Pre-Operative Predictors of Difficult Laparoscopic Cholecystectomy

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Abstract

Gallstone disease is one of the common surgical problems in Nepalese population with prevalence of 4.87%. Laparoscopic Cholecystectomy (LC) is the standard of care and has replaced open cholecystectomy since the invent of this techniques it is safe, easier, have less morbidity and short hospitalstay. However, LC can be difficult in certain circumstances resulting in prolong duration of surgery, bile/stone spillage, bile duct injury or conversion to open cholecystectomy. This may lead to surgeon patient misunderstanding, prolonged hospital stay, increased cost. Preoperative prediction of factors for difficult LC helps surgeon for proper planning of surgery, adequate counselling regarding potential complications and enhance better surgical outcome. Our study aim to identify factors responsible for intraoperative difficulties in LC.

Methods

A observational cross-sectional study was conducted after obtaining the ethical approval (Reference no.1244). The study was carried out from September 2024 to Jan 2025 taking 60 patients with symptomatic cholelithiasis meeting inclusion criteria. Non-probability purposive sampling was done. After pre-operative evaluation and recording of demographic, clinical, biochemical and ultrasound findings, LC was performed. Time taken, biliary / stone spillage, bleeding during surgery, injury to duct / artery, need for conversion was noted and operating surgeon graded as easy, difficult or very difficult. Data was entered in an MS Excel sheet analyzed in Microsoft excel and IBM SPSS. A 95% confidence interval and a p-value less than 0.05 was taken as statistically significant. .

Results

Total of 60 patients (10 males and 50 females) ranging from age 15 to 73 years were included. Out of them 44 (73.3%) were easy, 11(18.3) cases were difficult and 5 (8.3%) were very difficult. Our study showed history of acute calculus cholecystitis, thickened GB wall, impacted stone at neck, distended palpable GB and Contracted GB are found to be associated with difficult laparoscopic cholecystectomy. Age, Sex, BMI, comorbidities (HTN, DM, Hypothyroidism) are not directly associated with difficult lap. Cholecystectomy.

Conclusions
Preoperative prediction of difficult LC is possible and helps surgeons in proper planning of surgery, counselling the patient. It helps in ensuring patient safety and achieving better surgical outcome.

Keywords: Cholecystectomy; Difficult laparoscopic cholecystectomy; Symptomatic cholelithiasis

Introduction

Gallstone disease is one of the common surgical problems in Nepalese population with prevalence of 4.87%.[1] Since Carel Johann Langenbuch has performed first open cholecystectomy in 1882[2], open cholecystectomy has been treatment of choice for more than 100 years. After the invent of laparoscopic technique in cholecystectomy by Philip Mouret in 1987, LC has become the gold standard and almost replaced open cholecystectomy as it is a safe and effective method and has been proved to be superior to conventional method of open cholecystectomy regarding postoperative pain and disability without increased mortality or overall morbidity. Although the chances of intraoperative CBD injury in LC appear to be slightly increased compared to open cholecystectomy, it significantly reduces hospital stay, is cosmetically more acceptable and has financial benefit too.[3] The rate of intra- operative conversion from LC to Open Cholecystectomy (OC) is 2%-10% as suggested by current literatures, and that conversion is known to increase perioperative time, complication rates, perioperative costs, the length of hospital stay, and hospital charges.[4] It also helps in counseling the patients and their relatives preoperatively regarding possibility of conversion to OC and other possible complications.[5] The risk of conversion to open cholecystectomy is related to various risk factors like the surgeon factor, equipment failure and more importantly patient's factors. A large number of clinical studies have reported patient's risk factors like age, sex, BMI and previous abdominal surgery. Ultrasound findings like contracted gall bladder, large single stone, gall bladder thickness and pericholecystic fluid collection are associated with difficult laparoscopic cholecystectomy.[6,7] Randhawa and Pujahari worked on one such system for predicting the degree of difficulty in LC considering age, BMI, H/o Hospitalization for cholecystitis, Abdominal scar, Palpable gallbladder, GB Wall thickness, Pericholecystic collection, Impacted stone with a sensitivity and specificity of 75.00% and 90.24%, respectively.[8]

Our hospital receives patients from various geographical regions and of various socio-demographic characteristics. This study will provide additional information about the risk factors of difficult LC. Since this study predicts difficult laparoscopic cholecystectomy preoperatively and it is one of the most commonly performed procedures in our hospital, this study bears a major importance towards patient's safety. This study is done to evaluate the clinical hematological, radiological factors responsible for predicting difficult LC.

Materials and Methods

It was be a prospective observational study. This study was conducted in Department of General Surgery, Gorkha Public Hospital, Ghorahi Dang. Patients aged 15-60 years undergoing elective laparoscopic cholecystectomy for symptomatic cholelithiasis were included in the study. Patients with features of obstructive jaundice, malignant gall bladder disease, pregnant patients, major Bleeding Disorder,cirrhosis with portal hypertension were excluded from the study.

Calculation of sample size:

Formula:

$$N = Z_\alpha^2 PQ/d^2$$

= (1.96 x 1.96) x 4x96 / (5x5)
= 60

Where,
N = required sample size
Z_α = z deviate corresponding to desired reliability level (1.96 for 95% reliability)
P = estimated proportion in the population (if P is 4%)[1]
Q = 100 – P (P is in %) 96
d = maximum tolerable error (if 5%)

A Structured-proforma was prepared including socio-demographic profile of patient, height, weight, history of pain, past history of ERCP, history of cholecystitis, co-morbid conditions, liver function test and USG findings were noted. Operations was conducted under general anesthesia. LC was performed by single competent surgeon. The timing of surgery was noted from the first port site incision till the last port closure. All the intraoperative events were recorded. All the cases received standard postoperative care and follow up. Intraoperative assessment of degree of difficulty were graded as table 1. Data analysis was done using MS Excel and SPSS with generation necessary charts and results. P Value of 0.05 was considered significant.
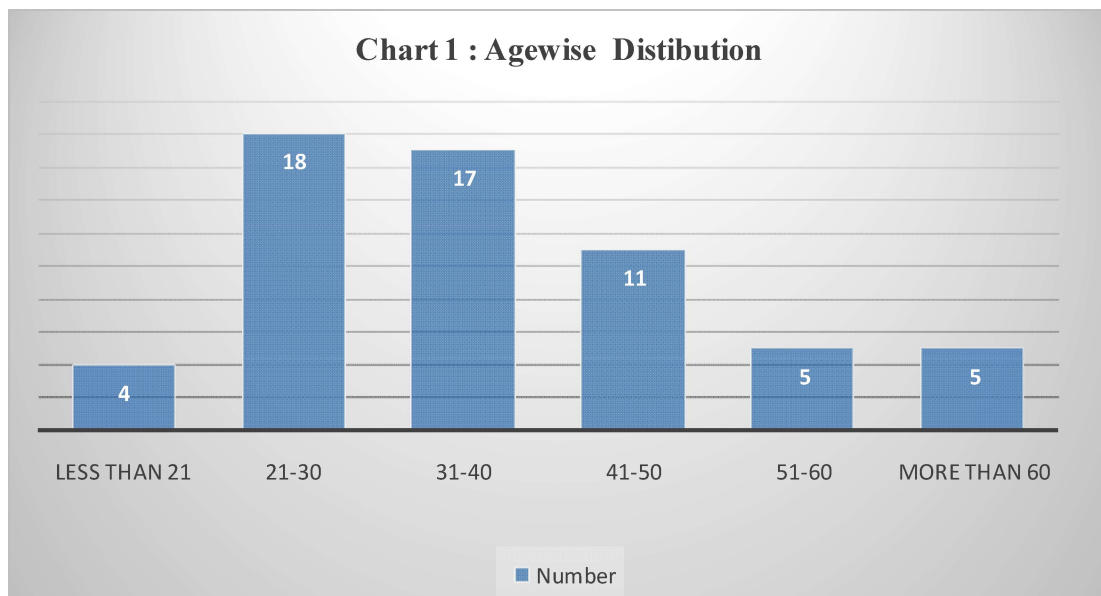
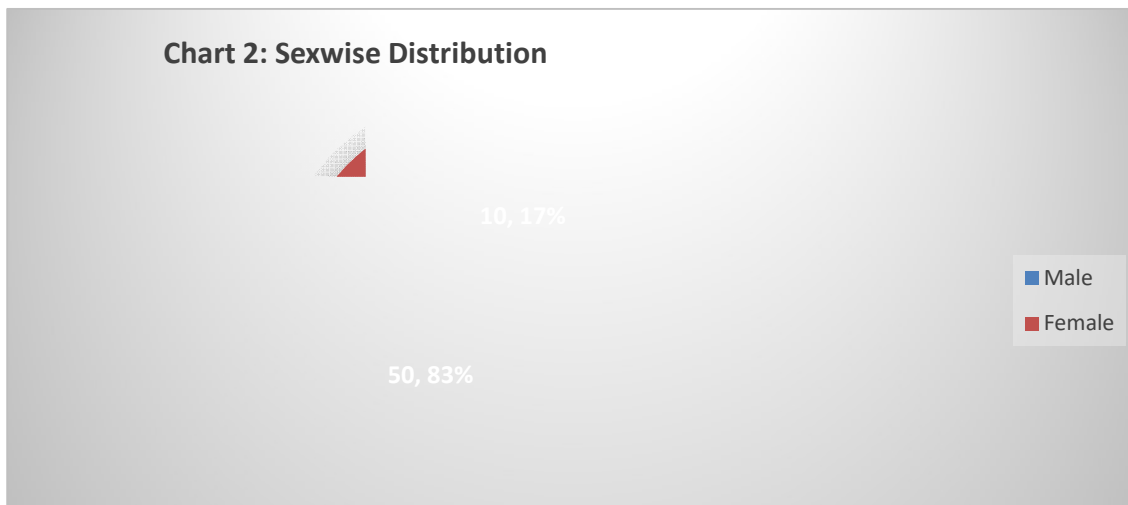**Table 1:** Intra operative assessment of degree of difficulty

Parameters	Grading
Time taken <60min and No bile spillage and No injury to duct	Easy
Time taken 60-120 minutes and/or Bile or stone spillage and/or Injury to duct	Difficult
Time taken >120 min or conversion	Very difficult

Results

A total of 60 age ranging from 15 years to 73years patients were included in the study during the study period. The demographic, clinical and sonological finding, operative finding and level of difficulty are depicted in following tables and charts. There was no conversion to Open cholecystectomy or any kind of bile duct or vascular injury.There were 10 (17%) males and 50 (83%) females.

Chart 1 : Agewise Distibution

Age Group	Number
LESS THAN 21	4
21-30	18
31-40	17
41-50	11
51-60	5
MORE THAN 60	5

Chart 2: Sexwise Distribution

10, 17%

50, 83%

■ Male
■ Female

Various clinical and biochemical parameters are listed in table1.

Table 2: Preoperative assessment: Distribution of Clinical parameters

Sample Group (N=60)			
Clinical Parameters	**Categories**	**Number (n)**	**Percentage (%)**
BMI	<25	29	48.3
	>25	31	51.7
Comorbidities	None	52	86.7
	HTN	4	6.7
	Diabetes Mellitus	1	1.7
	Hypothyroidism	1	1.7
	>1 chronic medical condition	1	1.7
	Others	1	1.7
History of cholecystitis	None	48	80.0
	Present	12	20.0
LFT	WNL	58	96.7
	Deranged	2	3.3

Table 3: preoperative assessment: USG finding

Sample Group (N=60)			
USG Finding	**Categories**	**Number (n)**	**Percentage**
GB Wall thickness	GB wall thickness less than 4 mm	57	95%
	GB wall thickness more than 4 mm	3	5%
Distended GB	No	50	83.3%
	Yes	10	16.7%
Contracted Gall bladder	No	56	93.3%
	Yes	4	6.7%
Impacted Stone at neck	No	59	98.3%
	Yes	1	1.7%
Acute Cholecystitis	No	59	98.3%
	Yes	1	1.7%
Stone size largest	Less than 25mm	54	90%
	More than 25mm	6	10%

Out of 6o patients, 44 (73.3%) were easy, 11(18.3) cases were difficult and 5 (8.3%) were very difficult. The intraoperative findings are listed in table 3.

Table 4: Intraoperative assessment: Operative finding

Sample Group (N=60)			
Operative Finding	**Categories**	**Number (n)**	**Percentage**
Normally distended/contracted GB with calculi, rest normal	No	21	35%
	Yes	39	65%
Gross omental adhesion with calculi	No	47	83.3%
	Yes	13	21.7%
Acutely inflamed Gall Bladder with calculi	No	55	91.7%
	Yes	5	8.3%
Mucocele of GB with calculi	No	57	95%
	YES	3	5%
Bile spillage	No	56	93.3%
	Yes	4	6.7%
Stone spillage	No	55	91.7%
	Yes	5	8.3%

The comparison of various characteristics of study population and intraoperative outcome with level of difficulty is depicted in table 4.

Table 5: Characteristics of Included Population by Study parameters

Patient characteristics	Category	Intraoperative outcome			p value
		Easy	**Difficult**	**Very difficult**	
Age (years)	≤50	33 (67.3 %)	11 (22.4%)	5 (10.2%)	0.249
	>50	7 (63.6%)	1 (36.4%)	3(27.3%)	
Sex	Female	35 (70%)	8 (16%)	7 (14%)	0.223
	Male	5 (50%)	4 (40%)	1 (10%)	
BMI	<25	22 (75.9%)	4 (13.8%)	3 (10.3%)	0.338
	>27.5	18 (58.1%)	8 (25.8%)	5 (16.1%)	
History of hospitalization for acute cholecystitis	None	36 (75%)	7 (14.6%)	5 (10.4%)	0.023
	Present	4 (33.3%)	5 (41.5%)	3 (25%)	
Comorbidities	None	36(69.2%)	10 (%)	6(11.5%)	0.264
	HTN	2 (50%)	1(25%)	1(25%)	
	Diabetes Mellitus	1 (100%)	0		
	Hypothyroidism	0		1 (100 %)	
	>1 chronic medical condition	1 (100%)	0		
	Others	0	1 (100%)		

USG finding	Thickened GB wall	GB wall thickness less than 4 mm	40 (70.2%)	11 (19.3%)	6 (10.5%)	0.010
		GB wall thickness more than 4 mm	0	1 (33.3%)	**2 (66.7%)**	
	Distended GB	No	34 (68%)	12 (24%)	4 (8%)	0.012
		Yes	6 (60%)	0	4 (40%)	
	Contracted GB	No	40 (71.4%)	9 (16.1%)	7 (12.5%)	0.008
		Yes	0	3 (75%)	1 (25%)	
	Impacted stone at	No	40 (67.8%)	12 (20.3%)	7 (11.9%)	0.037
		Yes	0	0	1 (100%)	
	Acute Cholecystitis	No	40 (67.8%)	11 (18.6%)	8 (13.6%)	0.131

History of acute calculus cholecystitis, thickened GB wall, impacted stone at neck,distended palpable GB and Contracted GB are found to be associated with difficult laparoscopic cholecystectomy. Age, Sex, BMI, comorbidities (HTN, DM, Hypothyroidism) are not directly associated with difficult lap. Cholecystectomy. One case had stone size of 6cm that had difficulty in gall bladder retraction and stone retrieval and fall in very difficult operative category.

Discussion

Laparoscopic cholecystectomy (LC) is a widespread technique for management of patients with gallbladder (GB) calculi and has great advantages including short hospital stay, decreased morbidity, rapid recovery, and better cosmesis.[9]The prediction of the risk factors and safety of the procedure help surgeons in deciding the surgical approach, counseling the patients, reducing the risk of complication, reducing the rate of conversion to open cholecystectomy, and reducing overall medical cost.[10,11] Many factors have been described as predictors of difficult LC in various literatures. Parameters like BMI more than 30, empyema of GB, thick-walled GB, large size stones, multiple GB calculi, recurrent acute attack, and previous endoscopic retrograde cholangiopancreatography (ERCP) are found to statistical significant to be used as criteria for predicting difficult LC.[12]As in previous study,

our present study also found History of cholecystitis, thickened GB wall, distended and palpable GB and impacted stone to be associated with difficult LC. There were no Post ERCP case and BMI was not found to be significant in our study. A study by Randhawa Aswini K Pujahari JS found factors like BMI > 27.5 (p < 0.010), previous hospitalization (p < 0.001), palpable GB (p < 0.01) US-Thick-walled GB (p < 0.038) to be of statistical significance in predicting difficult LC and developed a preoperative scoring system. [8]Findings were similar as our present study expect High BMI which showed no statistical significance. And there were no patients with previous surgery involving midline incision. In a study by Agung Ary Wibowo, Oscar tri jokoputra, Zairinnoor et al showed history of hospitalization for acute cholecystitis, high BMI, abdominal scar , palpable gallbladder , thick gallbladder wall and leukocytosis have been found to be associated with difficult LC. In our study,there were no patients with previous surgery with midline scar. High BMI was not significantly associated with difficult LC and other parameters were significantly associated in our study. [13]In other study conducted at KMC, Kathmandu by Mukund Raj Joshi, Tanka Prasad Bohara, Shail Rupakheti et al found only three parameters (history of acute cholecystitis, gall bladder wall thickness and contracted gall bladder) to be significantly associated with difficult LC. [14]Our study, in addition to these three parameters,

distended palpable GB was found to be significant in predicting difficult LC.

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Conclusion

Preoperative prediction of difficult LC can be done considering history of acute calculus chlecystitis, thickened GB wall, impacted stone at neck, distended palpable GB, and contracted GB as shown in our present study along with many similar studies. In addition to this, some studies showed high BMI, abdominal scar, large stone size and post ERCP to be associated with difficult LC. Operating Surgeons must consider these parameter before performing LC that aid in better surgical planning and preparation resulting in better surgical outcome.

Our study is a single centric study that included small study population, so results cannot be generalized to all populations. Larger multi-centric study are recommended establish the pre-operative predictors of difficult LC and to validate the existing scoring systems

Conflict of Interest: None

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Quick Response Code	
DOI: 10.22192/ijcrms.2025.11.02.002	