

Original Research Article

Comparison of two preoperative scoring systems in predicting difficult laparoscopic cholecystectomy

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ABSTRACT

Background: Gallstones are a prevalent condition in India, with laparoscopic cholecystectomy being the gold standard treatment. Accurate preoperative prediction of surgical difficulty is essential to improve outcomes and reduce complications.

Methods: This prospective observational study, conducted among 77 patients at a tertiary care center, compared two scoring systems: Randhawa and Pujahari, Acharya and Adhikari. Preoperative scores were assessed using clinical, laboratory, and imaging parameters. These scores were compared to intraoperative outcomes such as surgery duration, complications, and conversion to open cholecystectomy.

Results: Both scoring systems showed reliable accuracy in predicting surgical difficulty. Randhawa and Pujahari demonstrated higher specificity and better performance in ruling out difficult cases, while Acharya and Adhikari showed higher sensitivity and negative predictive value. Most surgeries were categorized as easy (66.2%), with a smaller proportion being difficult (31.2%) or very difficult (2.6%).

Conclusions: Preoperative scoring systems are valuable tools for predicting the complexity of laparoscopic cholecystectomy. While both systems performed well, Randhawa and Pujahari had slightly better accuracy, whereas Acharya and Adhikari showed superior sensitivity.

Keywords: Cholelithiasis, Gall stones, Laparoscopic cholecystectomy, Prediction, Scoring

INTRODUCTION

Gallstones are very common condition in India, with its overall prevalence being around 10-20%.¹ It is more common among females.² Laparoscopic cholecystectomy is the gold standard for treating symptomatic gall stone disease. It has now become one of the most commonly performed surgery worldwide. It is minimally invasive, relatively less painful and has a shorter period of recovery.³ Assessment of complexity factor prior to surgery is necessary to ensure successful surgery with any delays. Hence, preoperative prediction of complexity factors, helps in determining whether the patient needs to

undergo laparoscopic cholecystectomy or open cholecystectomy.^{4,5}

In our study we are using two scoring systems (Randhawa and Pujahari scoring and preoperative scoring by Acharya and Adhikari) that include patients' history, clinical examination, laboratory findings (total leucocyte count) and ultrasonographical findings to predict the difficulty of laparoscopic cholecystectomy preoperatively.

The aim of our study is to compare Randhawa and Pujahari preoperative scoring system with preoperative

scoring by Acharya and Adhikari for predicting difficult laparoscopic cholecystectomy.

METHODS

A prospective observational study was conducted at Father Muller Medical College Hospital, Mangalore, Karnataka among 77 patients posted for laparoscopic cholecystectomy in the department of general surgery from July 2022 to January 2024 after obtaining ethical clearance (IEC/CCM/490/2022).

Inclusion criteria

Patients above the age of 18 undergoing laparoscopic cholecystectomy.

Exclusion criteria

Patients with carcinoma gall bladder, diagnosed preoperatively through radiological investigations. Laparoscopic cholecystectomy performed with other laparoscopic interventions and patients requiring CBD exploration.

Patients who were diagnosed to have gallstones requiring cholecystectomy were evaluated and worked up with the following parameters: age, gender, prior history of acute cholecystitis, BMI, Supraumbilical or infraumbilical abdominal scar, Palpable Gb, Total leucocyte count, Wall thickness, pericholecystic fluid, stone size, GB distension and impacted stones (Table 1 and 2).

We used scoring systems adopted by Randhawa et al and Acharya et al.^{3,4} All parameters were noted according to the scoring systems and total scores were tallied and divided preoperatively into Easy- score 0-5, Difficult- score -6-10, very difficult- score 11-15 according to Randhawa and pujahari scoring and easy - score <5 and difficult- score >5 according to Acharya and Adhikari scoring.

We compared these preoperative predictions to Intraoperative criteria (Table 3) to see if the procedures that were expected to be easy, difficult and very difficult were actually the same. The preoperative score was then compared against the peroperative findings and divided into following categories as given below.

Table 1: Randhawa and Pujarhari scoring system.³

Scoring factors	Minimum	Maximum	Total
Age	<50 years (0)	>50 years (1)	1
Sex	Female (0)	Male (1)	1
H/o hospitalization for acute cholecystitis	No (0)	Yes (4)	4
Clinical			
BMI wt(kg)/ht (m ²)	<25 (0)	>25(2)	2
Abdominal scar	No (0)	Infraumbilical (1), Supraumbilical (2)	2
Palpable GB	No (0)	Yes (1)	1
Sonography			
Wall thickness	Thin (0)	Thick > 4 mm (2)	2
Pericholecystic fluid	No (0)	yes (1)	1
Impacted stone	No (0)	Yes (1)	1

Table 2: Preoperative scoring system by Acharya and Adhikari.⁴

	History		Max score	Total score
Age (in year)	<60 (0)	>60 (1)	1	14
Sex	Female (0)	Male (1)	1	
H/o acute cholecystitis within 6 months	No (0)	Yes (3)	3	
H/o recurrent abdominal pain	No (0)	Yes (1)	1	
BMI (wt/ht2)	<25 (0)	>25(1)	1	
Abdominal scar	No (0)	Yes (1)	1	
Total leucocyte count	<10000 (0)	>10000 (1)	1	
Gall bladder wall thickness(mm)	<3 (0)	>3 (2)	2	
Impacted stone	No (0)	Yes (1)	1	
Stone size (mm)	<25 (0)	>25(1)	1	
Gb distension	No (0)	Yes (1)	1	

Table 3: Easy / difficult per-operative criteria used by us.³

Factors	Easy	Difficult	Very difficult
Time taken (min)	<60 min	60-120 min	>120 min
Bile / stone spillage	No	Yes	Yes
Injury to duct or artery	No	Duct only	Both
Conversion to open	No	No	Yes

Statistical analysis

Data was analysed and visualisation was done using SPSS 23 (IBM SPSS statistics [IBM corporation: NY, USA]), Python scipy and Matplotlib. Descriptive statistics were calculated with Frequency, and percentage.

Diagnostic accuracy was analysed with sensitivity, specificity, Positive predictive value, Negative predictive value, Accuracy and Chi square test were employed to analyse the data.

RESULTS

Among the 77 patients, 41 patients were aged >50 years and most of them were in the age bracket of 51-60 years. 62% of the patients were females. 55% of the patients had a BMI > 25. Thirty-five of the patients had a history of acute cholecystitis. Only one of the patients had an

upper abdominal scar. The mean total leucocyte count amount among the patients was 8508. Fifty three percent of the patients had stones of size >10 mm, among them 24.7% had impacted stones. Forty five percent of the patients had a wall thickness of >3 mm.

All the scores according to Randhawa and Pujahari scoring system and Acharya and Adhikari scorings were tallied. The minimum and maximum scores achieved were 0 and 10, 1 and 11 respectively. A mean score of 4.40 in Randhawa and Pujahari and mean score of 5.25 in Acharya and Adhikari, with a standard deviation of 2.68 and 2.671 respectively.

The Acharya and Adhikari scoring system exhibit a marginally higher range and average score relative to the Randhawa and Pujahari scoring system. Both systems, however, have similar standard deviations, suggesting a comparable distribution of scores around the mean.

Table 4: Preoperative parameters of study participants.

		N	%
Age (years)	<50	36	46.80
	>50	41	53.30
Gender	Male	29	37.70
	Female	48	62.30
BMI	<24.9	34	44.20
	>25	43	55.90
H/o acute cholecystitis	Yes	35	45.50
	No	42	54.50
Gall stone size	<10 mm	36	46.80
	>10 mm	37	53.30
Gb wall thickness	<3 mm	42	54.55
	>3 mm	35	45.50

Table 5: Distribution of preoperative scores according to the two scoring systems.

Scoring systems	Minimum	Maximum	Mean	SD
Randhawa and Pujahari	0	10	4.4	2.682
Acharya and Adhikari	1	11	5.25	2.671

Based on the preoperative scores, each of the scoring systems were further categorised into: easy - score 0-5, difficult - score 6-10 and very difficult – score 11-15 for

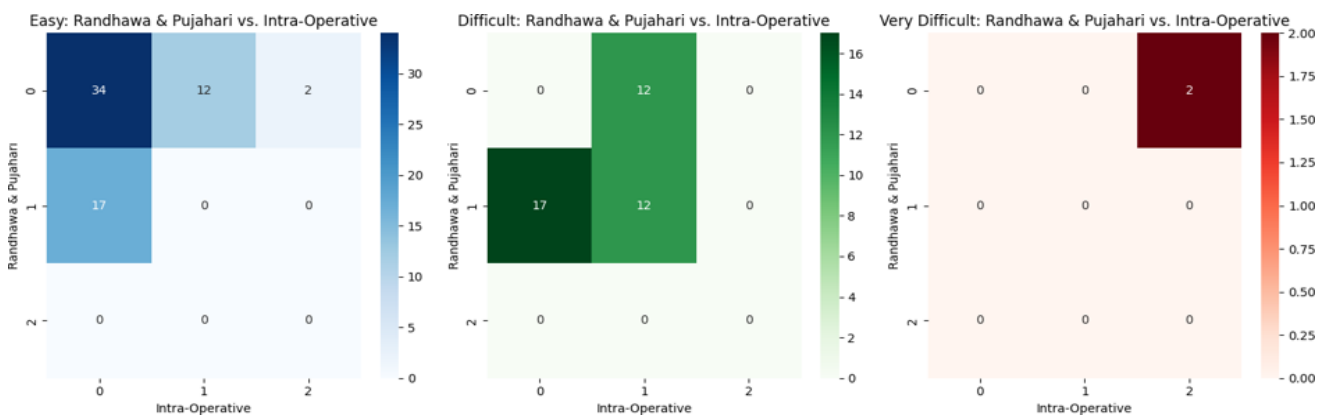
Randhawa and Pujahari scoring system. Easy – score <5 and difficult – score >5, for Acharya and Adhikari scoring system.

Table 6: Peroperative parameters and surgical outcomes.

		N	%
Time range	<60 min	26	33.80
	>60 min	51	66.20
Bile spillage	Yes	14	18.20
	No	63	81.80
Injury to duct/ artery	No	76	98.70
	Yes	1	1.30
Conversion to open surgery	Yes	2	2.60
	No	75	97.40

Table 7: Comparison of preoperative and peroperative difficulty categories.

Scoring systems	Category	N	%
Preoperative			
Randhawa and Pujahari	Easy	48	62.34
	Difficult	29	37.66
	Very difficult	0	0
Acharya and Adhikari	Easy	40	51.95
	Difficult	37	48.05
Peroperative			
Randhawa and Pujahari	Easy	24	66.20
	Difficult	51	31.20
	Very difficult	2	2.60
Acharya and Adhikari	Easy	51	66.20
	Difficult	24	31.20
	Very difficult	2	2.60

**Figure 1: Heat map showing comparison of Randhawa and Pujahari scoring vs Intraoperative parameters.**

The above pre-operative findings were compared with Intraoperative findings and the following was concluded: Acharya and Adhikari and the Randhawa and Pujahari scoring system revealed that 31.20% of the operations were difficult, 66.20% were easy, and 2.60% were very difficult, based on a total of 77 operations.

The average statistics for the Randhawa and Pujahari classification indicate a balanced but moderate overall performance with specificity (71.25%) and NPV

(71.35%) being stronger than sensitivity (37.4%) and PPV (38.88%).

This suggests better performance in ruling out rather than correctly identifying positive cases.

The average statistics for Acharya and Adhikari indicate similar performance to the Randhawa and Pujahari classification, with specificity (69.34%) and NPV (72.067%) being relatively stronger. Overall accuracy (71.42%) suggests a balanced but moderate classification performance.

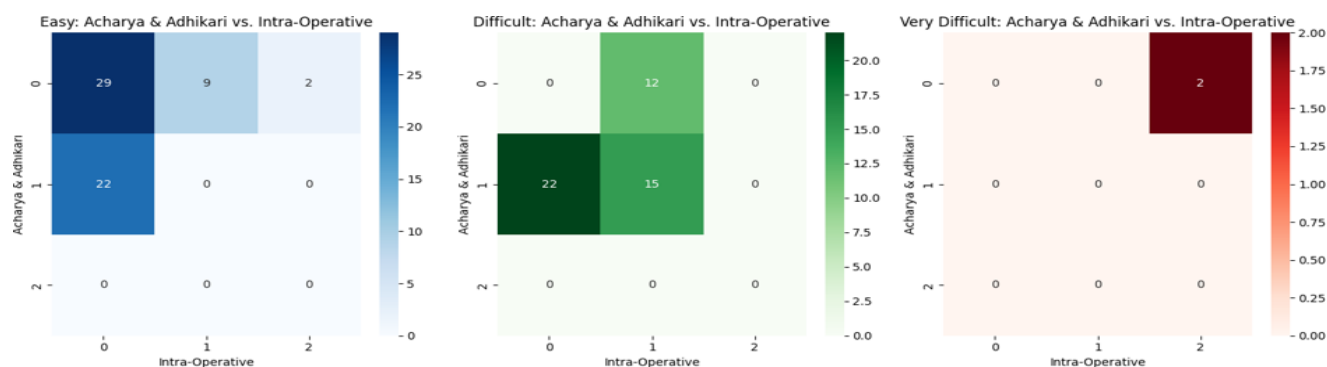


Figure 2: Heat map showing comparison of Acharya and Adhikari scoring vs Intraoperative parameters.

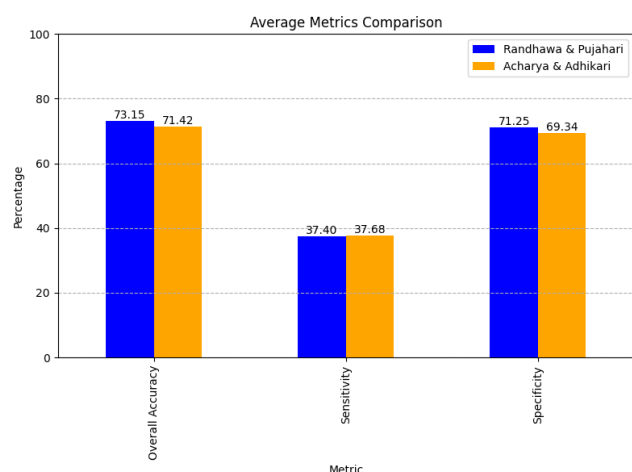


Figure 3: Comparison between two scoring systems.

On comparison, the Randhawa and Pujahari system has a slight edge in overall accuracy and specificity, while the Acharya and Adhikari system has a marginally higher sensitivity and NPV.

DISCUSSION

Open cholecystectomy was the benchmark for treatment for more than 100 years.⁶ In 1985, 103 years after the first open cholecystectomy was carried out, Prof. Dr. Erich Mühe carried out the first laparoscopic cholecystectomy.⁶ Once laparoscopic cholecystectomy was introduced, it completely transformed the surgeons practice and now is the standard of treatment for cholelithiasis. Our aim was to compare the usefulness of two preoperative scoring systems namely Randhawa and Pujahari preoperative scoring system and preoperative system by Acharya and adhikari to predict the difficulty of laparoscopic cholecystectomy. Shaique et al and Nidoni et al, in their studies stated that gall stones were predominantly seen in the 30-50 years age group and four times more prevalent in women.^{2,7,9} In our study, we found that our patients aged above 50 years (53.30%) had higher prevalence and showed female predominance.

A significant number of patients (45.5%) had a history of acute cholecystitis and recurrent abdominal pain and had

a difficult laparoscopic cholecystectomy. Gupta et al and Philip et al in their study found that past history of acute cholecystitis was a significant factor to predict difficult laparoscopic cholecystectomy.^{8,9} These cases would require a higher time for dissection of calots triangle due to adhesions. Majority of the laparoscopic cholecystectomies in our study, took longer than 60minutes, suggesting the complexity of the cases being operated. Only 18.25% of the patients had bile spillage and injury to the bile duct and cystic artery was very rare. Conversion from laparoscopic to open cholecystectomy was necessary only for 2.3 % of our patients. Conversion rate reported in literature was between 7 and 35%.¹⁰ Gupta et al had a conversion rate of 4.3% in their study and bile spillage was present in only 9 of their patients.⁸

Both scoring systems provided valuable insight, demonstrated good overall accuracy and performed well in determining the complexity of laparoscopic cholecystectomy. However, Randhawa and Pujahari scoring system had a slightly better overall accuracy and specificity compared to Acharya and Adhikari scoring system. Whereas, Acharya and Adhikari scoring system had a marginally better sensitivity and negative predictive value. This study highlights the importance for adequate preoperative assessment while planning for laparoscopic cholecystectomy. Predicting difficult cases allows for better preparation, potentially reducing the time required for surgery, complications, and the likelihood of conversion to open surgery.

Our study had a limited sample size, and was conducted in a single centre. Hence, this would affect the applicability of the study to a broader patient population or different clinical settings. There can be a potential bias in assessing the intraoperative difficulty and the study also doesn't take into account differences in expertise. Therefore, this suggests the need for further multicentre studies with larger sample size and diverse population to better validate and refine our study.

CONCLUSION

In conclusion, Randhawa and Pujahari scoring system performed slightly better compared to Acharya and

Adhikari scoring system. Both scoring systems provide us with an in-depth sight into the demographic, clinical, radiological and surgical parameters of patients undergoing laparoscopic cholecystectomy. However, both the Randhawa and Pujahari and Acharya and Adhikari preoperative scoring systems are useful tools in predicting the difficulty of Laparoscopic cholecystectomy.

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