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A study to assess the relationship of cuschieri and nassar surgical difficulty scores with duration of laparoscopic cholecystectomy.

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Abstract

Background

The most effective treatment for cholelithiasis symptoms is laparoscopic cholecystectomy. However, the intraoperative findings determine the operation difficulties. To grade operating complexity, the Cuschieri and Nassar surgical difficulty score systems are frequently employed. It may be possible to anticipate surgical difficulties and enhance perioperative planning by evaluating their correlation with operating time.

Objective

To assess the correlation between the length of laparoscopic cholecystectomy and the Cuschieri and Nassar surgical difficulty levels.

Methods

This observational study included patients undergoing elective laparoscopic cholecystectomy. Intraoperative findings were graded using both Cuschieri and Nassar scoring systems. Operative duration was recorded in minutes. Statistical analysis was performed to determine the correlation between difficulty scores and duration of surgery.

Results

Longer operating times were substantially correlated with higher Cuschieri and Nassar scores ($p<0.05$). The length of operation and rising difficulty grades were found to be positively correlated. An increase in age was associated with longer operating times and higher difficulty scores, most likely due to adhesions, fibrosis, and chronic inflammation. The participants' mean age was 41.1±12.17 years.

Conclusion

In laparoscopic cholecystectomy, the Cuschieri and Nassar grading systems both accurately predict surgical difficulties. The Nassar score, on the other hand, has a stronger relationship with the length of the operation and could be a more accurate indicator of operating complexity.

Recommendation

In order to enhance operative planning, patient counseling, surgical training, and risk management, Cuschieri and Nassar difficulty scores should be regularly implemented into clinical practice. These scores are trustworthy intraoperative predictors of operative length in laparoscopic cholecystectomy.

Keywords: *Cuschieri grading systems, Nassar grading systems, Laparoscopic cholecystectomy, Comparative analysis, cholelithiasis.*
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Introduction

People have been suffering from gallstone disease for a very long time. The most common disorder affecting the biliary system, which is in charge of moving bile throughout the body, is gallstone disease. Over the course of centuries, cholecystostomy, cholecystolithotomy, and ultimately cholecystectomy were the various methods used to treat this illness (1). Age over 65, obesity, acute cholecystitis, males, prior abdominal surgery, adhesions, a confined gall bladder, a stone impacted in Hartmann's pouch, and several gall bladder stones are the most prevalent reasons for a difficult cholecystectomy (2).

Over time, a number of rating systems have been created to forecast the difficulty of laparoscopic cholecystectomy.

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The majority of these have some predictive value and are based on preoperative clinical symptoms. Their precision is still restricted, though, until the gallbladder is directly seen during surgery, which enables a more accurate evaluation of surgical difficulty. Intraoperative grading techniques are comparatively rare and less frequently used than preoperative rating systems (2).

A frequent surgical treatment with differing degrees of operating difficulty is laparoscopic cholecystectomy (LC). Surprisingly few grading systems exist for evaluating intra-operative difficulty, and none of them have become widely used in clinical settings. Creating a simple grading system could have a number of important advantages, including better risk assessment, standardized reporting guidelines, improved study comparability, and optimized surgical planning(4).
The Nassar, Cuschieri, Parkland, and Sugrue scales are some of the commonly used surgical difficulties scoring systems. However, the length of operation is the most objective metric frequently used to evaluate surgical difficulties. Therefore, it is reasonable to predict that a longer surgery will be the outcome of a higher grade of surgical difficulty (5).
To test this assumption statistically was the aim of our prospective study. The goal of the current study was to determine the statistical relationship between the length of laparoscopic cholecystectomy and the two most often used difficulty scoring systems, Nassar and Cuschieri.

Methods

STUDY SITE

Central Referral Hospital, a teaching hospital with 500 beds connected to the Sikkim Manipal Institute of Medical Sciences in Gangtok, Sikkim, has a general surgery department.

STUDY DESIGN:

The study was a prospective observational study

STUDY DURATION:

1-year 6 months

STUDY POPULATION

The population group consisted of patients who had elective cholecystectomy procedures during the study period. Every year, Central Referral Hospital at Sikkim Manipal Institute of Medical Sciences in Gangtok performed over 500 cholecystectomies.

SELECTION CRITERIA

The research included all individuals who had laparoscopic cholecystectomy procedures performed between May 2023 and April 2024. Patients who consented to participate in the trial were all enrolled.

Inclusion Criteria:

1. Patients who underwent elective laparoscopic cholecystectomy.

Exclusion Criteria:

1. Patients who do not provide consent for participation in the study
2. Patients with jaundice
3. Pregnant patients
4. Patients with gall bladder malignancy
5. Patients in whom there was any deviation from the proposed procedure of laparoscopic cholecystectomy
6. Equipment failure affecting duration of surgery

SAMPLE SIZE

At Central Referral Hospital SMIMS, Gangtok, about 500 laparoscopic cholecystectomies of varying degrees of difficulty were performed during the study period. The study comprised all consecutive patients who gave their consent for an elective laparoscopic cholecystectomy during the study period. For this study, data for at least 300 patients were gathered, taking into account a 30–40% post-recruitment drop-off rate because of exclusion criteria or consent rejection.

Standardization of scoring criteria

To reduce subjective interpretation and inter-observer variability, Cuschieri and Nassar ratings were applied using precise definitions and consistent procedures.

Inclusion of consecutive cases

To minimize selection bias, all eligible patients undergoing laparoscopic cholecystectomy during the research period were included.

Adjustment for confounding variables

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To reduce the impact of confounding on operating length, pertinent patient and surgical characteristics (such as comorbidities and surgeon experience) were documented and taken into account during analysis.

DATA ANALYSIS

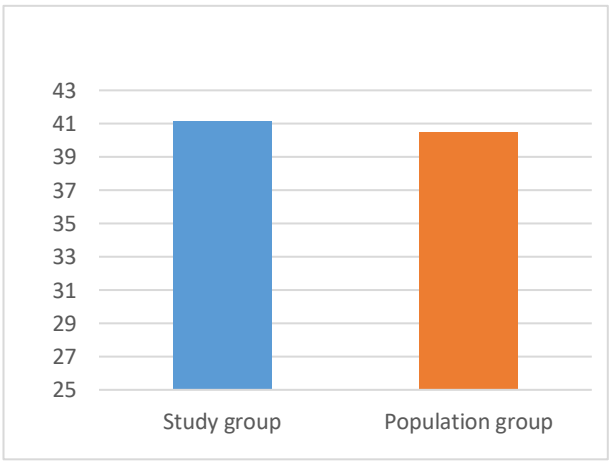
Google Sheets and Microsoft Excel were used to enter the data, while SPSS® version 27 was used for analysis. Where appropriate, data was presented graphically. The right methods were applied to the analysis. Pearson's approach was used to perform statistical correlation. The chi-squared test was used to analyze categorical data. Data were compared using ANOVA and the student T test. Non-parameter tests such as the Mann Whitney U test and chi-squared were used to compare nominal data. The categorical variables were shown as frequency and percent, while the continuous variables were shown as mean and standard deviation. For every statistical test, the significant cut-off p-value was ≤0.05.

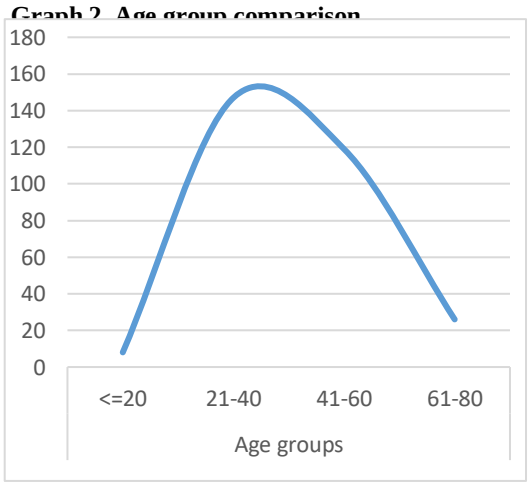
Results

Table 1. Comparison of age

	Study group	Population group	p-value (paired -Samples T test)
Age (in years)	41.1±12.17	40.5± 11.26	0.93

The study and population groups' mean ages are contrasted in this table. The similar mean ages show that the groupings are homogeneous. There is no statistically significant difference, according to the p-value of 0.93. This minimizes age-related confounding and guarantees comparability. All groups have a balanced age distribution.





Graph 1. Age comparison (in years)

The age distribution and participant grouping are shown graphically in these graphs. They demonstrate that the majority of patients are in the middle age range. The consistency between study and population groups is emphasized by the graphical approach. It validates Table 1's findings. It is possible to deduce age-related trends in surgical complexity.

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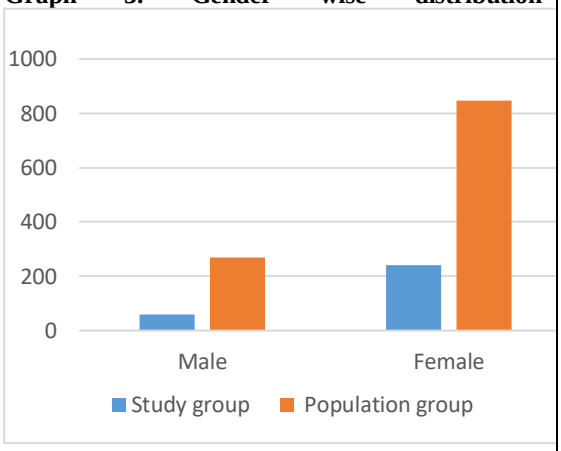
Table 2. Gender comparison

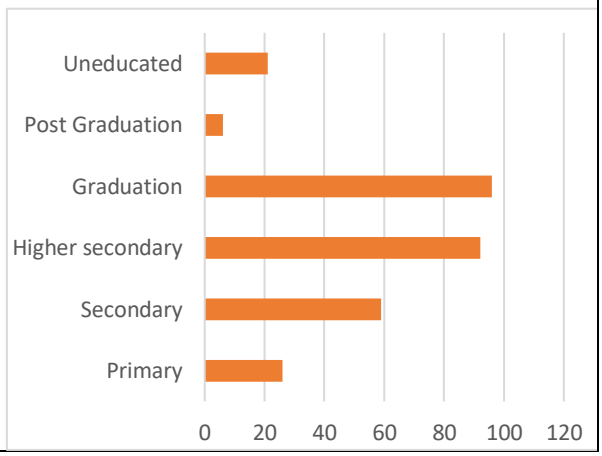
	Male	Female	p-value [χ^2 test]
Study group	59	241	0.10
Population group	269	847	

The gender distribution in the study and demographic categories is shown in this table. In both groups, women make up the majority. There is no discernible gender difference, according to the p-value of 0.10. This implies that the distribution of genders is similar. It lessens prejudice based on gender.

Graph 3. Gender wise distribution



Graph 4. Education status of patients under study



The majority of patients are female, as seen in Graph 3. Participants' varied levels of schooling are displayed in Graph 4. These illustrations aid with comprehending demographic traits. They offer context for analyzing health-seeking behavior and patient awareness. They both play a part in population profiling.

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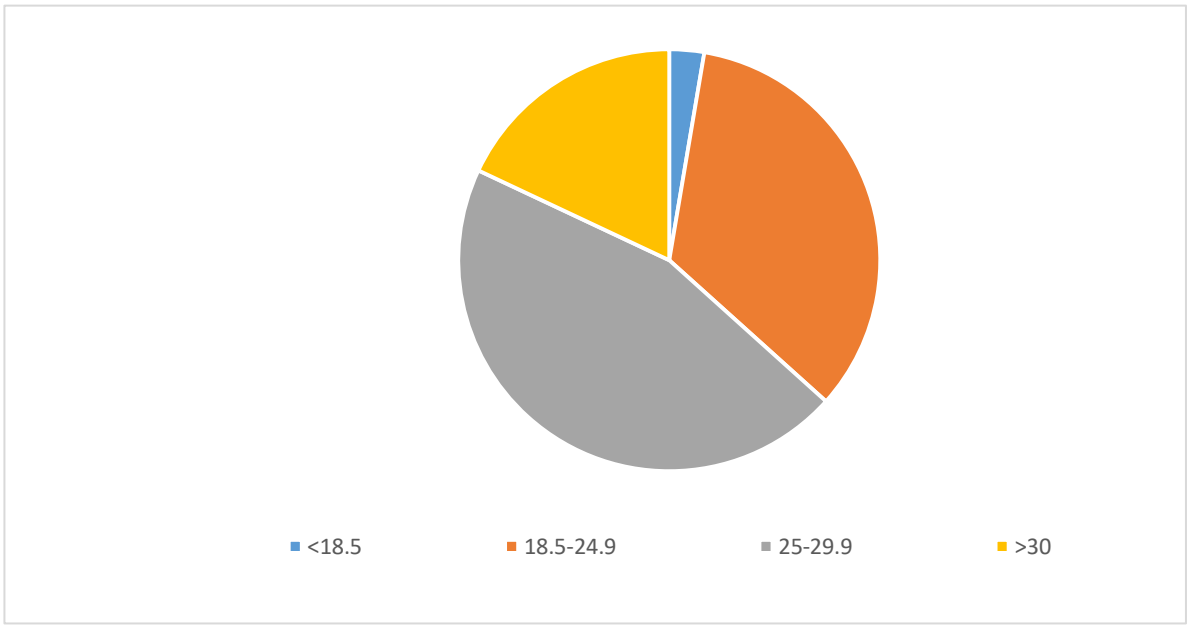
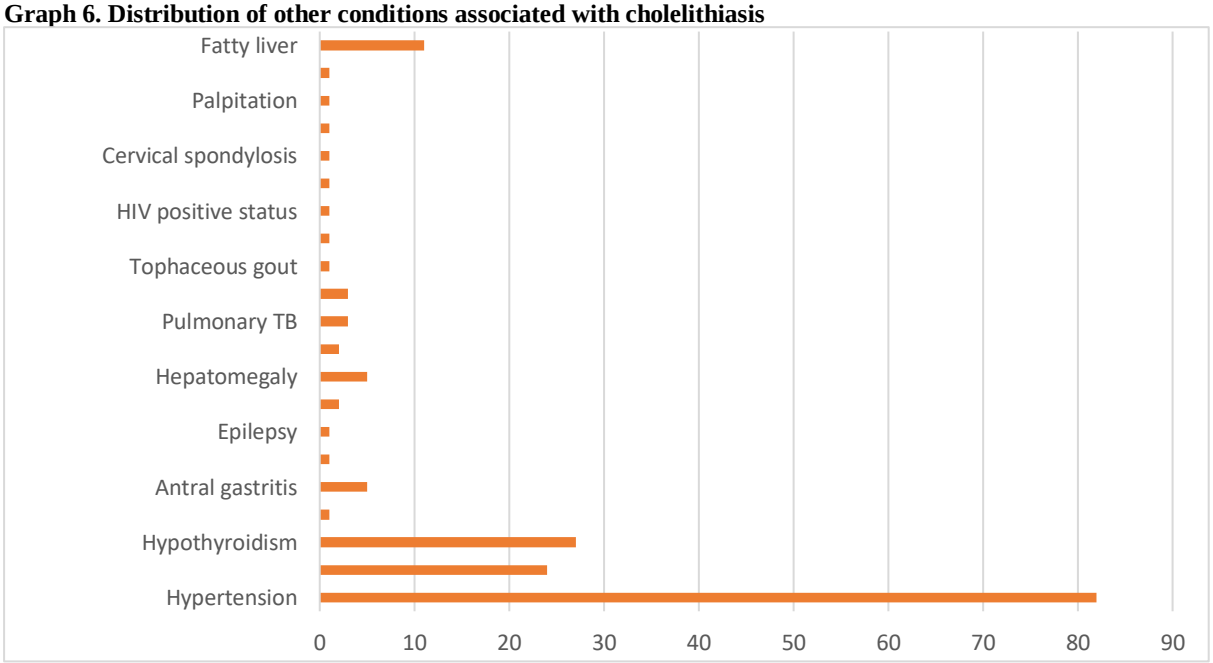
Graph 5. BMI distribution in study group



Graph 6. Distribution of other conditions associated with cholelithiasis



Graph 7. Distribution of Comorbidities in study group

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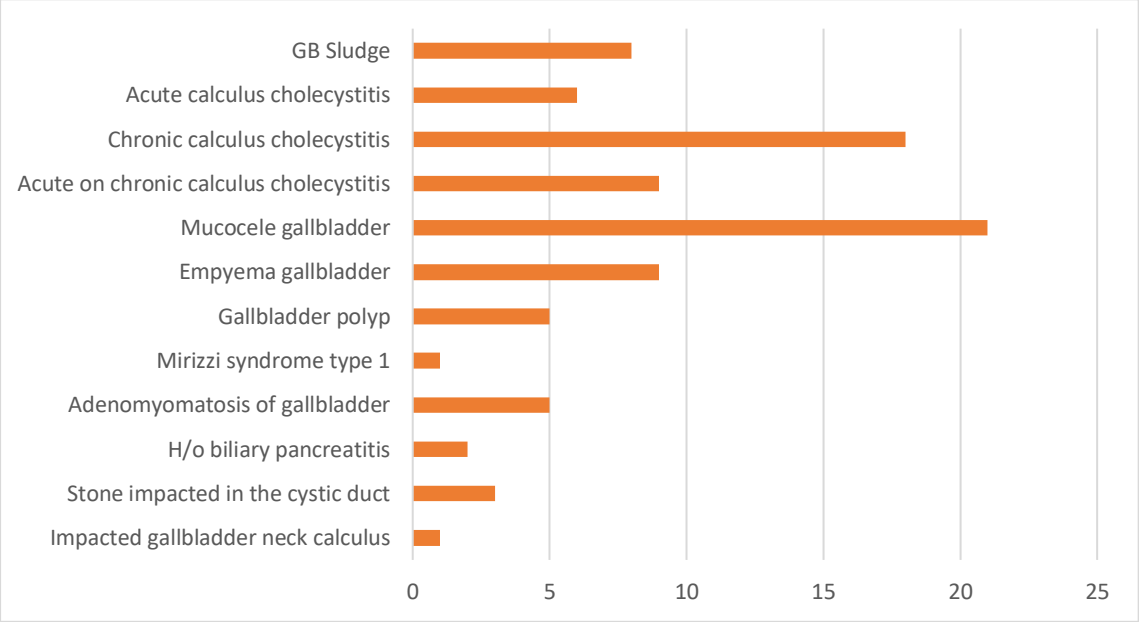
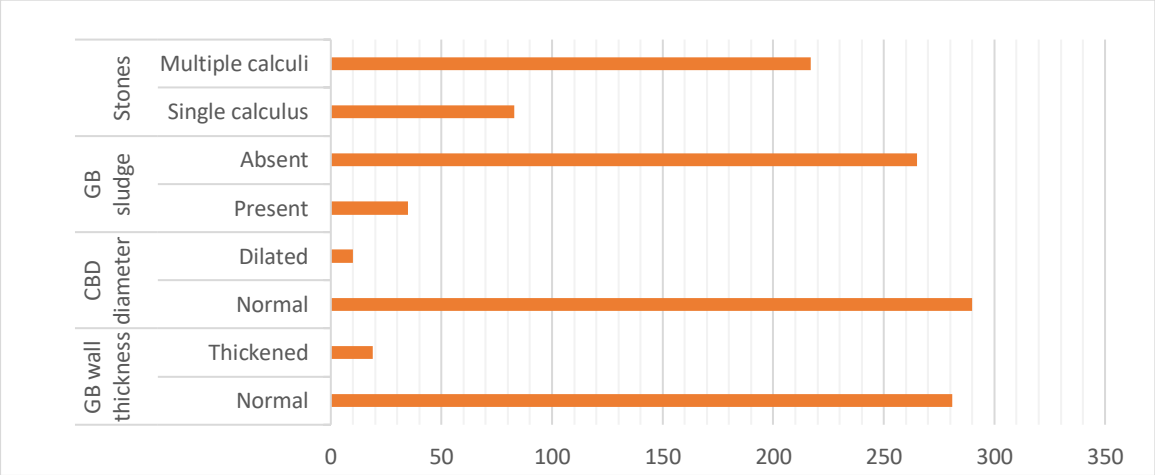


Graph 8. Ultrasound findings



The clinical features of the patients are summarized in these graphs. The majority of patients fall within normal to overweight ranges, according to the BMI distribution. Diabetes and hypertension are common comorbidities. Gallbladder pathology patterns are highlighted by ultrasound findings. When combined, they shed light on the risk profiles of patients.

Table 3. Distribution of mean duration of surgery with Nassar and Cuschieri scale

Scoring system	Score	Mean duration of surgery (in minutes)	p-value (ANOVA test)	Spearman ranked	p-value

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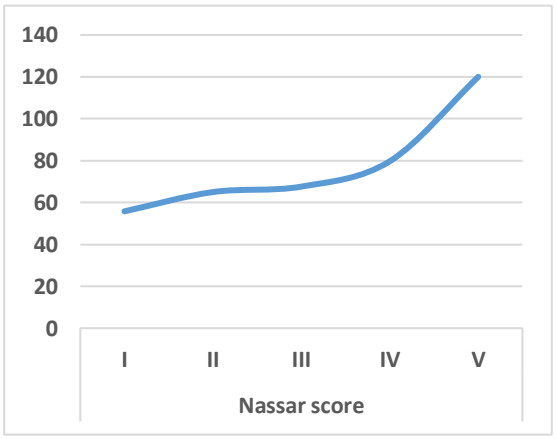
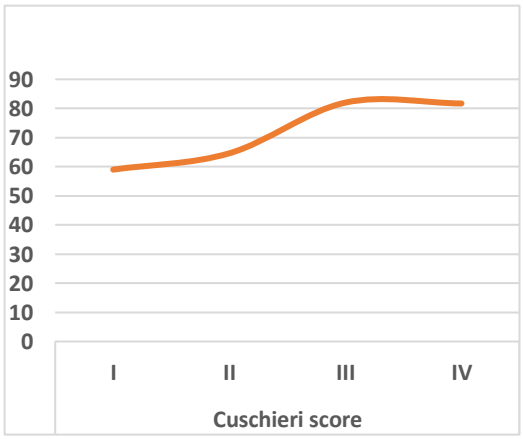
				correlation coefficient	
Nassar	I	55.8±16.85	9.647×10^{-8}	0.30	1.714×10^{-7}
	II	65.0±22.17			
	III	67.6±21.53			
	IV	79.7±25.70			
	V	120.0±0.00			
Cuschieri	I	59.0±17.63	5.752×10^{-10}	0.30	1.032×10^{-7}
	II	64.6±21.07			
	III	82.0±27.53			
	IV	81.7±7.64			
Overall Mean		65.0±22.31			

Graph 9. Mean duration of surgery vs Nassar score



Graph 10. Mean duration of surgery vs Cuschieri score



The average operating time for various Cuschieri and Nassar grades is displayed in this table. Higher scores are accompanied by a noticeable rise in length. Strong significance and a positive association are shown by statistical testing. It confirms that longer procedures are associated with greater difficulty. Nassar scoring indicates a little higher correlation.

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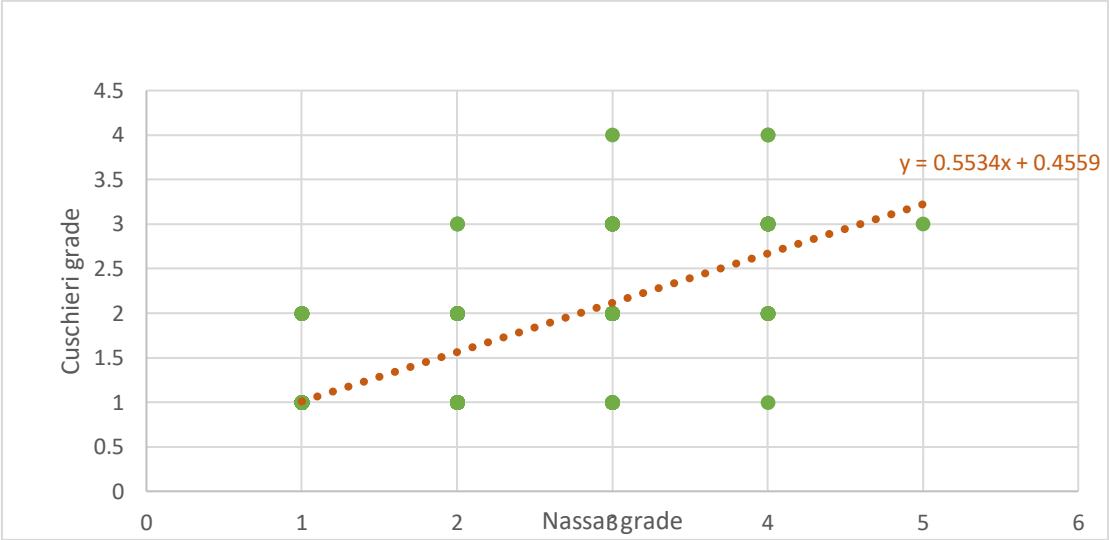

Graph 11. Relationship of Nassar and Cuschieri difficulty scores

The link between operative time and difficulty grades is shown in these graphs. As scores rise, there is a clear upward tendency. The graphic illustration supports statistical conclusions. It draws attention to how predictable both scoring systems are. The gradient in Nassar is more steady.

Table 4. Relationship of Nassar and Cuschieri difficulty scores

Correlation	Spearman coefficient	p-value
Nassar vs Cuschieri scores	0.70	2.546×10^{-4}

The association between Nassar and Cuschieri scores is shown in this table. There is a significant positive association (0.70). Statistical importance is confirmed by the significant p-value. It shows that the two scoring systems are similar. Their concurrent clinical usage is supported by this.

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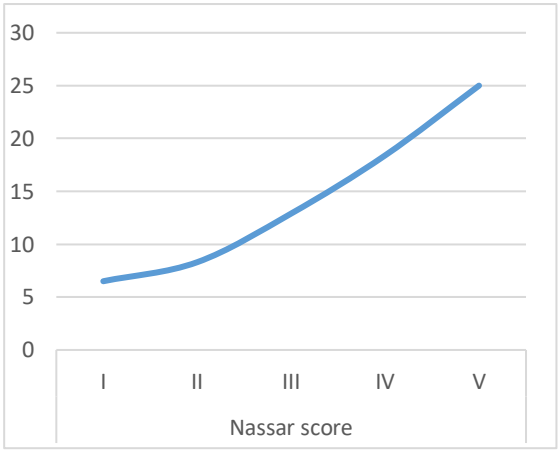
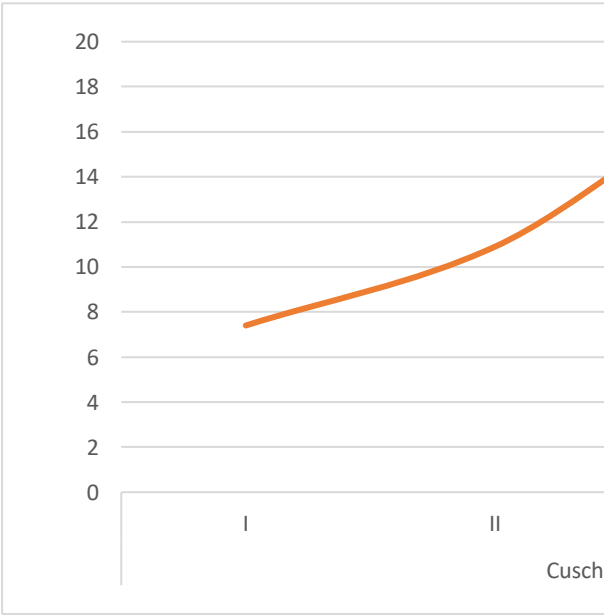
Graph 12. Mean blood loss volume (mL) vs Nassar score



The high correlation between the two scoring systems is seen graphically in this graph. The linear trend shows that the scores are in accord. It supports Table 4's statistical conclusions. The graph illustrates how surgical complexity is consistently graded.

Graph 13. Mean blood loss volume (mL) vs Cuschieri score



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Scoring system	Score	Mean Blood loss volume (mL) (Blood loss volume ± S.D)	p-value (ANOVA test)
Nassar	I	6.5±2.57	2.846×10^{-37}
	II	8.3±4.24	
	III	12.9±5.00	
	IV	18.4±6.02	
	V	25.0±0.00	
Cuschieri	I	7.4±3.75	1.937×10^{-33}
	II	10.9±5.20	
	III	17.5±5.03	
	IV	18.7±5.51	
Total		10.4±5.84	-

Table 5. Relationship of Nassar and Cuschieri difficulty scores with intraoperative blood loss

Higher difficulty scores are associated with an increase in intraoperative blood loss, as shown in this table. There is a strong correlation between the two scoring systems. Greater surgical complexity is correlated with higher grades. The results validate these scores' predictive significance. Intraoperative risk is reflected in it.

These graphs show how blood loss increases as scores rise. Both score systems show the same pattern. Interpretation is strengthened by visual depiction. It highlights the difficulty grading's clinical significance. Once more, Nassar demonstrates a more distinct progression.

Table 6. Distribution of difficulty scores with intraoperative GB content spillage

Scoring system	Score	Gallbladder spillage		p-value [χ^2 test]
		Present	Absent	
Nassar	I	17	67	0.001
	II	23	67	
	III	33	58	
	IV	19	15	
	V	1	0	
Cuschieri	I	36	111	0.001
	II	26	71	
	III	28	25	
	IV	3	0	

Gallbladder content spilling across difficulty grades is assessed in this table. Higher ratings indicate a higher spilling incidence. There is a statistically significant correlation. In higher grades, it suggests more operational difficulties. Similar patterns can be seen in both scoring systems.

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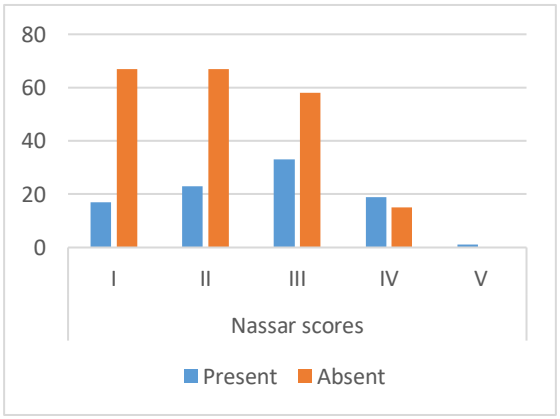
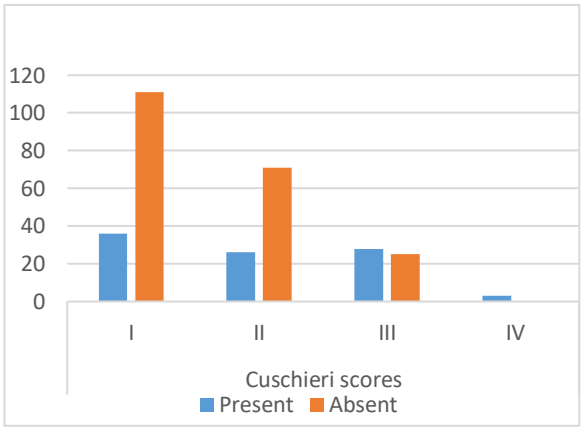
Graph 14. Nassar score vs GB content spillage



Graph 15. Cuschieri score vs GB content spillage



These graphs show that as difficulty scores rise, leakage increases. Tabulated data is supported by the visual trend. It draws attention to intraoperative issues. At higher grades, the pattern becomes more noticeable. This highlights the need for surgical vigilance.

Table 7. Distribution of difficulty scores with Iatrogenic injuries

Scoring system	Score	Iatrogenic injuries		p-value [χ^2 test]
		Present	Absent	
TNassar	I	0	84	0.68
	II	0	90	
	III	1	90	
	IV	0	34	
	V	0	1	
Cuschieri	I	0	147	0.20
	II	0	97	
	III	1	52	
	IV	0	3	

The association between difficulty scores and iatrogenic injuries is evaluated in this table. Overall, very few injuries are documented. There is no discernible correlation. This implies that despite greater difficulties, surgical outcomes are safe. It is an example of good surgical technique.

Discussion

In this prospective observational study, 500 patients undergoing elective laparoscopic cholecystectomy between May 2023 and November 2024 had their operational outcomes and Cuschieri and Nassar difficulty scores assessed. Assessing their relationship to the length of operation was the main goal, with correlation with intraoperative data being one of the secondary goals (2).

The participants' mean age was 41.1±12.17 years, and an increase in age was linked to longer operating times and greater difficulty scores, most likely as a result of adhesions, fibrosis, and chronic inflammation. Although there was a gender preponderance (male:female = 1:4.08), male patients tended to have more operating difficulty,

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which is in line with earlier research that attributes this to stronger gallbladder walls and severe inflammation. The most prevalent comorbidity was hypertension, which was followed by diabetes mellitus and hypothyroidism (6). Operative length showed a substantial positive connection with both the Nassar and Cuschieri difficulty scores. Longer procedures were linked to higher grades in both systems, indicating a greater level of technical complexity. However, the Nassar score seems to be better at assessing surgical difficulty when operative time was taken into account as an objective criterion. The two scoring systems also showed a strong connection, indicating that both are trustworthy instruments for intraoperative evaluation, while the Nassar system might offer more thorough operational insights (7).

Increased intraoperative blood loss was substantially correlated with higher difficulty scores, most likely as a result of acute inflammation, thick adhesions, and deformed anatomy (8). Gallbladder content spills were also more common in higher grades, albeit there was some discrepancy between the results from the two scoring systems. There was just one instance of bile duct damage, and there was no correlation between iatrogenic injury and difficulty scores (9). The study backs up the usefulness of both scoring systems overall, with the Nassar scale showing higher prediction value for operative complexity and length.

Conclusion

In conclusion, longer operating times for laparoscopic cholecystectomy are substantially correlated with higher surgical difficulty scores, which indicate more intraoperative difficulties and technical complexity. There is a strong and comparable capacity to evaluate surgical difficulty across the Nassar and Cuschieri scoring systems, and there is a considerable correlation between them. However, the Nassar difficulty score seems to be better in predicting surgical complexity when operative duration is utilized as an objective standard for comparison. As a result, even if both scoring systems are trustworthy instruments for intraoperative evaluation, the Nassar score might be more useful in predicting the length of the procedure and its general difficulty.

Generalizability:

The results of this cross-sectional study can be applied to analogous clinical situations where laparoscopic cholecystectomy is frequently carried out with similar surgical skills and techniques. In hospitals with comparable patient profiles and perioperative procedures, the correlation between Cuschieri and Nassar difficulty scores and operating time is probably valid. However, in environments with varying surgeon experience, resource availability, or case complexity, generalizability might be constrained. Applicability may also be impacted by differences in patient characteristics, such as comorbidities and disease severity. As a result, even if the findings offer helpful direction, care must be used when extrapolating to various healthcare settings.

Limitations of the study

The capacity to determine causal correlations between Cuschieri and Nassar surgical difficulty scores and operative duration is limited by the cross-sectional study's data collection at a single point in time. The results might not be very generalizable, especially if they were carried out at a single facility with specialized surgical procedures and patient demographics. Due to the subjective intraoperative evaluation used in both scoring systems, observer bias and inter-surgeon variability may be introduced. As a confusing factor, variations in the experience and skill level of surgeons may have a substantial impact on operating time. Furthermore, it may not be possible to completely control patient-related factors such comorbidities, body mass index, previous abdominal procedures, and the degree of inflammation. The length of an operation can also be impacted by differences in surgical methods, tools, and perioperative procedures. Statistical power may be diminished by a small sample size. Additionally, the dependability of results may be impacted by the inclusion of instances during the learning curve phase and possible errors in data recording.

Recommendation

By strengthening patient safety frameworks, maximizing healthcare resource usage, increasing training stratification, and improving operational planning, the incorporation of Cuschieri and Nassar difficulty scores into standard laparoscopic cholecystectomy practice has significant translational potential. Standardized risk-adjusted surgical performance indicators can be developed using their predictive value for operative duration.

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List of abbreviations:

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GB	Gall bladder
LC	Laparoscopic cholecystectomy
ANOVA	Analysis of variance
ML	Mili litre
SD	Standard deviation
BMI	Body mass index

Source of funding:

None

Conflict of interest:

Author has declared no conflict of interest.

Availability of data

Data is available upon request from the corresponding author

Author contributions:

All author contributed equally in concept, data collection, analysis, manuscript preparation.

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Kumar Nishant is a Professor and HOD in the Department of General Surgery, Sikkim Manipal Institute of Medical Sciences.

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