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A PROSPECTIVE STUDY OF SURGICAL COMPLICATIONS (CLAVIEN DINDO) IN GENERAL SURGERY PATIENTS

Nikhil Kumar Chowdhry K[1], Yogeshwari[2], Bengali Ashwini[3] Khalid Muqueem[4]

[1]Senior Resident, Dept of General Surgery JJMC Davangere, India
[2]Senior Resident, Depr of General Surgery, GIMS Kalburgi, India
[3]Junior Resident, General Surgery, BMCRC Bellary, Karnataka, India
[4]Professor & Unit Chief, Department of General Surgery, BMCRC Bellary, Karnataka, India

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Corresponding Author:

Dr. Nikhil Kumar Chowdhry K
Senior Resident, Dept of General Surgery JJMC Davangere, India.

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ABSTRACT

Objective: BACKGROUND: Surgical complications are a common and distressing part of operative care, often affecting patient recovery and quality of life. To standardize the assessment of such complications, Clavien et al. introduced a classification system in 1992, later modified as the Clavien-Dindo system in 2004. This system grades complications based on the treatment required, from minor issues to patient death. It is widely accepted for its simplicity, reliability, and use in surgical audits and research. The present study aims to apply this system to effectively evaluate surgical and procedural adverse effects.
OBJECTIVES: Primary objective: Mainly to grade postoperative surgical complications in the department of general surgery.Secondary objectives: Length of hospital stay, morbidity, and mortality in patients undergoing elective and emergency surgeries.
RESULTS: Most complications were minor (Grades I–II, 73.6%), while severe complications (Grade III and above) occurred in 10.53% of patients. The highest complication rates were observed in patients aged 51–60years, with comorbidities like hypertension and diabetes seen in 58.95% of cases. The Clavien-Dindo classification proved reliable for grading and managing complications.
CONCLUSION: The study highlights the utility of the Clavien-Dindo classification in effectively grading surgical complications. It underscores the importance of risk stratification based on age and comorbidities and calls for enhanced perioperative protocols to improve patient outcomes.

Keywords*: Clavien-Dindo classification, surgical complications, general surgery, postoperative outcomes, morbidity, mortality, comorbidities, risk stratification, perioperative care, prospective study.*

INTRODUCTION

Surgical procedures are indispensable in the treatment and management of various diseases, providing curative, palliative, and preventive benefits to patients across the globe. However, they are inherently associated with a spectrum of postoperative complications that can impact recovery, prolong hospitalization, increase healthcare costs, and, in severe cases, lead to mortality. Therefore, the accurate assessment, classification, and reporting of surgical complications are vital for enhancing patient safety, driving quality improvement, and benchmarking outcomes both within and across healthcare systems. To address this need, several classification systems have been developed over the years, with the Clavien-Dindo classification emerging as one of the most widely accepted and implemented frameworks worldwide. Originally introduced by Clavien et al. in 1992 and modified by Dindo et al. in 2004, the Clavien-Dindo classification provides a standardized, objective, and reproducible method of categorizing surgical complications based on the type of therapeutic intervention required rather than subjective clinical impressions. It ranks complications from Grade I, which includes minor deviations from a normal postoperative course, to Grade V, representing patient death.

This systematic approach is particularly useful because of its simplicity, clarity, and applicability across a range of surgical disciplines—from general to specialized fields such as hepatobiliary, colorectal, and vascular surgery. As the healthcare landscape increasingly moves toward value-based care and outcome-driven reimbursement, the need for consistent

documentation and grading of complications has become more pressing. Utilizing a validated system like Clavien-Dindo allows clinicians and researchers to identify trends, assess risk factors, and uncover preventable causes of morbidity, all of which contribute to more informed clinical decision-making and healthcare policy development. Furthermore, consistent complication grading fosters better multidisciplinary collaboration among surgical teams, anesthetists, critical care providers, and nursing staff, ultimately aiming to reduce postoperative morbidity and mortality. In recent years, prospective studies have validated the use of Clavien-Dindo in general surgery cohorts, reinforcing its practical relevance across different healthcare settings. Nevertheless, gaps still exist in population-specific data, especially in low- and middle-income countries, which highlights the importance of conducting context-specific research.

Additionally, modern advancements such as Enhanced Recovery After Surgery (ERAS) protocols, minimally invasive techniques, and improved perioperative care demand ongoing assessment of complication patterns using robust tools. The present study aims to prospectively evaluate the incidence, types, and severity of postoperative complications in general surgery patients using the Clavien-Dindo classification. By systematically documenting these outcomes and the corresponding therapeutic responses, this research intends to generate valuable insights into the burden of surgical morbidity and support continuous improvements in surgical care.

MATERIALS AND METHODOLOGY

Study Overview
Location: Department of General Surgery, BMCRC, Ballari

Duration: 1.5 years (June 1, 2023 – November 30, 2024)

Design: Prospective observational study

- **Inclusion Criteria**

Patients aged 13–80 years
Undergoing open general surgeries (elective or emergency)
Provided informed consent

- **Exclusion Criteria**

Surgeries from other specialties (ENT, Ophthalmology, Ortho, Neurosurgery)
Patients <13 years, pregnant women, and polytrauma cases

Method of Data Collection
Postoperative complications assessed using Clavien-Dindo Classification:

Grade I–V, based on intervention required (ranging from minor deviation to death)

Sample Size

Sample size was calculated using the following formula:

n=Z2.p(1−p)h2n=h2Z2.p(1−p)

- **Estimated proportion (p)**
- **Confidence level**
- **Z-value (for 95% confidence level)**
- **Absolute precision (h)**

Calculated using 12.5% complication prevalence with 7% margin of error

Minimum sample size: 86 patients

Sampling Method
Consecutive sampling: all eligible patients during the study period were included

Statistical Analysis
Data entry in Excel; analyzed with SPSS v28

Categorical data: frequency, %, Chi-square/Fisher's Exact Test

Quantitative data: Mean ± SD, Unpaired t-test $p < 0.05$ considered significant

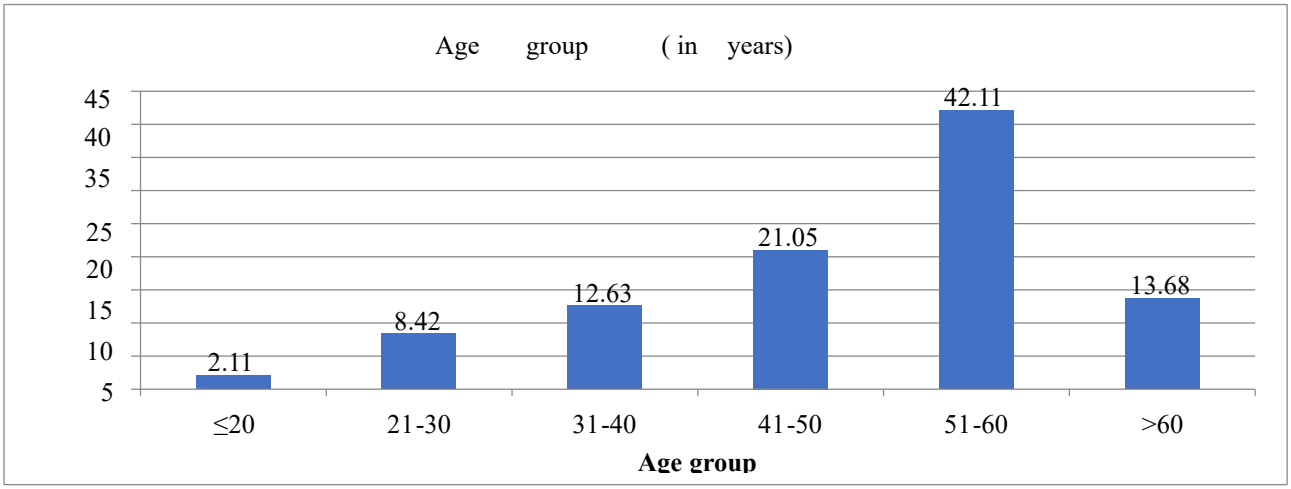
Study Outcomes
Primary: Grade surgical complications using the Clavien-Dindo system

Secondary: Evaluate length of hospital stay, morbidity, and mortality

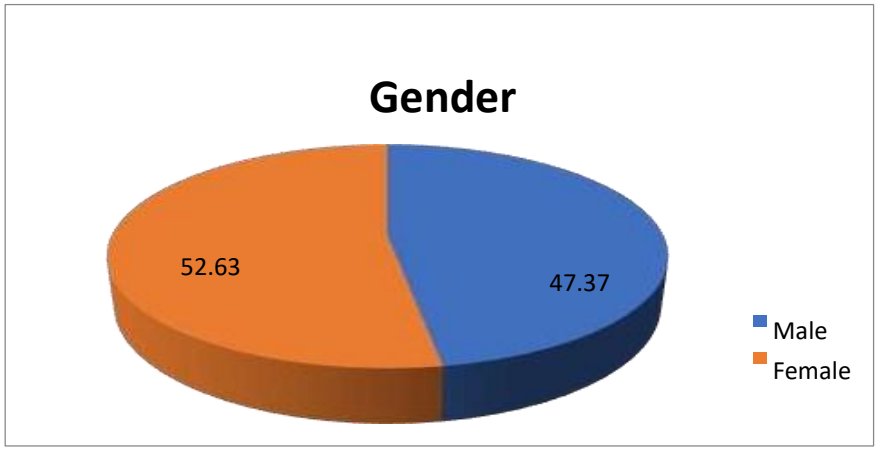
Side Effects: Not applicable.

RESULTS

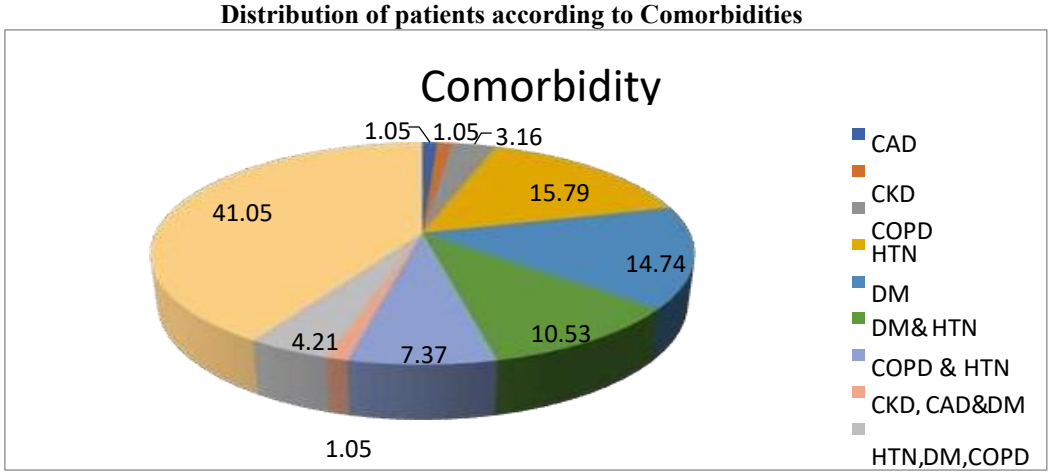
Age Distribution



Gender distribution



Distribution of patients according to Comorbidities



Comorbidity pattern in patients

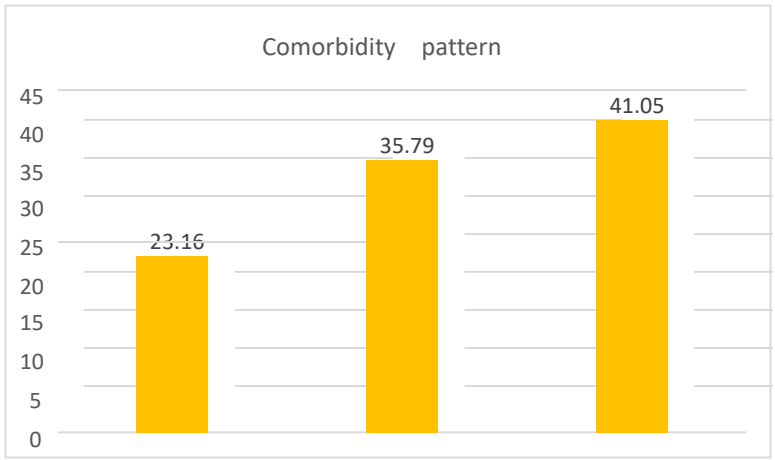


Table 5: Distribution of cases according to diagnosis

Diagnosis	No of cases	Percentage
ACUTE APPENDICITIS	13	13.68
CARCINOMA BREAST	10	10.53
CARCINOMA MIDDLE THIRD OF OESOPHAGUS	1	1.05
CHOLANGIOCARCINOMA	2	2.11
DIABETIC FOOT	6	6.32
FIBRODENOMA	6	6.32
HALLOW VISCUSS PERFORATION (PRE PYLORIC/ DUODENAL)	11	11.58
HYDROCELE	9	9.47
ILEAL PERFORATION	4	4.21
LEFT/ RIGHT SIDED INGUINAL HERNIA	13	13.68
MULTINODULAR GOITRE	5	5.26
SOLITARY NODULE OF THYROID	7	7.37
ANTERIOR WALL HERNIA	8	8.42
Total	**95**	**100.00**

Table 6: Distribution of patients according to the pattern of Procedure.

Procedure	No of patients	Percentage
AMPUTATION	6	6.32
NEAR TOTAL THYROIDECTOMY	5	5.26
EXCISION BIOPSY	7	7.37
EXPLORATORY LAPAROTOMY WITH RESECTION AND ANASTOMOSIS	4	4.21
GRAHAMS PATCH REPAIR	11	11.58
HEMITHYORIDECTOMY	7	7.37
JOBOULAY'S	9	9.47
MESH REPAIR	3	3.16

MODIFIED RADICAL MASTECTOMY	10	10.53
OPEN APPENDICECTOMY	13	13.68
RETRORECTUS MESH REPAIR	4	4.21
TENSION-FREE HERNIOPLASTY	13	13.68
TRANSHIATAL OESOPHAGECTOMY WITH OESOPHAGOGASTROSTOMYs	1	1.05
WHIPPLES	2	2.11
Total	**95**	**100.00**

Figure 7: Total number of patients in various grades of complications

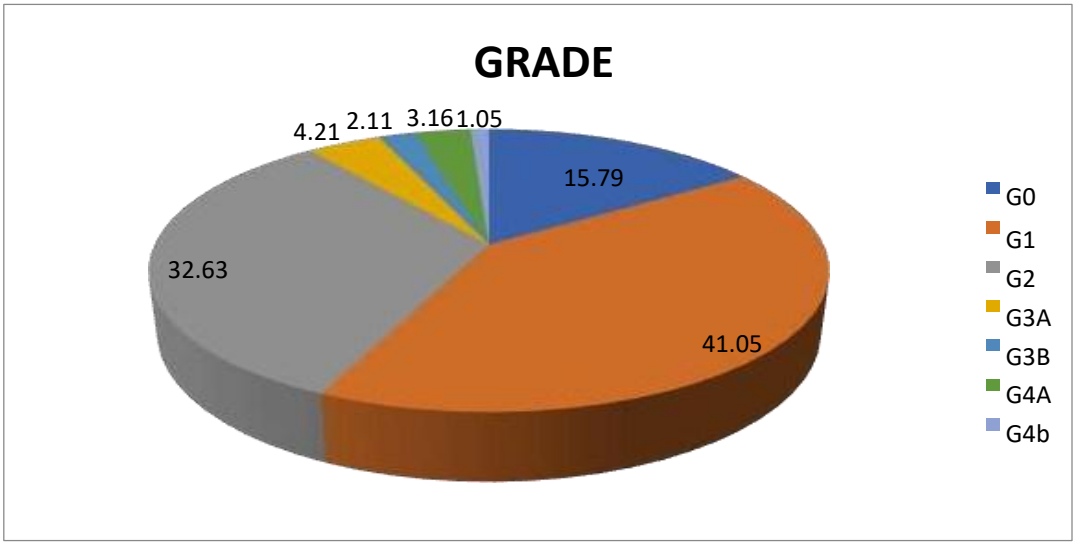


Table 8: Grade vs Procedure

Diagnosis	G0	G1	G2	G3A	G3B	G4A	G4B	Total
ACUTE APPENDICITIS	1	5	7	0	0	0	0	13
CARCINOMA BREAST	0	3	3	1	1	1	1	10
CARCINOMA MIDDLE THIRD OF OESOPHAGUS	0	0	1	0	0	0	0	1
CHOLANGIOCARCINOMA	0	1	0	0	0	1	0	2
DIABETIC FOOT	1	1	4	0	0	0	0	6
FIBRODENOMA	1	2	3	0	0	0	0	6
HALLOW VISCUSS PERFORATION	1	6	4	0	0	0	0	11
HYDROCELE	3	5	1	0	0	0	0	9
ILEAL PERFORATION	0	0	1	1	1	1	0	4
LEFT/ RIGHT SIDED INGUINAL HERNIA	3	6	4	0	0	0	0	13
MULTINODULAR GOITRE	1	4	0	0	0	0	0	5
SOLITARY NODULE OF THYROID	1	3	1	2	0	0	0	7
ANTERIOR ABDOMINAL WALLL HERNIA	3	3	2	0	0	0	0	8
Total	15	39	31	4	2	3	1	95

Table 8: Zero comorbidity vs Grade

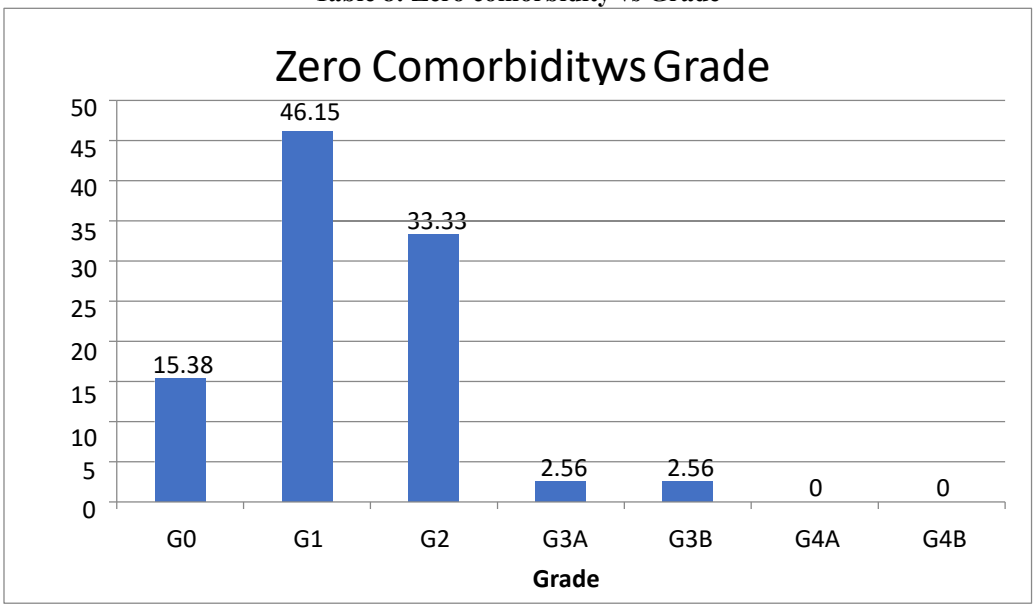
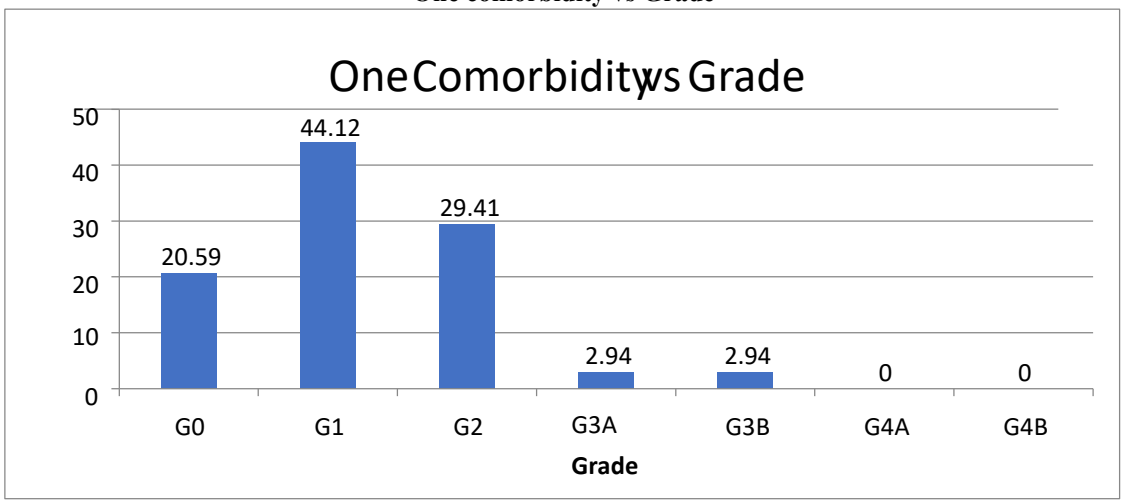


FIGURE 8

One comorbidity vs Grade



Two or more than two Comorbidity vs Grade

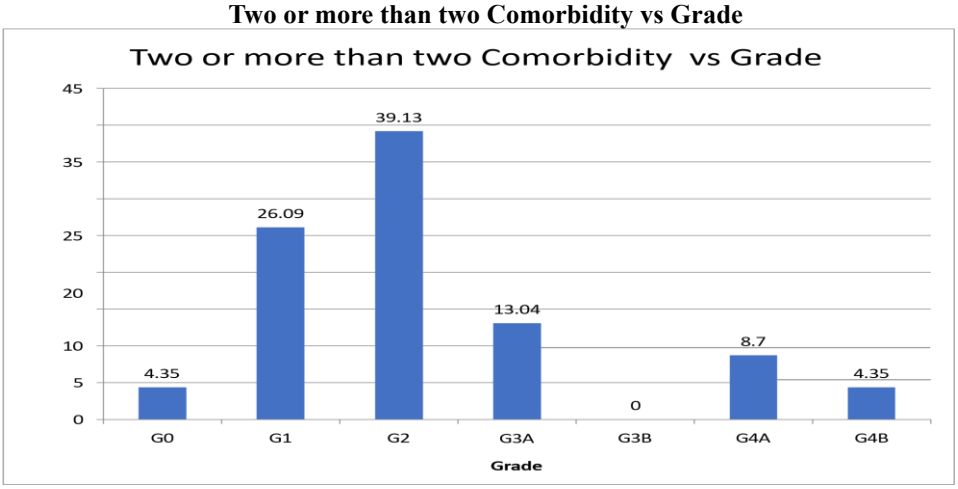


FIGURE 10

Table 12: Procedure vs Grade

Procedure	Grade							Total
	G0	G1	G2	G3A	G3B	G4A	G4B	
AMPUTATION	1	1	4	0	0	0	0	6
EXCISION BIOPSY	2	2	3	0	0	0	0	7
EXPLORATORY LAPAROTOMY WITH RESECTION AND ANASTOMOSIS	0	0	1	1	1	1	0	4
GRAHAMS PATCH REPAIR	1	6	4	0	0	0	0	11
HEMITHYORIDECTOMY	1	3	1	2	0	0	0	7
JOBOULAY'S	3	5	1	0	0	0	0	9
MESH REPAIR	1	0	2	0	0	0	0	3
MODIFIED RADICAL MASTECTOMY	0	3	3	1	1	1	1	10
NEAR TOTAL THYROIDECTOMY	0	5	0	0	0	0	0	5
OPEN APPENDICECTOMY	1	5	7	0	0	0	0	13
RETRORECTUS MESH REPAIR	1	2	1	0	0	0	0	4
TENSION-FREE HERNIOPLASTY	3	6	4	0	0	0	0	13
TRANSHIATAL OESOPHAGECTOMY WITH OESOPHAGOGASTROSTOMYs	0	0	1	0	0	0	0	1
WHIPPLES	0	1	0	0	0	1	0	2
Total	**14**	**39**	**32**	**4**	**2**	**3**	**1**	**95**

DISCUSSION

This prospective study analyzed postoperative complications in 95 general surgery patients using the Clavien-Dindo Classification (CDC), an objective system that categorizes complications based on severity. The findings revealed that most complications were minor (Grades 1 and 2), indicating effective perioperative management, though severe complications were more common in patients with multiple comorbidities. The majority of surgeries were performed on patients aged 51–60, with a nearly equal gender distribution. However, older adults and those with chronic conditions like hypertension and diabetes faced increased complication risks.

Common surgical procedures included open appendectomy, hernia repair, Graham's patch repair, and modified radical mastectomy. Acute appendicitis, hollow viscus perforation, and carcinoma breast were the leading diagnoses. The study underscores the need for age- and comorbidity-specific perioperative strategies to minimize surgical risks and improve outcomes.

CONCLUSION

This prospective study utilized the Clavien-Dindo Classification (CDC) to objectively assess surgical complications in general surgery patients. Most complications were minor (Grades I & II = 73.6%), while severe complications (Grade III and above = 10.53%) were less frequent but had higher morbidity. Age and gender significantly influenced outcomes, with patients aged 51–60 showing the highest complication rates and some gender-based variation in complication types.

Comorbidities, especially hypertension and diabetes, were present in over half of the patients and strongly correlated with more severe complications, emphasizing the importance of preoperative risk assessment. Common surgeries included open appendectomies, hernia repairs, and breast procedures, reflecting the general surgical burden.

The findings highlight the value of the CDC as a reliable tool in surgical audit and suggest that better perioperative care, particularly for high-risk groups, can reduce complications. Overall, the study supports targeted, risk-based strategies to enhance patient outcomes and surgical quality.

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