Predicting difficult Laparoscopic Cholecystectomy using a Preoperative scale

Sangamesh B T, Ramprashanth M P, Shivakumar C R, Anil Reddy, Sagar S Kathare
Department of General Surgery, Gulbarga Institute of Medical Sciences, Kalaburagi, Karnataka, India.

Abstract

Introduction: Laparoscopic cholecystectomy is the gold standard for treating benign biliary disease. Since its advent, it has replaced the conventional open cholecystectomy. However, complications due to injury to the common bile duct have been on an increasing trend since its inception.

Objectives: 1. To assess the predictive capacity of a difficult laparoscopic cholecystectomy using a preoperative scale. 2. To assess whether the intraoperative complications increased with an increase in pre-operative risk.

Methods: A prospective analytical study with sample size of 82, was conducted from May 2024 to October 2025 in the department of general surgery in our hospital. Preoperative and intraoperative variables were studied and laparoscopic cholecystectomy was performed by the surgeons.

Results: An 18-month prospective study (May 2024-Oct 2025) at a tertiary hospital involving 82 patients revealed that increased age, elevated total leukocyte count (over 11,000/mm3), and a high Nassar's preoperative score were significant. Notably, thickened gallbladder wall thickness (>3mm) and a raised risk score correlated with increased difficulty. Gender, primary diagnosis, CBD diameter, preoperative ERCP, and admission type were not significant predictors. Complications rose substantially with higher preoperative risk.

Conclusion: Though some variables of Nassar's scale are individually not significant predictors of a difficult LC, the cumulative Nassar score is a significant predictor of a difficult LC. An increase in preoperative risk led to an increase in complications during LC from 32% in the low-risk group to 72% in the high-risk group.

Keywords: Intraoperative Score, cholecystectomy complications, Nassar's Scales.

Introduction:

Acute abdominal pain accounts for seven to ten per cent of emergency department visits. Cholecystitis is the second most common cause of non-traumatic acute abdominal pain worldwide, usually presenting as a sharp pain in the right hypochondrium[1]. It refers to the inflammation of the gall bladder from gallstones, polyps, or infectious causes, resulting in the mechanical occlusion of the cystic duct.

The most common cause of acute cholecystitis is gallstones (95%)[2] and is more commonly seen in obese females in the age-group of 40s[3]. Minimally invasive laparoscopic cholecystectomy is considered the gold standard for the treatment of symptomatic gallstones[4]. It reduces post-operative pain and is cosmetically a better choice than conventional open surgeries[5]. Prophylactic cholecystectomy is not ideal in asymptomatic patients, as only 20% of the asymptomatic patients become symptomatic, and only 1% of them present with gallstone-related complications[3,6].

Essential surgeries to the gallbladder are 49 per 100000 population and is the third most commonly performed surgeries[7]. Incorporation of minimally invasive surgeries into our practice has led to a "laparoscopic revolution" that has changed the face of surgery. The downside to this adoption was the increase in bile duct injuries as the surgeons were initially lacking expertise in the described field[8]. Though the incidence of bile duct injuries has decreased over time, this complication is still higher than that of an open cholecystectomy[9]. They are still a source of increased morbidity and expenditure to the healthcare system, resulting in numerous re-interventions and a decrease in the quality of life[10,11].

Address for Correspondence:

Dr. Ramprashanth M P
Department of General Surgery,
Gulbarga Institute of Medical Sciences,
Kalaburagi, Karnataka, India.
Email: ramprashanth78@gmail.com

Thus, studies were performed to predict the difficulty of laparoscopic cholecystectomy preoperatively[12,13].

Many factors, including advanced age, female gender and obesity, were analysed in detail by many researchers[14,15]. The difficulty faced with prediction was the impact of the skill and experience of a surgeon when performing the procedure. What was once a difficult laparoscopic cholecystectomy became easy in the hands of a trained surgeon. Hence, the need for a more objective intraoperative scale was sought. A study by Nassar et al. gave birth to a new set of intraoperative grading of laparoscopic cholecystectomies[12].

A link between the said intraoperative grading and preoperative evaluation was sought to minimise the challenges that arise from difficult laparoscopic cholecystectomies. A better prediction meant a better-informed consent, better planning by surgeons and incorporation of more experienced surgeons if needed. It also helps surgeons anticipate challenges, thereby reducing the risk associated with difficult cholecystectomies[13,16].

With the implementation of such scales in clinical practice, the rate of conversion of laparoscopic to open is decreasing substantially from 2-15% down to 1-6%[13]. A surgeon should not consider a conversion to open as a complication, but rather a prudent decision prioritising the safety and well-being of the patient. Therefore, a scale predicting the risks of complications and the possibility of conversion is invaluable. The choice between laparoscopic and open methods of cholecystectomy can be better decided based on such scales.

Development of a reliable and accurate scoring system will assist surgeons in optimising the surgical approach, reducing complications and lowering the conversion rate. Nevertheless, there is a dearth of significant research on the effectiveness of the suggested scale in an Indian context. Therefore, our study is aimed at evaluating the predictability of the proposed scales within the setting of our teaching hospital.

Aims and objectives:

1. To assess the predictive capacity of a difficult laparoscopic cholecystectomy using a preoperative scale.
2. To assess whether the intraoperative complications increased with an increase in pre-operative risk.

The earliest record of "biliary colic" or symptomatic gallstone disease in humans was first described by a Florentine pathologist, Antonio Benivieni, in 1507[17]. He had performed a post-mortem on two women of noble birth, where he discovered a collection of small gallstones of various shapes and colours. He later documented the same in his *De abditis nonnullis ac mirandis morborum & sanationum causis* ("Hidden causes of disease").

The relationship between gallstones and surgical management was established when Stalpert von der Wiel drained an abdominal abscess in a patient with a history of chronic abdominal pain. This incidentally led to the discovery of gallstones in 1687[18]. However, in the year 1743, the first cholecystostomy was performed by a renowned surgeon, Dr. Jean Louis Petit, who developed a procedure to adhere the gall bladder to the skin and drain via a trocar (leading to fistulous tract formation)[19].

In July 1882, Carl Langenbuch, the director of the Lazarus Hospital in Berlin, developed open cholecystectomy as he was convinced that the gall bladder was not essential (as proven by animal studies) and also the source for gallstone formation[18]. A successful removal of the gall bladder was done on a 43-year-old patient using a subcostal incision similar to modern times. These early pioneers laid the foundations of current cholecystectomies.

Jacques Perissat advanced the evolution of laparoscopic surgery, making the critical jump from mini-laparotomy to modern video-assisted procedures. The first laparoscopic cholecystectomy was performed on September 12, 1986, by Dr. Med Erich Mühe of Böblingen, Germany. The transition of laparoscopy from gynaecological procedures to general surgery is a significant historical achievement[20].

A consensus conference was held in September 1992 in Bethesda, Maryland, regarding the preferred treatment for gallstones. Numerous benefits and advantages of laparoscopic over open surgery were discussed. The delegates inferred that laparoscopic cholecystectomy is the preferred modality for the treatment of gallstones. This ultimately helped to adopt the laparoscopic procedure worldwide as the "standard of care procedure"[21].

Since then, multiple prospective and retrospective studies have been performed worldwide to evaluate the safety and efficacy of the laparoscopic cholecystectomy[22–25]. The studies concluded that laparoscopy has an added benefit of a lesser hospital stay, decreased complications, and faster recovery. Many concluded that laparoscopic cholecystectomy should be considered as the "gold standard" for the management of symptomatic cholelithiasis.

The introduction of laparoscopic surgery to hospitals (even in developed countries) was delayed due to the lack of digital video recording devices. In 1995, Nassar et. al. decided to perform laparoscopic surgery without

video assistance, but under direct vision. The study was aimed at proving that cholecystectomies can be performed without video-assistance, but in turn led to the development of an intra-operative grading system for difficult laparoscopic cholecystectomies[26].

The scale was graded as:

- Grade 1 and 2: Easy laparoscopic cholecystectomy
- Grade 3 and above: Difficult laparoscopic cholecystectomy

The Nassar intraoperative scale[13] was validated in 2018 by Ewen A. Griffiths et. al. The developed grading was superior to other intraoperative scales developed by Parkland et. al.[15], Cushieri et. al.[27], and Sugrue[28]. The Nassar's intraoperative scale is consistent, clinically relevant, and aimed at the production of a universal "objective"[29] scale to act as a reference standard. [Table 1]

Table 1: Intra-operative grading of laparoscopic cholecystectomy

	Gallbladder	Cystic pedicle	Adhesions
Grade 1	Floppy, non-adherent	Thin and clear	Simple up to the neck / Hartmann's pouch
Grade 2	Mucocele, Packed with stones	Fat laden	Simple up to the body
Grade 3	Deep fossa, Acute cholecystitis, Contracted, Fibrosis, Hartmans adherent to CBD, Impaction	Abnormal anatomy or cystic duct - short, dilated or obscured	Dense up to fundus; Involving hepatic flexure or duodenum
Grade 4	Completely obscured, Empyema, Gangrene, Mass	Impossible to clarify	Dense, fibrosis, wrapping the gallbladder, Duodenum or hepatic flexure difficult to separate
Grade 5	Gallbladder - Burnt out GB, cholecystocutaneous abscess	Mirizzi type II or above	Cholecysto-duodenal fistula, Cholecysto-colic fistula

The conversion to open from a laparoscopic approach in cholecystectomies is seen in 1 to 15% of patients. It is known to increase perioperative time, complication rates, and the duration of hospital stay. The conversion itself does not increase the risk of bile leaks, bile duct injuries, or bleeding. However, starting with a laparoscopic approach in a challenging case does increase these risks, often necessitating conversion to an open procedure[30].

There was a growing need for a dependable prediction model for challenging laparoscopic cholecystectomy procedures. Giuseppe et. al.[31] registered the patient's characteristics, preoperative laboratory parameters, and CT abdominal scan findings and inferred that difficult laparoscopic cholecystectomies had increased white blood counts and fibrinogen levels.

A. Hu et al. conducted a systematic review of the literature in 2017, analysing over 30 studies. They concluded that male sex, an older age group, and a high BMI were most associated with difficult cholecystectomies. The study ended with a need for external validation of the proposed risk factors. There was still a need for a large-scale study to identify difficult laparoscopic cholecystectomies[30].

In 2019, Ahmed Nassar, continuing his research on difficult laparoscopic cholecystectomies, created a scale designed to improve upon the limitations of prior studies that involved small patient cohorts and lacked an objective measure of operative difficulty[29]. The developed scale was validated in the internal and external datasets. [Table 2] Multiple variables were included in the study and were successful in establishing a scale that is reliable and consistent in the prediction of difficult laparoscopic cholecystectomies.

Table 2: Preoperative Nassar Scale

Variables		Score
Age	<40	0
	>40	1
Gender	Female	0
	Male	1
ASA Classification	1	0
	2	1
	3	2
	4 to 5	7
Primary Diagnosis	Pancreatitis	0
	Biliary Colic	0
	CBD Stone	1
	Cholecystitis	4
Gallbladder wall thickness (≥ 3mm)	No	0
	Yes	2
CBD dilatation (> 6 mm)	No	0
	Yes	1
Pre-operative ERCP	No	0
	Yes	1
Admission type	Elective	0
	Delayed	1
	Emergency	2

Risk Stratification: Low risk: 0 to 1, Intermediate risk: 2 to 6, High risk: 7 to 19

Methodology:

Source of data: Patients undergoing laparoscopic cholecystectomy in the department of general surgery at a tertiary teaching hospital

Study design: Hospital-based observational study

Study period: 18 months (May 2024 to October 2025)

Sample size:

The sample size was calculated using the formula:

$$N = \frac{z^2 \times p \times (1-p)}{\varepsilon^2}$$

Where,

N = Sample size

Z = 1.96 for 95% confidence

P = 0.294, attained from the proportion of difficult laparoscopic cholecystectomies (29.4%)[31].

ε = Margin of error = 10%

Hence, N (sample size) is about 79.73

Therefore, a minimum of 80 patients were planned for inclusion in the study

Study centre: Tertiary Hospital

Inclusion criteria:

1. Patients between 18 and 80 years.
2. Patients undergoing laparoscopic cholecystectomy for benign biliary disease.
3. Patients with at least one diagnostic image (ultrasound, magnetic resonance cholangiopancreatography, or tomography)

Exclusion criteria:

1. Patients with planned open cholecystectomy.
2. Patients with known gallbladder cancer.
3. Patient with incomplete variables for the study.
4. Immunocompromised patients due to chemotherapy, immunosuppressants, corticosteroids, etc.
5. Pregnant females

All patients undergoing laparoscopic cholecystectomy in our general surgical department who met our inclusion criteria were enrolled in the study. Detailed history and clinical assessment were done at the time of inclusion in the study. Consent was obtained from the patient to participate in the study.

The presence of a benign biliary disease is confirmed by the radiological investigation, preferably an ultrasonogram of the abdomen and pelvis. The preoperative risk was assessed using the Nassar scale.

Surgical Procedure:

A laparoscopic cholecystectomy is performed by the operating surgeon in standard fashion. Patient is in supine position with a slight head low and right tilt, under general anaesthesia. The operative procedure was performed using *Olympus VISERA Elite III*. Ports were placed in the described fashion:

1. 10mm umbilical camera port.
2. 10mm subxiphisternal port 2-3 cm below the xiphisternum.
3. 5mm port in the mid-clavicular line just below the costal margin.
4. 5mm port in the anterior axillary line below the costal margin.

Multiple techniques are employed to establish pneumoperitoneum. The most commonly employed was the open Hasson's technique, followed by the Veress needle technique. The entire abdominal cavity was inspected, and the gall bladder was held using the Allis forceps and retracted towards the right shoulder. Dissection is carried out cranial to the line joining the Rouviere's sulcus, segment 4 of the liver, and the umbilical fissure. Critical view of safety was employed in anterior and posterior dissections. The cystic duct, cystic artery, and bile duct are visualised. The cystic artery and cystic duct were clipped separately with appropriately sized *Liga Clips 300* or *Liga Clips 400*. Scissors are used to cut, and confirmation was done. Retrograde dissection was carried out for the gall bladder. The specimen is placed in an endobag and delivered through the 10 mm umbilical port. In cases of bile spillage, irrigation was performed using 0.9% normal saline, and hemostasis was confirmed. A subcostal drain is kept for a few patients, through the 5mm port (if suspicion of bile leak or bleeding), before closure of all ports.

Post-surgery, the intraoperative data was collected. The intra-operative scale suggested by Nassar was used to classify the operation into four grades.

Grades 1 and 2 are considered easy, and the rest is considered a difficult operation.

Additionally, the following events are recorded during surgery:

1. CBD injury
2. Bile leak
3. Bleeding
4. Conversion from laparoscopic to open approach.
5. Critical View of safety failed

The preoperative and intraoperative scales developed

by Nassar et al. are being incorporated in the study after obtaining permission from the author for the same.

Statistical analysis:

Appropriate statistical methods were applied for the analysis of data. Bivariate analysis and comparison of pre-operative factors between an easy and a difficult cholecystectomy. Pre-operative data are compared to intra-operative difficulty and analysed for statistical significance using SPSS version 26.

Results:

A total of 82 patients were enrolled in the study over a time period of 18 months, from May 2024 to October 2025. A total of 38 easy and 44 difficult cholecystectomies were included.

Table 3: Demographic statistics

Variables		N	Percent	SD
Age	Average years	43.84		14.16
Gender	Male	28	34.14	
	Female	54	65.85	
ASA Grade	ASA 1	34	41.46	
	ASA 2	42	51.21	
	ASA 3	5	6.09	
	ASA 4-5	1	1.21	
Primary Diagnosis	Pancreatitis	3	3.65	
	Biliary colic	63	76.82	
	Choledocholithiasis	1	1.21	
	Cholecystitis	15	18.29	
Hepatobiliary system	GB thickness (in mm)	3.34		0.89
	CBD Diameter (in mm)	3.96		1
ERCP	Not Done	76	92.68	
	Done	6	7.31	
Type of Admission	Elective	75	91.46	
	Delayed	5	6.09	
	Emergency	2	2.43	

The analysis revealed a mean age of 43.84 ± 14.16 years with a female preponderance of 65.85%. The demographic details are summarised in the following table [Table 3]. The role of Nasser's preoperative score in predicting a difficult LC was studied. The patients were graded and ranged from 0 to 17. [Fig. 1] The average score was 3.1; the median and mode were 2.

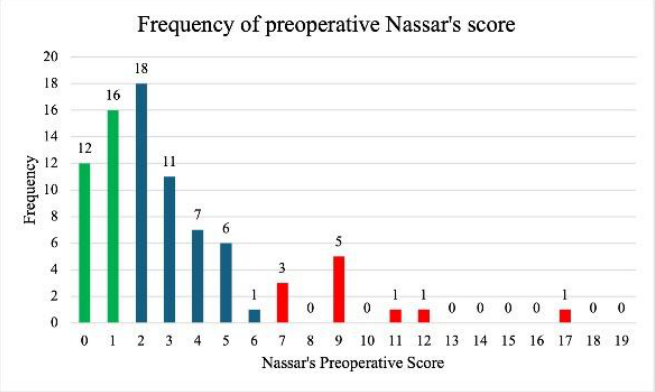

Figure 1: Frequency of preoperative Nassar's score

The analysis revealed a significant p-value, indicating that this score is statistically relevant in predicting a difficult LC. Out of 82 patients, 28 belonged to the low-risk group, 43 to the intermediate-risk group, and 11 to the high-risk group. [Fig 2]

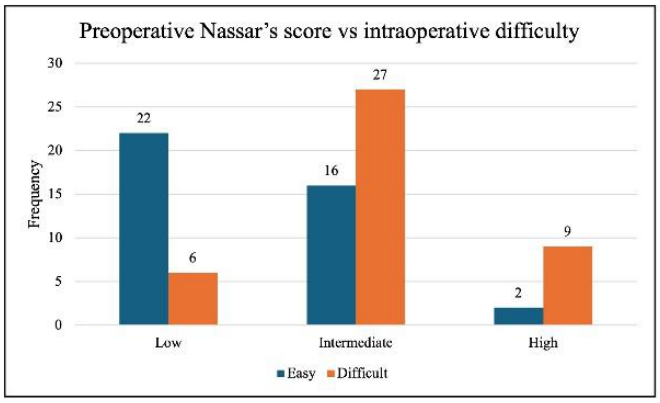

Figure 2: Preoperative Nassar's score vs intraoperative difficulty

On analysing the individual parameters, the ages of the patients spanned a wide range from 18 years to 77 years. Median age was 42 years, and the mode (most common) was 47 years. [Fig 3, 4]

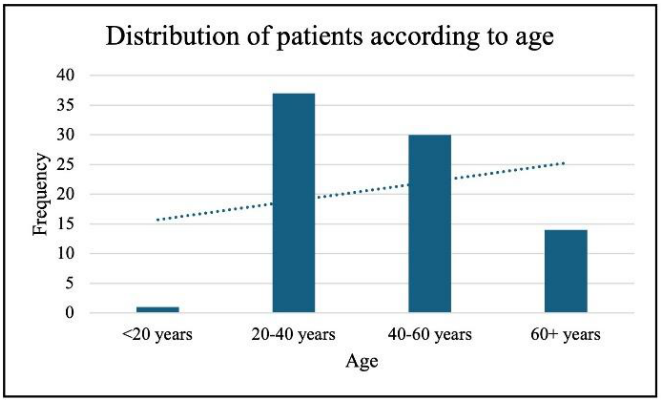

Figure 3: Distribution of patients according to age

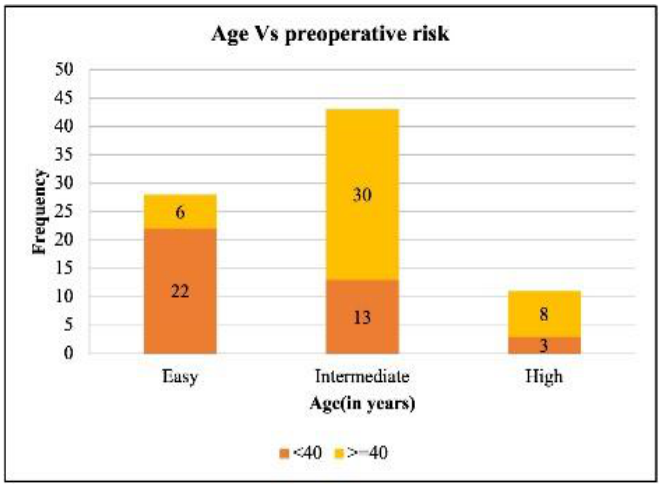

Figure 4: Age vs preoperative risk.

Moreover, the study found age to be a statistically significant factor with a p-value of 0.04, indicating that age is a reliable criterion for predicting the difficulty of laparoscopic cholecystectomy.

Out of the 82 included patients, 24 were male, and 58 were female. The gender in predicting the difficulty was insignificant, with a p-value of 0.21.

The ASA score was assessed for the patients undergoing LC. The prediction of difficult LC using ASA was insignificant, with a p-value of 0.12. The majority of the patients belonged to ASA grade 2, amounting to a total of 42 out of 82 patients. Only 1 patient belonged to ASA grade 4. [Fig 5]

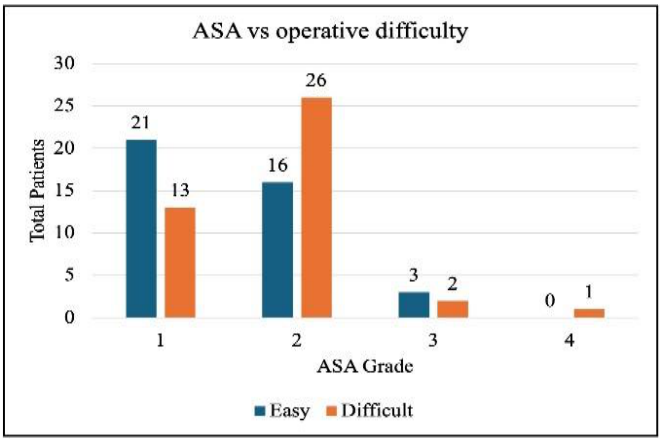

Figure 5: ASA vs operative difficulty

The patients were grouped into 4 diagnoses – biliary colic, cholecystitis, choledocholithiasis and pancreatitis.

The majority of the patients had biliary colic, and only one patient had choledocholithiasis, in whom pre-operative endoscopic retrograde cholangiopancreatography was performed. Primary diagnosis was insignificant in the prediction of difficult LC. [Figure 6]

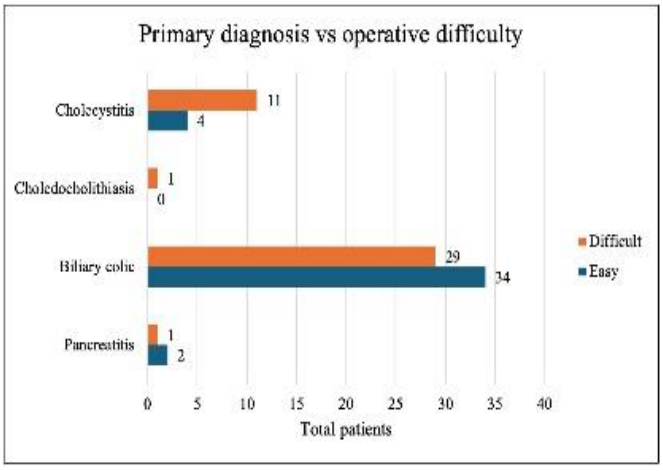

Figure 6: Primary diagnosis vs operative difficulty

Gallbladder wall thickness was a significant predictor of a difficult laparoscopic cholecystectomy. There were 25 difficult LCs out of 60 with gallbladder thickness less than 3 mm, whereas 17 out of 22 of the difficult LCs had gallbladder thickness more than 3 mm.

Data analysis of 82 patients for the diameter of the common bile duct for the prediction of difficult LC was performed to determine whether a dilated common bile duct of more than 6mm had difficult LC. It revealed a p-value of 0.58, which is statistically insignificant.

The role of pre-operative ERCP was evaluated in the prediction of a difficult LC. The analysis revealed it to be an insignificant factor in predicting a difficult LC.

The types of admission – elective, emergency, and delayed- were studied to determine the significance in the prediction of a difficult LC. Our analysis revealed an insignificant p-value of 0.144. All the data analysed were tabulated [Table 4]

Table 4: Comparison of variables of Nassar's score

	Variables	Easy	Difficult	p val
Age	<40	23	15	0.047985787
	40+	17	27	
Gender	Male	11	17	0.215491758
	Female	29	25	

	Variables	Easy	Difficult	p val
ASA	1	21	13	0.12*
	2	16	26	
	3	3	2	
	4	0	1	
Primary Diagnosis	Pancreatitis	2	1	0.175421263
	Biliary colic	34	29	
	Choledocholithiasis	0	1	
	Cholecystitis	4	11	
GB wall thickness	<3	35	25	0.00426312
	3+	5	17	
CBD diameter	<=6	39	40	0.585524572
	>6	1	2	
Pre-Operative ERCP	No	38	38	0.431696863
	Yes	2	4	
Type of admission	Elective	39	36	0.144170031
	Delayed	0	2	
	Emergency	1	4	
Pre-operative Risk	Low	22	6	0.000665441
	Intermediate	16	27	
	High	2	9	
TLC	<11000	35	26	0.007947865
	>=11000	5	16	
Sr. Albumin	<3.0	6	12	0.122364075
	3.0 -3.5	10	15	
	3.5 - 4	12	8	
	>4	12	6	

* Two-tailed p-test

The risk of complications increased with an increase in the intraoperative difficulty of LC. No injury to the common bile duct was noted. Bleeding was the highest complication that was recorded among all the groups. The conversion from laparoscopy to open was observed in both intermediate and high-risk groups, amounting to two in each group. No conversion was observed in the low-risk groups. Bile leak was seen in one patient belonging to the easy category. [Figure 7, 8]

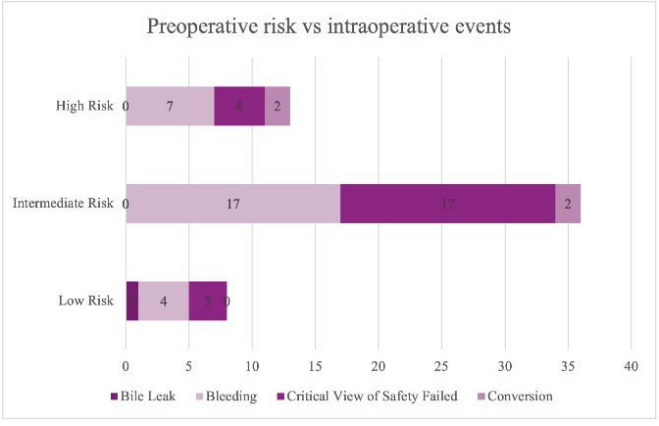

Figure 7: Preoperative risk vs intraoperative events

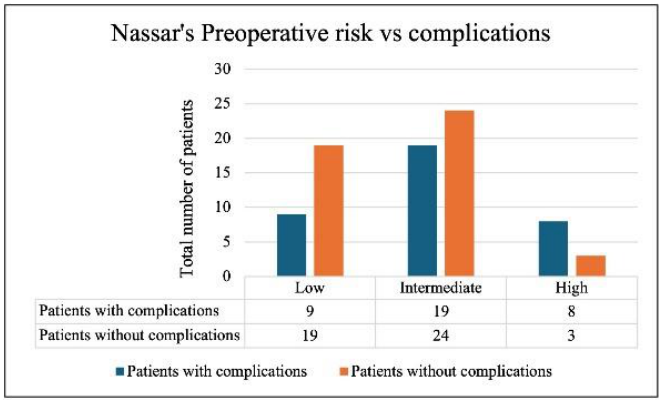

Figure 8: Preoperative risk vs complications

Discussion:

Cholelithiasis is more common in females belonging to the reproductive age group[32,33]. As few studies have rightfully justified it by attributing it to the sedentary lifestyle of the female population in the Indian sub-continent, it remains unchanged in our region of study as well[34]. The female preponderance with a median age of 43 years strengthens the known fact about cholelithiasis, the 5Fs – "fair, fat, female, fertile, and forty"[35]. With the increasing body mass index in females, with a majority of the population consuming meat[36,37], there exists a high risk for the development of gallstones, especially in our region of study.

The most common diagnosis for patients undergoing laparoscopic cholecystectomy is an uncomplicated biliary colic[38]. Most of them presented to our outpatient department with symptoms of intermittent abdominal pain of variable duration and underwent an ultrasonogram of the abdomen, revealing cholelithiasis. Following this, the second most common group belongs to cholecystitis. This can be attributed to the patients presenting to our emergency department, who have neglected their symptoms of abdominal pain. Many other studies have inferred similar results, and a few have quoted it as the "second most common cause for inflammatory acute abdominal pain"[39]. Pancreatitis was the third most common cause for patients undergoing laparoscopic cholecystectomy in our hospital. Patients with choledocholithiasis were usually referred to a higher centre due to the lack of a surgical gastroenterology team and a shortage of instruments during the course of our study, and were usually excluded. This explains the low number of patients with choledocholithiasis in our study. However, our surgical team operated on patients who presented with status post-ERCP with choledocholithiasis. Primary diagnosis alone was not a significant predictor of a difficult LC, though theoretically, patients with cholecystitis should have a difficult LC owing to surrounding inflammation with a thickened wall of the gall bladder. In our study, only 15 out of the 82 patients diagnosed with cholecystitis were operated on, and statistical significance was not achieved. And as many studies have shown, most of the difficult LC is seen in the biliary colic group[40]. Only one patient with choledocholithiasis was operated on with LC, who had undergone endoscopic retrograde cholangiopancreatography previously for common bile duct stenting.

Many patients belonging to ASA-PS III to IV presented late to our hospital and denied any form of high-risk operative procedures. Many emergency laparoscopic cholecystectomies were thus not performed due to a lack of consent[41]. Hence, with the available data, the significance of the ASA-PS score to a difficult or easy LC could be concluded.

The admission type alone was not a significant predictor of a difficult LC. The majority of them were elective, as most of the admissions were done during the outpatient period. Patients with pancreatitis and cholecystitis who were managed conservatively were readmitted after 6 weeks for cholecystectomy, amounting to a meagre 4. Many patients were lost to follow-up, resulting in a deficiency of delayed admissions and interval cholecystectomies in our study. Almost all of the LCs that were performed were elective or delayed, except for a few cases that were done as an emergency procedure.

An ultrasonogram was utilised to measure the gallbladder thickness. It is a significant predictor of a difficult LC. Out of the 40 easy LCs, 35 had a gallbladder wall thickness of less than 3 mm. Out of the 22 patients with a gallbladder wall more than 3mm, 17 of them had a difficult LC. These help ascertain the importance of the gallbladder wall in predicting an easy or a difficult LC.

Only 3 out of 82 patients underwent LC with a CBD diameter of more than 6 mm. The patients with dilated CBD had to undergo ERCP for CBD stenting, which was unavailable at our place of study. Many such patients were lost to follow-up post-ERCP and stenting. This could be one of the reasons for CBD diameter not being a significant predictor of a difficult LC in our study. Multiple other reasons for the low number of patients include a lack of trained personnel and the necessary instruments for ERCP. The same reason could be extended for the relatively low number of patients presented with status post-ERCP, and thus was also not a significant predictor of a difficult LC.

The Nassar's preoperative scale is a combination of the aforementioned variables with their corresponding scores that, when summed up, can grade the difficulty of an LC preoperatively into low, intermediate and

high risk groups. Most of the patients fell into the intermediate risk group, largely because the low-risk group had a narrow range of scores (zero or one). Apart from the co-morbidities like diabetes mellitus or hypertension, which raise the score by a minimum of 1, other factors like age and gender also influenced the score significantly. To overcome this, the data was analysed by the total score, and the frequency of each score was plotted on the y-axis. [Table 5]

Table 5: Preoperative risk vs complications

Variables	Low Risk	Intermediate Risk	High Risk
Bile Leak	1	1	1
CBD injury	0	0	0
Bleeding	4	4	4
Critical View of Safety Failed	3	3	3
Conversion	0	0	0

The majority of the patients (45 out of 82) have a total score from 1 to 3, following which there is a sharp decline in the total score till 6, and only a handful of cases in the high-risk group were noted. However, this demarcation from low-risk to intermediate-risk is vital for predicting a difficult LC. The shift from one to two is crucial in the prediction of a difficult LC, as evidenced by the p-value.

Apart from the variables in Nassar's score, total leucocyte count and serum albumin were studied for their predictive capacity for a difficult LC. A raised TLC count of more than 11,000/mm3 was a significant predictor of difficult LC. This helps in re-strengthening the diagnosis of cholecystitis with a difficult LC. Serum albumin was also studied, and a low value revealed no significant association with a difficult LC. As a negative acute phase reactant, its level will fall during acute cholecystitis and thus is a potential predictor of the difficulty. A lack of any significant association can be attributed to other causes for hypoalbuminemia, like diabetic nephropathy and nutritional deficiency in the elderly[42].

The risk of complications is a major consideration in any surgery, both for the patient and the operating surgeon. Being prepared for possible complications helps the surgical team plan the proposed surgery. Although the complication risk appears higher in the intermediate risk group, there is a significant difference when expressed as a percentage. In the high-risk group, 8 out of 11 had complications, and in the low-risk group, only 9 out of 28 had complications.

Summary:

The prospective study was conducted in our tertiary hospital in the department of general surgery from May 2024 to October 2025, over a duration of 18 months. A total of 82 patients were included in this study. The key findings are as follows.

Age:

An increase in age increased the probability of a difficult LC. The mean age was 43.11 years.

Gender:

Females were more common than men for benign biliary disease. However, no significant association was seen between gender and operative difficulty.

Primary diagnosis:

The most common primary diagnosis was cholelithiasis, followed by cholecystitis. Choledocholithiasis was the least common. There was no significant association between the primary diagnosis and the operative difficulty.

GB wall thickness:

A total of 60 out of 82 patients had GB wall thickness of less than 3 mm. The rest of them had a thickened GB wall of more than 3 mm. Increased GB wall thickness was significantly associated with increased risk of operative difficulty.

CBD diameter:

Only 3 of 82 patients had a dilated CBD. CBD diameter was an insignificant predictor of difficult LC

Preoperative ERCP:

4 out of 6 patients had difficult LC post-ERCP and stenting. However, preoperative ERCP was not statistically significant in predicting the difficulty of LC.

Type of admission:

75 out of 82 patients were admitted on an elective basis. 5 were admitted on an emergency basis, and two as a delayed admission. The type of admission was an insignificant predictor of difficult LC.

Nassar's pre-operative score:

Nassar's preoperative score was a significant predictor of the operative difficulty of LC

Complications:

The risk of complications increased with an increase in preoperative risk from 32% in the low-risk group to 72% in the high-risk group.

Conclusion:

In conclusion, the prospective study of 82 patients in our tertiary care centre demonstrated a significant association in the prediction of a difficult LC with the following variables: age, GB wall thickness and total leucocyte count.

Though some variables of Nassar's scale are individually not significant predictors of a difficult LC, the cumulative Nassar score is a significant predictor of a difficult LC.

An increase in preoperative risk led to an increase in complications during LC from 32% in the low-risk group to 72% in the high-risk group.

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