

**ORIGINAL RESEARCH**

# Predictors of difficulty in laparoscopic cholecystectomy by clinical, hematological and radiological evaluation

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**ABSTRACT**

**Background:** Cholelithiasis is present in 10 to 15% of the general population and asymptomatic in the majority. But in India, the incidence is around 4%. Approximately 1-2% of patients will develop symptoms requiring cholecystectomy per year. The advantages of laparoscopic cholecystectomy over open cholecystectomy are an earlier return to bowel functions, less postoperative pain, improved cosmesis, less length of hospital stay, earlier return to full activity, and decreased overall cost, reduced infection. The rate of conversion from laparoscopic cholecystectomy to open cholecystectomy is 5 to 10%. Hence it is necessary to study the predictive factors for difficult laparoscopic cholecystectomy. Therefore, this study was undertaken. **Study Design:** The study design is of case series. **Aim of the Study:** To determine the role of clinical, hematological and radiological factors role in predicting difficult laparoscopic cholecystectomy and the possibility of conversion to open cholecystectomy before surgery. **Results:** This study was done in the Department of General Surgery, M.G.M. Hospital, Warangal, Telangana state from September 2017 to August 2019. A total number of 220 cases were included in this study, which satisfied the inclusion and exclusion criteria. The following conclusions were derived from the present study. **Conclusion:** The highest incidence of gallstone is in the age group of 21 to 30 years, which is closely followed by 51 to 60 years and 41-50 years. The sex ratio (Male: Female) is 1:2 clearly shows female preponderance, which is the same all over the world. Endogenous estrogen and progestin are attributed to this phenomenon. The pain was the predominant symptom seen in all (100%) patients. Vomiting was present in 30% of the patients with pain. Dyspepsia was present in 20.4% of the patients and fever in 11.3% of them. Tenderness in the right hypochondrium was present in 25.4% of the patients while guarding and mass was present in 0.9 and 1.3%, respectively. Ultrasound is the most accurate and sensitive investigation for the diagnosis of cholelithiasis. Of the 220 patients, 213 had stones in the gallbladder, 29 patients had wall thickening, and 17 had a peri-cholecystic collection. In the present study, Prior Hospitalization, BMI > 27.5, Palpable Gall Bladder, Thick GB Wall, raised TLC, and Peri-Cholecystic Collection were significant predictors of difficult laparoscopic cholecystectomy. The positive predictive value for easy prediction was 94.7%, and for difficult prediction was 100%.

**Key words:** Pericholecystic collection, Dyspepsia, palpable gall bladder.

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**INTRODUCTION**

Cholelithiasis is present in 10 to 15% of the general population and asymptomatic in the majority. But in India, the incidence is around 4%.

An epidemiological study restricted to railroad workers showed that north Indians have a seven times higher occurrence of gallstones as compared to south Indians [1] Changing incidence in India is mainly attributed to westernization, availability of ultrasound. Approximately 1-2% of patients will develop symptoms requiring cholecystectomy per year. There is a gradually increasing incidence after 21 years, which is reaching its peak in the 5<sup>th</sup> and 6<sup>th</sup> decades. Females are more affected than males in the ratio of

4:1.[2]

The advantages of laparoscopic cholecystectomy over open cholecystectomy are an earlier return to bowel functions, less postoperative pain, improved cosmesis, less length of hospital stay, earlier return to full activity, and decreased overall cost, reduced infection [3,4,5]

The rate of conversion from laparoscopic cholecystectomy to open cholecystectomy is 5 to 10%. Hence it is necessary to study the predictive factors for difficult laparoscopic cholecystectomy. Therefore, this study was undertaken.

## AIMS AND OBJECTIVES OF THE STUDY

### AIMS

To determine the role of clinical, hematological and radiological factors role in predicting difficult laparoscopic cholecystectomy and the possibility of conversion to open cholecystectomy before surgery.

### OBJECTIVES

- To assess the pre-operative difficulty factors
- To correlate pre-operative findings with intra-operative difficulty index in operating laparoscopic cholecystectomy.
- To find out difficulty using the Global rating scale while conducting the procedure.

### METHODOLOGY

The materials for the present study on "PREDICTORS OF DIFFICULTY IN LAPAROSCOPIC CHOLECYSTECTOMY BY CLINICAL, HEMATOLOGICAL AND RADIOLOGICAL EVALUATION" comprising of all cases admitted to M.G.M. HOSPITAL, WARANGAL from September 2017 to August 2019. The method of the study included the screening of patients who presented with upper abdominal pain, or vomiting or dyspepsia, or jaundice. Such patients were studied in detail clinically and investigated. Ultrasound abdomen was done in all patients. Routine hematological and biochemical investigations were done. LFT and were done in all patients.

The patients confirmed by USG examination were evaluated with the following factors: age, sex, h/o previous hospitalization (cholangitis or obstructive jaundice, ERCP), BMI wt. (kg)/ ht. (m<sup>2</sup>), abdominal scar-supraumbilical or subumbilical, palpable gall bladder, sonographic findings- wall thickness, Pericholecystic collection, multiple/single large calculi

All the patients were received symptomatic treatment preoperatively. After evaluation, the patient will be subjected to laparoscopic cholecystectomy and time taken, presence of adhesions to GB and Calots triangle, blood loss, difficulty in gallbladder bed dissection, other visceral injuries, bile/stone spillage, injury to bile duct/ cystic artery and conversion were noted.

Postoperatively cases were followed up for any complication. A drain was removed between 2<sup>nd</sup> and 5<sup>th</sup> post OP day depending on the drainage, and suture removal was done on 8<sup>th</sup> post OP day. All cases were followed up for any recurrent symptoms.

### INCLUSION CRITERIA

The patients aged above 18 years presenting symptoms and signs of Cholelithiasis/cholecystitis and diagnosed by ultrasonography of abdomen

### EXCLUSION CRITERIA

- Patients with CBD calculus, raised ALP, dilated CBD, where CBD exploration is needed.
- Patients with features of obstructive jaundice
- Suspected malignant gall bladder disease
- Patient medically unfit for Laparoscopic surgery

### RESULTS

This study included 220 cases that were studied prospectively over a period of 24 months, from September 2017 to August 2019.

### AGE DISTRIBUTION

In the present study, the youngest patient was 19 years of age, and the oldest was 75 years of age. The majority of the patients in the current series were in the age group of 31-40 years of age.

**Table 1: Showing the age-wise distribution of patients underwent laproscopic cholecystectomy**

Age In Years	Herman's Series	%	Hanifseries	%	Present Study	%
0-10	0	0%	0	0	0	0
11-20	25	1.60%	1	0.4%	2	0.5%
21-30	92	5.90%	8	3.2%	14	24.1%
31-40	226	14.60%	58	23.2%	18	18.2%
41-50	325	21%	150	60%	15	20.9%
51-60	473	30.60%	33	13.2%	10	23.2%
>61	352	23.57%	0	0	1	13.2%

### SEX DISTRIBUTION

In a total of patients in the study, 74 patients were males, and 146 were females.

The male: female ratio is 1:2.

**Table 2: Showing sex wise distribution of patients underwent laproscopic cholecystectomy**

Sex	Battachary's Series	%	Hanif Series	%	Present series	%
MALE	26	28.6%	90	36%	74	33.6%
FEMALE	65	71.4%	160	64%	146	66.4%

**PRESENTING SYMPTOMS**

The pain was the predominant symptom seen in all 220 patients. Vomiting was present in 30% (66) of the patients with pain. Jaundice was present in 4.5% (10) patients and 20.4% (45) had dyspepsia

**Table 3: Showing presenting symptoms**

Symptoms	Ganey's Series	%	Alok Sharma Series	%	Present Study	%
PAIN	987	95%	58	100%	220	100%
VOMITING	576	55.6%	48	82.8%	66	30%
JAUNDICE	101	10%	3	5.17%	10	4.5%
DYSPEPSIA	222	21%	5	8.62%	45	20.4%
FEVER	92	9%	NA	0%	25	11.3%

**PRESENTING SIGNS**

Tenderness in the right hypochondrium was present in 56 patients, Epigastric region in 11 patients, and a mass was palpable in 1 patient.

**Table 4: Showing presenting signs**

Signs	Hadfield Series (%)	Present Study	%
Tenderness In Righthypochondrium	65.5%	56	25.4%
Epigastric Region	18.7%	15	6.8%
Mass	7%	1	0.45%

**ULTRASONOGRAPHY**

Of 220 patients, 213 patients had stones in the gallbladder, 27 patients had wall thickening, gangrenous in 2, perforated in 1, and 17 had a pericholecystic collection.

Out of 213 patients, 159 patients had multiple calculi, 54 had single calculi.

**Table 5: Showing ultrasonography findings**

Ultrasonography	No Of Cases
Multiple calculi	159
Solitary calculi	54
Wall thickening	27
Gangrenous wall	2
Pericholecystic collection	17

**CORRELATION OF PRE-OP SCORE AND THE OUTCOME**

Patients who have dilated CBD and aberrant anatomy which required CBD exploration were excluded from this study

**Table 6: Showing correlation of pre-op score and the outcome**

Pre-Op Score	Easy	Moderate	Difficult	Total
0-5	40	114	4	158
6-10	6	43	10	59
11-15	0	3	0	3
TOTAL	46	160	14	220

**SCORING FACTORS AND EASY/DIFFICULT CRITERIA-ANNEXURE II/III****ANALYSIS OF PRE-OP OUTCOME WITH THE RISK FACTORS****Table 7: Showing the analysis of pre-operative outcome with the risk factors**

Risk Factors	Level	Pre-Op Outcome			P-Value	
		E-NO (%)	M-NO (%)	D-NO(%)	PS	R [8]
AGE	<= 50 Y	38	96	6	0.0035	0.937
	>50 Y	8	64	8		
SEX	FEMALE	98	46	2	1.000	0.736
	MALE	60	13	1		
BMI wt(kg)/ht(m <sup>2</sup> )	<=25	37	83	6	0.4324	0.227
	25.1-27.5	7	42	6		
	>27.5	2	35	2		
PREVIOUS SURG.	Nil	30	93	6	0.0003	0.882
	Yes	16	67	8		
GB PALPABLE	NP	45	158	14	0.6168	0.022
	Yes	1	2	0		

<b>USG- WALL THICK</b>	<b>N</b>	45	137	8	<b>0.0026</b>	<b>0.038</b>
	<b>Yes</b>	1	21	5		
<b>RAISED TLC</b>	<b>Nil</b>	42	127	7	<b>0.0043</b>	<b>0.190</b>
	<b>Yes</b>	4	33	7		
<b>P/C COLLECTION</b>	<b>Nil</b>	43	152	8	<b>0.00032</b>	<b>0.999</b>
	<b>Yes</b>	3	8	6		

**D-Difficult, E-Easy, PS-Present study, R-Journal concerning no8 bibliography, NP-Non-palpable, N-Normal, P Value-Predictive value.**

As per the R<sup>[7]</sup> study prior to hospitalization, BMI >27.5, Palpable GB, thick GB wall on Ultrasonography abdomen were significant predictors of difficult laparoscopic cholecystectomy.

**In the present study, BMI >27.5, prior hospitalization for surgeries, thick GB wall, raised WBC count, and Pericholecystic collection were significant predictors of difficult laparoscopic cholecystectomy.**

Fischer exact test was used to find the significant association of findings of the preoperative score with the perioperative outcome.

## DISCUSSION

### AGE DISTRIBUTION

Majority of the patients in the present series were in the age group of 21-30 years of age followed by 51-60 years, whereas in Herman's series and Hanif series the majority of them were in the age group of 51- 60 years and 41-50 years respectively[ 9]

### SEX DISTRIBUTION

In the present series, out of 220patients, 74 were males, and 146 were female patients. The male: female ratio is 1:2. Bhattacharya's series showed 71.4 % of the patients were females, and 28.6% were males. Similar sex distribution was seen in Hanif series.[ 10]

## PRESENTING SYMPTOMS

### PAIN

The pain was the predominant symptom seen in all 220 patients. All the 220 patients presented with chronic recurring pain. In 80% (176) of patients, the pain was in the right hypochondrium. Of the 220 patients, 84% (185) patients had a colicky type of pain, 15% (33) patients had a dull aching type of pain, and diffuse in one patient. In 20% (44) patients, the pain was in epigastrium predominantly. Radiation of pain to back was seen in 19.5%(43).

The pain was the most common symptom in both Ganey's series and Alok Sharma series.[ 11,12]

### VOMITING

Vomiting was present in 30% (66) of the patients with pain. Vomiting was spontaneous and occurred mostly during the attack of pain.

Of the 66 patients, 16 patients came into Easy,42 under Moderate, and 8 patients into Difficult category.

## JAUNDICE

Jaundice was present in 10(4.5%) patients, which was obstructive. CBD exploration was done in these patients after laparoscopic cholecystectomy, and these cases were not included in the study

## DYSPEPSIA

Dyspepsia was present in 20.4% (45) of the patients. Patients who are positive for H.pylori on endoscopic antral biopsy and have duodenal ulcers are treated with the H.pylori kit for two weeks.

## FEVER

Fever was present in 11.3% (25) of the patients, which was of mild to moderate degree and was associated with chills.

Of the 25 patients, surgery was Easy in 2 patients, moderate in 19, and Difficult in 4 patients.

## PAST HISTORY

Of the 220 patients, 28 had undergone tubectomy, 27 had undergone LSCS, 6 had undergone appendectomy, and 26 had undergone a hysterectomy, 4 underwent hernioplasty. Few patients had an attack of acute cholecystitis, which required hospitalization and were managed conservatively. One patient had acute pancreatitis and was treated conservatively with admission.

## GENERAL PHYSICAL EXAMINATION

A general survey revealed that 126 (57.2%) patients had BMI < 25, 25 (25%) had BMI in the range of 25-27.5, and 39 (17.7%) had BMI > 27.5.

30 patients were hypertensive, and 26 were diabetic, 1 patient had bronchial asthma, 2 patients are with hypothyroidism and was on thyroid hormone supplementation, 2 patients with anemia, 1 patient with sickle cell anemia

On inspection, scar due to previous surgery was seen in 92(41.8%) of the patients. Out of this 6 had a supra umbilical scar, and 86 had an infra umbilical scar.

## PRESENTING SIGNS

Tenderness in right hypochondrium was present in 56(25.4%) patients. Which is more when compared to Hadfield's series.[ 13]

Guarding and rigidity was present in 2(0.9%) patients as 18.7% seen in Hadfield's series. [13] Mass was palpable in 3(1.3%) patients while in Hadfield's series mass was palpable in 7% of the patients [13]

## INVESTIGATION

Routine biochemical and hematological investigations like Hb%, Urine examination, Blood grouping, BUN, Creatinine, RBS, and LFT were done in all cases.

Hb% of patients ranged from 10 to 13 gm%. FBS and PPBS were done for diabetic patients. BUN and Creatinine were within normal limits.

TLC counts were done in all cases and found to be normal in 176(80%) patients and raised in 44 patients(20%) of which 4 were under easy category, 33 were under moderate category, and difficult in 7 patients.

## ULTRASONOGRAPHY

Ultrasound was done as a routine investigation in all the patients. The sonological criteria used to diagnose gallstones were acoustic shadowing of the opacities in the gallbladder and change in the position of the opacity with the change in patient position.

Out of 220 patients, 213 patients had stones in the gallbladder, 29 patients had wall thickening, and 17 had a pericholecystic collection. Out of 213 patients, 159 patients had multiple calculi, 54 had single calculi, and no calculi in 7 patients.

In Alok Sharma series, 98.3% had stones in GB, and 5.2 % had GB wall thickening. Of the 98.3%, 73.7% had multiple stones, 26.3% had solitary stones, and 5.2% had bile duct stones. [12]

## EVALUATION OF PREDICTIVE FACTORS FOR DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY:

The factors included were age, sex, prior H/O hospitalization, BMI, abdominal scar due to previous surgery, clinically palpable GB, TLC, wall thickness, pericholecystic collection. [8]

## CORRELATION OF PRE-OP SCORE AND THE OUTCOME

Out of the 4 patients in whom lap. was converted to open; all the patients have dense adhesions of CBD, omentum, and bowel and were difficult to identify calot's triangle. The positive predictive value for easy prediction was 94.7%, and for difficult prediction was 100%.

Conversion rate from the lap. Cholecystectomy to open cholecystectomy was 1.8% in the present series.

In a study by J S Randhawa And A K Pujahari, of the 228 patients studied, cases with 0 to 5 pre-op score were 178, of which 158 were easy LC, 14 were difficult LC, and 6 were very difficult LC. The positive predictive value for easy prediction was 88.8%, and for difficult prediction was 92%. The conversion rate was 3/228, i.e., 1.315% and all were due to anomalous ducts [8]

## POST-OPERATIVE TREATMENT

In all cases, post-operative treatment included

- Nasogastric aspiration till the patient recovered from the postoperative ileus evidenced from the

appearance of bowel sounds and passage of flatus.

- I-V fluids continued till oral liquid diet was started, i.e., following removal of Ryle's tube.
- A broad-spectrum antibiotic for 5 days
- Analgesics as and when required
- Drainage tube was removed between 1<sup>st</sup> and 5<sup>th</sup> post OP day.

## FOLLOW UP

Patients were followed up for a month, and no significant complication was noted.

## CONCLUSIONS

The highest incidence of gallstone in the present series is in the age group of 21 to 30 years, which is closely followed by 51 to 60 years and 41-50 years. Whereas in Herman's series and Hanif series highest incidence was in the age group of 51-60y and 41-50 y, respectively.

The sex ratio (Male: Female) is 1:2 clearly shows female preponderance, which is the same all over the world. Endogenous estrogen and progesterin are attributed to this phenomenon.

The pain was the predominant symptom seen in all (100%) patients. Vomiting was present in 30% of the patients with pain. Dyspepsia was present in 20.4% of the patients and fever in 11.3% of them.

The symptomatology matched well with that of Ganey's series.

Tenderness in the right hypochondrium was present in 25.4% of the patients while guarding and mass was present in 0.9 and 1.3%, respectively.

Ultrasound is the most accurate and sensitive investigation for the diagnosis of cholelithiasis.

Of the 220 patients, 213 had stones in the gallbladder, 29 patients had wall thickening, and 17 had a pericholecystic collection.

The patients who were detected to have CBD stone pre-operatively were excluded from the study.

In the present study, Prior Hospitalization, BMI > 27.5, Palpable Gall Bladder, Thick GB Wall, raised TLC, and Peri-Cholecystic Collection were significant predictors of difficult laparoscopic cholecystectomy.

As per the R<sup>7</sup> study, Prior Hospitalization, BMI > 27.5, Palpable GB, Thick GB Wall were significant predictors of difficult laparoscopic cholecystectomy.

The positive predictive value for easy prediction was 94.7%, and for difficult prediction was 100%.

The conversion from laparoscopic cholecystectomy to open cholecystectomy was 1.8% which was in accordance with that of the study by Kama et al. [6]

## SUMMARY

Cholelithiasis is the most common biliary pathology. Gallstones are present in 10 to 15% of the general population and asymptomatic in the majority of them, of about >80%. About 1-2% of asymptomatic patients will develop symptoms requiring cholecystectomy

every year, making it one of the most common operations performed.

In 1992, The NIH (National Institute of Health), consensus development Conference, given a statement that the safe and effective way of treatment for symptomatic cholelithiasis is laparoscopic cholecystectomy.

In about 5 to 10% of the cases of laparoscopic cholecystectomy, an open cholecystectomy may be needed for the safe removal of the gallbladder.

Therefore, it is necessary to analyze the risk factors that predict difficult laparoscopic cholecystectomy.

The following risk factors were considered- age >50 years, male sex, H/O prior hospitalization for acute cholecystitis/ biliary pancreatitis, ERCP, BMI 25-27.5, and >27.5, abdominal scar, palpable GB, wall thickening, raised TLC count, and pericholecystic collection.

Out of this BMI >27.5, H/O prior hospitalization, palpable GB, wall thickening, raised TLC count, and pericholecystic collection were significant predictors of difficult laparoscopic cholecystectomy, as per the present study.

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