavorable outcomes by taking proactive steps after recognizing these risks in advance [8-10].
- **Cost-Effective Healthcare:** Early risk factor identification helps in resource planning and lowers the need for emergency procedures or prolonged hospital stays brought on by complications. Early risk identification makes it possible to employ healthcare resources more

effectively, which lowers costs and improves resource allocation.

Objectives of the Study

- To evaluate the effect of demographic variables (weight, age, and gender) on the degree of difficulty associated with laparoscopic cholecystectomy operations.
- To assess how certain medical disorders and anatomical features (diabetes mellitus, adhesions in the Triangle of Calot, impacted calculi, and pericholecystic collection) affect procedure complexity.
- To better evaluate risk and prepare for surgery by identifying important preoperative risk variables that potentially forecast more difficulties during laparoscopic cholecystectomy.

Methodology

Research Design: This research examines the effects of demographic, medical, and anatomical characteristics on the degree of difficulty associated with laparoscopic cholecystectomy using retrospective observational data from existing patients. Without interacting directly with patients, the emphasis is on comprehending the relationship between these characteristics and procedure complexity.

Sample Selection: A chosen healthcare facility's patient records from a certain time frame are examined. Patients with full preoperative and intraoperative data who had laparoscopic cholecystectomy and were between the ages of 20 and 60 met the inclusion criteria. The study does not include patients with open cholecystectomy or those with insufficient data.

Data Collection: Three primary categories are the focus of the direct data collection from patient records. Initially, demographic variables including age, gender, and body mass index are noted in order to evaluate any possible correlations with procedural complexity. Second, pertinent clinical and medical information is obtained, such as the existence of diabetes mellitus, impacted calculi, adhesions in the Triangle of Calot, pericholecystic collection, and any prior hospitalizations or procedures related to the abdomen. Each case is then classified as "Easy" or "Difficult" according to the surgeon's intraoperative notes and procedural details, which emphasize any difficulties or added complexity that may have

arisen during the treatment. This methodical strategy to gathering data offers a thorough foundation for examining the variables affecting the difficulty of laparoscopic cholecystectomy.

Data Analysis

In order to evaluate the influence of clinical and demographic variables on the difficulties of laparoscopic cholecystectomy, this study's data analysis used descriptive and comparative statistical approaches. Frequency distributions were utilized for categorical variables like gender and clinical conditions, whereas descriptive statistics like mean, median, and standard deviations were used for continuous variables like age and BMI. Age, gender, BMI, and laparoscopic complexity were shown to be significantly correlated with each other by comparative analysis, including chi-square tests. More complex operations were associated with older age, male gender, and higher BMI. Furthermore, P-values confirmed the statistical significance of clinical factors that were found to significantly influence the procedural difficulty, including diabetes, adhesions in the Triangle of Calot, impacted calculi, pericholecystic collection, prior abdominal surgeries, and previous hospitalizations. Better preoperative planning and risk assessment were made possible by the insights this thorough investigation offered into the major factors that influence the complexity of laparoscopic cholecystectomy.

Results

With notable differences in age, gender, and BMI, the demographic information in Table 1 highlights important variables impacting laparoscopic difficulties. According to the distribution, there was no discernible difference in the representation of younger patients in the 20–30 age bracket between the Easy (20%) and Difficult (20%) groups. However, the challenging group had a greater percentage (33.3%) than the Easy group (23.3%) in the 40–50 age range, indicating that aging may make laparoscopic operations more challenging. This is supported by the statistically significant P-value of 0.020. Additionally, gender disparities were found: the Easy group had 37% men and 64% females, but the Difficult group had 60% males and 40% females. The P-value of 0.045 suggests that male gender is linked to more difficult procedures.

Table 1: Demographic Respondent

Demographic Data	Laparoscopic Difficulty			
		Easy (n = 60)	Difficult (n = 30)	P- value
Age group (In years)	20-30	12 (20%)	06 (20%)	0.020
	30-40	18 (30%)	08 (27%)	
	40-50	14 (23.3%)	10 (33.3%)	
	50-60	16 (27%)	06 (20%)	
Gender	Male	22 (37%)	18 (60%)	0.045

	Female	38 (64%)	12 (40%)	
BMI (kg/m²)	<20	45 (75%)	10 (33.3%)	<0.0001
	≥20	15 (25%)	20 (67%)	

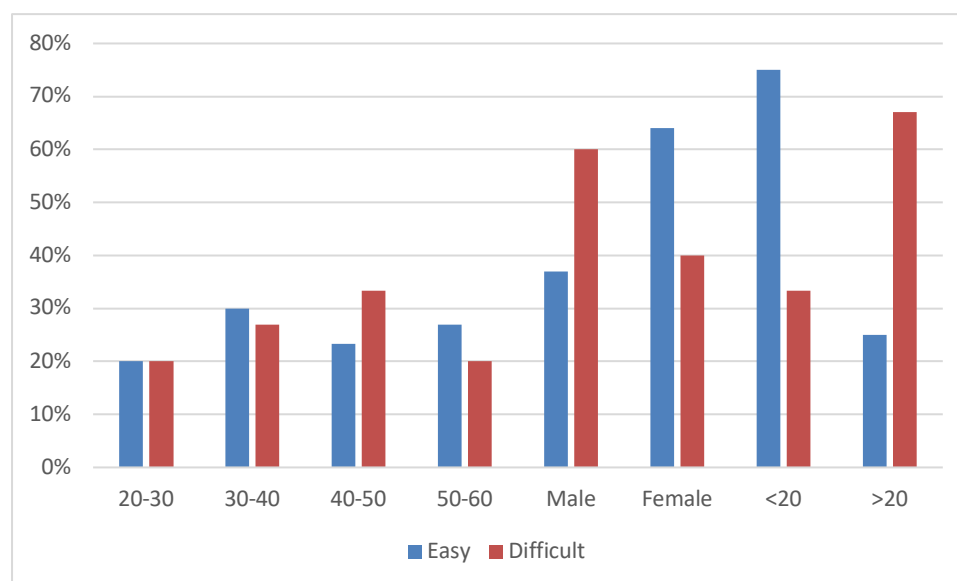


Figure 2: Graphical Representation on the percentage of Demographic Respondent

The study indicates a considerable relationship between laparoscopic difficulties and greater BMI. In contrast to 75% of patients in the Easy group, only 33.3% of patients in the Difficult group were in this category, with 67% of patients in the Difficult group having a BMI more than 20 kg/m². The very significant P-value of less than 0.0001 indicates that

a greater body mass index is a substantial risk factor for challenging laparoscopic operations. Overall, the results indicate that age, gender, and BMI are key factors that influence the complexity of laparoscopic procedures; the risk of experiencing a difficult surgery is greatly increased by older age, male gender, and greater BMI.

Table 2: Comparison of laparoscopic difficulty with various risk factors

Various Risk Factor		Laparoscopic difficulty, n (%)		P- value
Anatomical Variations		Easy (n = 60)	Difficult (n = 30)	
Impacted calculi	Yes	10 (16.67%)	12 (40%)	0.035
	No	50 (83.33%)	18 (60%)	
Sickle cell disease	Yes	02 (3.33%)	03 (10%)	0.220
	No	58 (96.67%)	27 (90%)	
Pericholecystic collection	Yes	08 (13.33%)	10 (33.33%)	0.048
	No	52 (86.67%)	20 (66.67%)	
Diabetes mellitus	Yes	20 (33.33%)	12 (40%)	0.010
	No	40 (66.67%)	18 (60%)	
Adhesion in Calot's triangle	Yes	05 (8.33%)	08 (26.67%)	0.017
	No	55 (91.67%)	22 (73.33%)	
Previous abdominal surgery	Yes	15 (25%)	10 (33.33%)	0.026
	No	45 (75%)	20 (66.67%)	
Previous hospitalization	Yes	18 (30%)	15 (50%)	0.022
	No	42 (70%)	15 (50%)	

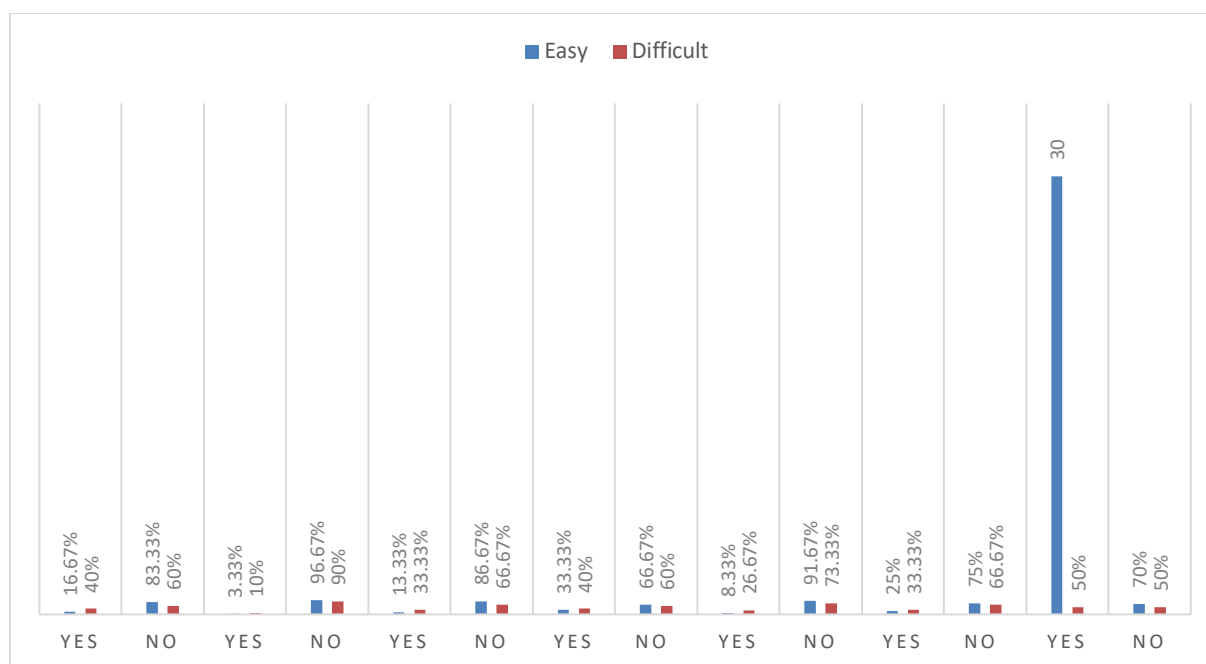


Figure 3: Graphical Representation on the percentage of Comparison of laparoscopic difficulty

The association between different risk factors and the degree of difficulty in laparoscopic cholecystectomy is shown in Table 2. With a P-value of 0.035, it is noteworthy that patients with impacted calculi were much more likely to be in the Difficult group (40%) than the Easy group (16.67%), suggesting that the presence of impacted calculi might make the treatment more difficult. Overall, sickle cell disease prevalence was low and there was no discernible variation in distribution across the groups ($P = 0.220$). With a P-value of 0.048, pericholecystic collection was found to be more common in the challenging group (33.33%) compared to the Easy group (13.33%), indicating that this condition makes the procedure more challenging. With a significant P-value of 0.010, diabetes mellitus was also more prevalent in the Difficult cases (40%) than in the Easy cases (33.33%), suggesting that it may have an effect on surgical outcomes. With a P-value of 0.017, adhesion in the Triangle of Calot (TOC) was also significantly greater in the Difficult group (26.67%) compared to the Easy group (8.33%), indicating that it was a complicating factor. With P-values of 0.026 and 0.022, respectively, patients with a history of prior abdominal surgery and hospitalization had higher rates in the Difficult group, suggesting that these were significant risk factors for a more difficult laparoscopic operation. Overall, there is a significant correlation between increased difficulty in laparoscopic cholecystectomy and factors like impacted calculi, pericholecystic collection, diabetes, adhesions in the TOC, prior abdominal surgeries, and previous hospitalizations. This information is crucial for preoperative planning and risk assessment.

Discussion

The study's conclusions point to a number of important clinical and demographic variables that influence the challenges associated with laparoscopic cholecystectomy. The statistical studies showed that age, gender, and BMI were significant predictors of procedural difficulty [11-12].

According to the findings, individuals who are older—especially those between the ages of 40 and 50—are more likely to have a challenging laparoscopic treatment [13]. This is consistent with other research showing that comorbidities that may need more careful handling and dissection, increased tissue stiffness, and decreased anatomical clarity may all make laparoscopic procedures more difficult as people age [14]. The correlation between age and greater procedural complexity, especially in older persons, is further supported by the significant P-value of 0.020 [15].

Another factor that contributed to this was gender, as men were more likely than women to have a challenging surgery [16]. Male patients may be more susceptible to more difficult laparoscopic operations due to anatomical or physiological variables, according to this finding, which had a P-value of 0.045 [17]. According to earlier studies, male patients are more likely to be obese and to have abdominal adhesions, which might make procedures more difficult.

One notably significant factor affecting the complexity of laparoscopic procedures was BMI. The idea that a higher BMI considerably increases the risk of complications after laparoscopic cholecystectomy is supported by the significant P-value of less than 0.0001. In terms of laparoscopic access, vision,

and increased intra-abdominal fat, obese individuals may provide more difficulties, which might impede tissue handling and tool manipulation. This research emphasizes how crucial preoperative BMI evaluation is for forecasting surgical results and customizing surgical approaches for obese individuals [18].

A number of clinical disorders were shown to be important risk factors for greater laparoscopic difficulties in addition to demographic considerations [19]. With a P-value of 0.035, impacted calculi were especially significant, with a greater percentage of patients in the Difficult group (40%) having impacted stones than in the Easy group (16.67%). Impacted calculi may impede the cystic duct, making dissection more difficult and necessitating precise and cautious surgical methods. This result is in line with earlier research that shown that impacted gallstones significantly increase the risk of complications after laparoscopic cholecystectomy.

Difficult laparoscopic operations were also substantially correlated with other clinical variables, including diabetes mellitus, adhesions in the Triangle of Calot (TOC), pericholecystic collection, prior abdominal surgeries, and prior hospitalizations. For example, with a P-value of 0.048, pericholecystic collections—which are typically suggestive of persistent inflammation or infection—were more common in the Difficult group. This implies that viral or inflammatory processes may make the operation more difficult by raising the danger of bleeding and erecting more obstacles to dissection. Diabetes mellitus is also known to hinder wound healing and raise the risk of infections, which may complicate the post-operative course and prolong recovery time (P-value of 0.010) [20].

Another important risk factor for challenging treatments was the existence of adhesions, especially in the Triangle of Calot (P-value = 0.017). Adhesions, which often arise from inflammation or prior operations, may mask important anatomical features, making dissection more difficult and raising the possibility of harm to critical systems like blood arteries or the bile duct. This result emphasizes how crucial meticulous preoperative imaging and surgical planning are, particularly for patients who have had prior abdominal procedures.

According to this research, a number of important risk variables, such as age, gender, body mass index, and other medical conditions, significantly increase the difficulty of laparoscopic cholecystectomy. The results highlight the need of a comprehensive preoperative assessment to determine these variables, which may help forecast procedure complexity and support risk classification and preoperative planning. By identifying high-risk patients, customized surgical strategies may be implemented to enhance patient outcomes and reduce complications. Examples of these strategies include the use of

sophisticated laparoscopic procedures or the consideration of alternative surgical methods.

Conclusion

The research concludes by emphasizing the significance of determining risk factors for challenging cholecystectomy operations, which may have a major influence on patient safety and surgical results. A retrospective observational research revealed that medical disorders such diabetes, impacted calculi, adhesions, and advanced age, as well as male gender and greater BMI, are important contributors to surgical complications. Early identification of these risk factors enables medical professionals to better plan and be ready for any obstacles that may arise during surgery, increasing procedural effectiveness, lowering the likelihood of complications, and ultimately improving patient care. This study offers insightful information on preoperative evaluations, highlighting the need of individualized treatment plans for cholecystectomy operations in order to guarantee the best possible results and economical healthcare administration.

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