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Assessment of postoperative complications and their risk factors in general surgery using clavien-dindo classification

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Abstract:
Postoperative complications remain a significant challenge in general surgery, adversely impacting patient safety, hospital resources, and recovery outcomes. This study evaluated 800 patients using the Clavien-Dindo classification to assess the incidence and contributing risk factors. A complication rate of 31.5% was observed, with higher frequencies associated with comorbidities, increased BMI, emergency surgeries, prolonged operative time, infected wounds, and excessive intraoperative blood loss. The analysis identified statistically significant associations between these variables and complication severity. These findings underscore the importance of risk stratification, optimized surgical planning, and preoperative patient management to reduce postoperative morbidity.

Keywords: Post-operative complications, surgery, risk factors, incidence

Background:
Unwanted outcomes of surgery, postoperative complications are a major source of concern that have a negative impact on patient safety and the standard of surgical care **[1-3]**. These range from ostensibly minor accidents that end without any harm to more significant ones that could endanger life, require numerous interventions, lengthen hospital stays and expenses and occasionally result in injury or death **[4-6]**. Surgical complications can degrade a patient's quality of life and cause psychological stress in addition to physical harm. Complications must be reduced in order to raise the standard of surgical care **[7-9]**. Therefore, it is necessary to comprehend the prevalence and risk factors of postoperative problems. Complications, however, are diverse and challenging to consistently capture **[10-12]**. The sheer amount of surgical operations carried out each year is still increasing. With incidences of complications reaching as high around thirty percent in certain patient categories, many of these individuals will suffer from postoperative problems **[13-15]**. To enhance surgical results, efforts to enhance quality are growing in popularity. The ultimate objective is to reduce death and morbidity among patients by measuring results and pinpointing areas that require improvement **[16-18]**. Enhancing quality healthcare favorable patient results are also of importance to payers as well as regulators. It is obvious that many of the things that patients care about the most will suffer as a result of postoperative problems **[19-21]**. For instance, a patient's standard of life will probably suffer if they have pelvic sepsis after ileal pouch surgery. Although this kind of problem is severe and obviously would influence the standard of life, it is unclear whether other problems will have the same effect on outcomes that are patient-centered **[22,23]**. Postoperative complications occur in about one-third of general surgery patients and are strongly associated with identifiable risk factors, highlighting the importance of patient optimization, surgical diligence, and infection control to improve outcomes and reduce complications **[24]**. As a result, we sought to ascertain if the research backs up the idea that complications following surgical procedures adversely affect other kinds of results that are patient-centered **[25-28]**. Therefore, it is of interest to describe the incidence and risk factors of postoperative complications in general surgery patients to guide the development of effective preventive strategies.

Materials and Methods:
This study covered every patient who had been brought to the surgical department for either elective or urgent surgery. Patients who had been transferred and underwent surgery somewhere else were not included. Additionally omitted were intestinal endoscopies, childcare and short-stay surgeries. Information of the patient's clinical history, physical examination, laboratory reports, clinical diagnosis and surgery were recorded. Comorbidities, body mass index, gender and age were evaluated as risk factors for post-operative problems, surgical approach, surgery scheduling and American Society of Anesthesiologists grade as risk factors for postoperative problems. Hospitals stay (days), class of wound, intraoperative complication, intraoperative blood loss (ml), duration of surgery (hours) as risk factors for postoperative problems. After surgery, patients were monitored for a period of thirty days and any problems were recorded. Days were used to record the length of the postoperative hospitalization. Any unwanted, unforeseen incident that directly results from an operation that affects the patient and would not have happened had the surgery gone as smoothly as could be reasonably anticipated was considered a complication. The Clavien-Dindo categorization was used to grade the problem (**Table 1**).

Statistical analysis:
The experimental data was put in MS Excel. SPSS version 24 was used for statistical analysis. Chi square test and t test was used for statistical analysis. p value ≤ 0.05 was considered as statistically significant.

Results:
In our study, 800 patients were evaluated and post-operative complications were reported in 252 patients. Frequency of post-

operative complications was 31.5%. Among 252 patients most of the cases (146) were routine cases, (24) were urgent and (82) cases were of emergency nature. Maximum routine cases had grade 1 infection, followed by grade 2 with a few unfortunate cases having higher grade 4a and one routine case with grade 5. Most grade 4a complications followed by grade4b complications were seen in emergency cases. And all except one grade 5 complications were of emergency laprotomy that landed in sepsis and died (**Table 2)**. Comorbidities, Body Mass Index and age were found to significant variables for postoperative problems. Presence of comorbidities increased the possibility of postoperative problems (p=0.01). Increased BMI also increased the possibility of post-operative problems (p=0.001). 41-60 years patients were found to have maximum post-operative problems **(Table 3)**. Surgical Approach, surgery Scheduling and American Society of Anesthesiologists grade were found to affect the possibility of post-operative problems. Open surgery had greater post-operative problems as compared to laparoscopic surgeries (p=0.048). Emergency surgeries were associated with greater post-operative problems. (p=0.001).AAA grade III were related to greater post-operative problems (p=0.001) (**Table 4)**. Hospital stay (days), class of wound, intraoperative complication, intraoperative blood loss (mL), duration of surgery (hours) were found to affect incidence of postoperative problems. Increased hospital stay increased the frequency of complications (p=0.001). Infected wounds were associated with greater incidence of post-operative problems (p<0.001). Presence of intra operative complications also increased the possibility of post-operative complications (0.02). Increased duration of surgery (p<0.001) and increased intraoperative blood loss (p<0.001) were related to increased frequency of post-operative complications **(Table 5)**.

Table 2: Distribution of patients with complications based on the Clavien-Dindo classification in routine patients

Clavien-Dindo grade	Frequency
I	46.42%
II	21.82%
IIIA	15.87%
IIIB	8.33%
IVA	3.96%
IVB	1.58%
V	1.98%

Table 1: The clavien-dindo classification

Grade	Description
I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical endoscopic and radiological interventions
II	Requiring pharmacological treatment with drugs other than those allowed for grade I complications. Blood transfusion and total parenteral nutrition are also included
III	Requiring surgical, endoscopic, or radiological intervention
III(a)	Intervention not under general anesthesia
III(b)	Intervention under general anesthesia
IV	Life-threatening complications (including central nervous system complications) requiring intensive care unit management
IV(a)	Single organ dysfunction (including dialysis)
IV(b)	Multiorgan dysfunction
V	Death of a patient
Suffix "d"	Complication persistent at discharge (d = disability). Indicative of the need to follow up

Table 3: Comorbidities, body mass index, gender and age as risk factors for post-operative complications

	Age			**Gender**		**Body Mass Index**	**Comorbidities**
	<40 years	41–60 years	>60 years	Male	Female	Kg/m^2 Mean± SD	Present
N	402	290	108	422	378		312
Presence of Complication (N = 252)	107 (26.01%)	113	32 (29.62%)	138	114	28.31 ± 2.04	132 (42.30%)
Absence of Complication absent (N = 548)	295	177	76	284	264	22.27 ± 1.46	180
P-value		0.034		0.11		0.001	0.01

Table 4: Surgical approach, surgery scheduling and American society of anesthesiologists' grade as risk factors for postoperative complications

	American Society of Anesthesiologists (AAA) grade			**Scheduling**		**Approach**	
	I	II	III	Elective	Urgent (semi emergency)	Emergency	Laparoscopic	Open
N	488	220	92	610	52	138	110	690
Presence of Complication (N = 252)	132 (27%)	68 (30.90%)	52 (56.52%)	146 23.93%	24 (47%)	82 (59.42%)	22 (20.00%)	230 (33.33%)
Absence of Complication absent (N = 548)	356	152	40	464	28	56	88	460
P-value		0.001			0.001		0.048	

Table 5: Hospital stays (days), class of wound, intraoperative complication, intraoperative blood loss (ml), duration of surgery (hours) as risk factors for postoperative problems

	Duration of	**Intraoperative**	**Intraoperative**		**Class of**	**Hospital**

	surgery (hours)	blood loss (mL)	complication			wound		stay (days)
	Mean ± SD	Mean ± SD	Present	Clean	Clean contaminated	Contaminated	Dirty	Mean ± SD
N			20	462	110	106	122	23.14 ± 9.73
Presence of Complication (N = 252)	3.25 ± 1.94	230.46 ± 184.54	18 (90%)	76 (16.45%)	42 (39.09%)	50 (47.16%)	84 (63.33%)	9.16 ± 0.83
Absence of Complication absent (N = 548)	1.47 ± 0.84	136.59 ± 75.36	2	386	68	56	38	
	<0.001	<0.001	0.02			<0.001		0.001

Discussion:

The annual number of surgical procedures performed continues to rise. Many of these patients will experience postoperative issues, with some patient categories experiencing difficulties at rates as high as thirty percent **[12-14]**. Efforts to improve quality are becoming more and more prevalent in an attempt to improve surgical outcomes. By tracking outcomes and identifying areas that need improvement, the ultimate goal is to lower patient mortality and morbidity **[11-13]**. Both payers and regulators place a high value on improving patient outcomes and the quality of healthcare **[10-14]**. The objectives of this study were to determine incidence and risk factor general surgery department to obtain some clues to plan preventive strategies. In our study, 800 patients were evaluated and post-operative complications were reported in 252(31.5%) patients. Frequency of post-operative complications was 31.5%. Among 252 patients most of the cases 146 were routine cases followed by 24 urgent cases and 82 emergency cases. Based on clavien dindo classification, maximum routine cases had grade 1 infection, followed by grade 2 with a few unfortunate cases presenting with grade 4a complications. Most of the grade 4a complications were seen in emergency cases followed by grade4b complications. Only 1 routine case associated with comorbidities landed in death due to sudden cardiac arrest, hence designating it as grade 5. In our study, Comorbidities, Body Mass Index and age were found to significant variables for postoperative problems. Presence of comorbidities increased the possibility of postoperative problems (p=0.01). Increased BMI also increased the possibility of post-operative problems (p=0.001). 41-60 years patients were found to have maximum post-operative problems. The findings of our study are having similarity with the findings of other studies **[25-28]**. These studies also reported that factors like presence of Comorbidities, increased Body Mass Index and age actively influence the incidence of post-operative problems **[21-24]**. The standard of surgical care and patient safety are negatively impacted by unintended surgical outcomes, or postoperative problems **[20–24]**. They range from seemingly insignificant mishaps that don't cause any harm to more serious ones that have the potential to endanger life, necessitate several procedures, prolong hospital stays and costs and even cause harm or death **[24-26]**. In addition to causing bodily pain, surgical complications can lower a patient's quality of life and lead to psychological stress. To improve the quality of surgical care, complications must be decreased **[17-19]**. Understanding the frequency and risk factors of postoperative complications is therefore essential. However, complications are varied and difficult to reliably record **[20–22]**.

In our study, Surgical Approach, surgery Scheduling and American Society of Anaesthesiologists grade were found to affect the possibility of post-operative problems. Open surgery had greater post-operative problems as compared to laparoscopic surgeries (p=0.048). Emergency surgeries were associated with greater post-operative problems (p=0.001). AAA grade III was related to greater post-operative problems. The findings of our study are supported by findings of other studies **[24-27]**. It goes without saying that postoperative complications will negatively impact many of the things that patients value most. For example, pelvic sepsis following ileal pouch surgery is likely to negatively impact a patient's quality of life **[21-23]**. Even while this type of issue is serious and would undoubtedly affect quality of life; it is uncertain if other issues will have the same impact on patient-centered outcomes **[24-27]**. Therefore, we aimed to determine if the evidence supports the notion that post-operative complications negatively impact other patient-centered outcomes **[13-16]**. Hospital stay (days), class of wound, intraoperative complication, intraoperative blood loss (mL), duration of surgery (hours) were found to affect incidence of postoperative problems. Increased hospital stay increased the frequency of complications (p=0.001). Infected wounds were associated with greater incidence of post-operative problems (p<0.001). Presence of intra operative complications also increased the possibility of post-operative complications (0.02). Increased duration of surgery (p<0.001) and increased intraoperative blood loss (p<0.001) were related to increased frequency of post-operative complications. Comprehensive preoperative evaluation and therapy might lessen the detrimental effects of comorbidities. Physicians, anesthesia professionals and surgeons must coordinate and communicate well in order to manage comorbidities during surgery **[23-26]**. When possible, obese patients should have their preoperative weight reduced. Emergency surgery must be performed as soon as possible for life-threatening issues including hemorrhagic shock **[27-28]**.

Conclusion:
Postoperative complications were observed in 31.5% of general surgery patients, with significant associations to modifiable and non-modifiable risk factors. Factors such as comorbidities, obesity, emergency procedures, and surgical complexity played a key role. Early identification and optimization of these risks can substantially improve surgical outcomes and patient safety.

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