

A Retrospective Analysis of Perioperative Complications Among Patients Undergoing General Anesthesia

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Abstract:

Background: General anesthesia is an important element of the contemporary surgical care system, as it enables carrying out surgical operations that are both safe and painless. However, it is associated with a list of perioperative complications that have the potential to affect the recovery and overall outcomes of patients, particularly those with a variety of risk factors and surgery complexity.

Aim: To examine the incidence, types and risk factors of perioperative complications in patients under general anesthesia retrospectively.

Methodology: The study was a retrospective observational study, which was carried out in the Department of Anaesthesiology, Shree Narayan Medical Institute and Hospital, Saharsa, Bihar, India and examined 150 patient records. Demographic, ASA grades, type and length of surgery, and perioperative complications data were collected and analyzed via descriptive statistics and multivariate logistic regression.

Results: Most of the patients were between 30-50 years old (42) and were mainly males (56.7) and in ASA grade I-II (60). The most frequent procedure was general surgery (33.3%) and the majority of the surgeries took less than 2 hours (46.7%). The most common complication was postoperative nausea and vomiting (30%), then there was hypotension (22%), and respiratory complications (15.3%). ASA grades and surgical length were significantly linked to more perioperative complications.

Conclusion: The incidence of perioperative complications is rather high in patients under general anesthesia, the most common being gastrointestinal and cardiovascular events. Significant predictors of complications are patient risk status and length of stay. Perioperative management and high-risk patient identification in the early stage of patient care can greatly enhance patient safety and outcomes.

Keywords: General anesthesia, Perioperative complications, Postoperative nausea and vomiting, ASA grade, Surgical duration, Patient safety.

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Introduction

General anesthesia is a key element of the contemporary surgical practice, making it possible to perform complex and painless surgical operations with the help of the reversible loss of consciousness, analgesia, muscle relaxation, and reflex suppression [1]. Although there have been great improvements in the development of anesthetic agents, perioperative monitoring technologies and perioperative care protocols, perioperative complications remain linked to administration of general anesthesia and may have a negative outcome on the patient outcomes. These complications may happen in any phase of anesthesia, such as during induction, maintenance, and recovery, and can be

mild, temporary effects or serious and life-threatening complications [2].

Perioperative complications definition and classification has changed over the years as anesthesiology practice has improved. Historically, complications have been classified broadly according to clinical presentation, but today systematic classification according to physiological systems involved, including cardiovascular, respiratory, neurological and gastrointestinal systems [3]. With such a systematic approach, clinicians are able to diagnose, treat and prevent anesthesia related complications more effectively. Hypotension, hypertension, hypoxia,

bronchospasm, postoperative nausea and vomiting (PONV), and delayed recovery are the common examples of perioperative complications that can considerably affect the postoperative recovery and hospitalization.

The perioperative complications are caused by a combination of interacting factors such as patient-related variables, surgical factors, and anesthetic techniques [4]. The patient factors including age, comorbidity, nutrition and the physical status classification of American Society of Anesthesiologists (ASA) are important determinants of anesthetic risk. ASA grading system is common to evaluate preoperative physical fitness, and predict perioperative morbidity and mortality. Surgical factors such as the nature and length of surgery also affect the complication rates with a longer and complex procedure being more likely to produce complications. Also, the anesthetic considerations (drug choice, airway control, and postoperative monitoring) play a role in the overall safety profile of providing anesthesia [5].

Perioperative complications are a serious health problem in the world, and millions of surgical patients are exposed to it annually [6]. It is estimated that a significant percentage of the surgical patients develop at least one complication during the perioperative period, and the rate is even greater in developing countries because of the differences in the healthcare structure and access to resources. Lateness of presentation, lack of access to advanced monitoring systems and unreliability of perioperative care practices also influence the weight of anesthesia-related complications in India and other low- and middle-income countries. These aspects underscore the significance of consistent review and enhancement of anesthesia services in order to make sure of patient safety [7].

In addition to clinical implications, perioperative complications also have significant economic and social impacts. They are linked with long hospitalization, high medical expenses, slow healing and low quality of life. The complicating patients may require intensive care support, additional interventions and extended rehabilitation which imposes both direct and indirect financial burdens on the health care systems and families [8]. Moreover, the complications may cause additional morbidity and, in the worst case, death, therefore, the need to diagnose it as early as possible and preventive measures is crucial.

Post-operative complications can also be an indicator of some underlying physiological imbalances or inadequacies in perioperative care. An example is that hypotension may be a manifestation of poor fluid balance or depth of anesthesia, and respiratory complications may be a manifestation of airway problems or underlying lung

disease [9]. Accordingly, the systematic evaluation of these complications can provide valuable data regarding the way to improve anesthetic practice, the way to provide optimal results to patients and the way to improve the well-being of patients in general during the perioperative process.

The multifactorial character of perioperative complications and their great influence on patient outcomes demand thorough research to examine their trends and risk factors [10]. Particularly retrospective studies have the benefit of studying large datasets and coming up with trends in real-world clinical situations. Such analyses would be handy in the development of evidence-based practices and specific interventions that would ensure that the number of complications is reduced.

The objective of the current study is to perform a retrospective study of perioperative complication in patients under general anesthesia. The study aims to determine the incidence, types, and determinants of complications by assessing clinical records at a specific time, thus serving to enhance the perioperative management measures and patient safety [11].

Methodology

Study Design: The study was a retrospective observational study that was meant to determine the perioperative complications in patient under general anesthesia. The aim of the study was to gather and analyze the already documented clinical and anesthesia records to determine trends, nature of complications and the demographic and clinical risk factors. The retrospective method was chosen to allow the systematic analysis of patient records during a specific time frame and offer a universal picture of the occurrence and nature of perioperative complications in patients under general anesthesia.

Study Area: The research was carried out in the Department of Anaesthesiology, Shree Narayan Medical Institute and Hospital, Saharsa, Bihar, India

Study Duration: The research was carried out during one year.

Study Participants

Inclusion Criteria

- Patients aged ≥ 18 years who underwent surgical procedures under general anesthesia at the study center.
- A patient with all the perioperative information, such as intraoperative monitoring and postoperative observations, in their clinical and anesthesia records.
- Patients who were either outpatient or inpatient admitted in the study period.

Exclusion Criteria

- Incomplete or missing medical and anesthesia records of patients.
- Patients that had a procedure with local or regional anesthesia.
- Emergency cases with lack of documentation or perioperative information.
- Patients with underlying critical conditions in which complications could not be easily traced to anesthesia.

Sample Size: A total of 150 patient records meeting the inclusion criteria were included in the study. The sample was chosen so that it was representative in the various age groups, surgical categories, as well as clinical conditions to make meaningful analysis of the perioperative complications.

Procedure: The medical records department and anesthesia registers of the hospital retrieved patient records and examined them in a systematic manner. Information was elicited on demographic factors, nature and length of operation, ASA (American Society of Anesthesiologists) physical status rating, anesthetic method and perioperative incidents.

The category of perioperative complications was defined by conventional clinical criteria in the following way: cardiovascular (hypotension, hypertension), respiratory (hypoxia, bronchospasm), gastrointestinal (postoperative nausea and vomiting), and other complications (delayed recovery, shivering). A structured proforma was used to collect data, to facilitate uniformity and consistency. All records were

anonymized to protect confidentiality of patient information and the Institutional Ethics Committee of the hospital was consulted regarding the ethical aspects of the study.

Statistical Analysis: The statistical analysis of the collected data was introduced into the SPSS version 27.0 (IBM, USA). Mean, standard deviation, frequency, and percentage were used to determine descriptive statistics of continuous and categorical variables, respectively. Chi-square tests were used to evaluate associations between categorical variables and independent t-tests were used to evaluate associations between continuous variables and demographic and clinical variables. The multivariate logistic regression analysis was done to find significant predictors of perioperative complications and to adjust the possible confounders. A p-value of <0.05 was considered statistically significant.

Result

Table 1 shows demographic and clinical profiles of the 150 study participants. The age distribution shows that the largest proportion of patients were aged 30–50 years (63, 42%), followed by 51–70 years (40, 26.7%), 18–29 years (30, 20%), and above 70 years (17, 11.3%). As far as gender distribution is concerned, 85 (56.7) and 65 (43.3) patients were male and female respectively. According to the ASA (American Society of Anesthesiologists) grading, most of the patients were in the ASA grade I-II (90, 60%), and the remaining 60 patients (40) were in the ASA grade III-IV. In general, the majority of patients were middle-aged adults with a rather low anesthetic risk.

Table 1: Demographic and Clinical Characteristics of Study Participants

Parameter	Category	Frequency (n)	Percentage (%)
Age (years)	18–29	30	20
	30–50	63	42
	51–70	40	26.7
	>70	17	11.3
Gender	Male	85	56.7
	Female	65	43.3
ASA Grade	I–II	90	60
	III–IV	60	40

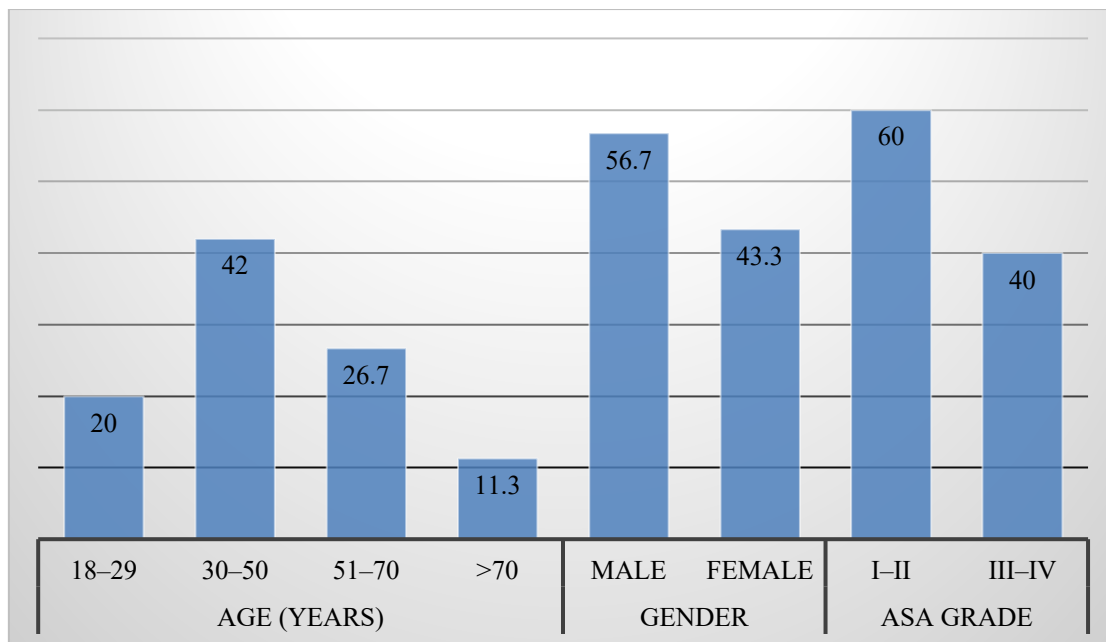


Figure 1: Visual Representation of Demographic and Clinical Characteristics of Study Participants

The statistics reveal that most of the patients receiving general anesthesia were in the mid-age category (30-50 years) with more males than females. The majority of the participants fell within ASA grade I-II, indicating a low-risk anesthetic population, but there was also a significant percentage of patients at higher risk (ASA III-IV). Generally, the results indicate a relatively stable yet patient population that needs close perioperative evaluation.

Table 2 presents the statistics of surgical features of the 150 research participants. General surgery (50, 33.3%), orthopedic (35, 23.3%), gynecological (30, 20%), and other surgeries (35, 23.3%) were the most frequent type of surgery. In terms of length of operation, 70 cases (46.7%) took less than 2 hours and 50 cases (33.3) took 2-4 hours and 30 cases (20) took more than 4 hours. The average length of operation was 2.8 ± 1.4 hours, which means that there was moderate variability in the length of operation.

Table 2: Surgical Characteristics of Study Participants

Parameter		Frequency (n)	Percentage (%)
Type of Surgery	General surgery	50	33.3
	Orthopedic	35	23.3
	Gynecological	30	20
	Others	35	23.3
Duration of Surgery	<2 hours	70	46.7
	2-4 hours	50	33.3
	>4 hours	30	20
	Mean duration (hours)	Mean \pm SD	2.8 ± 1.4

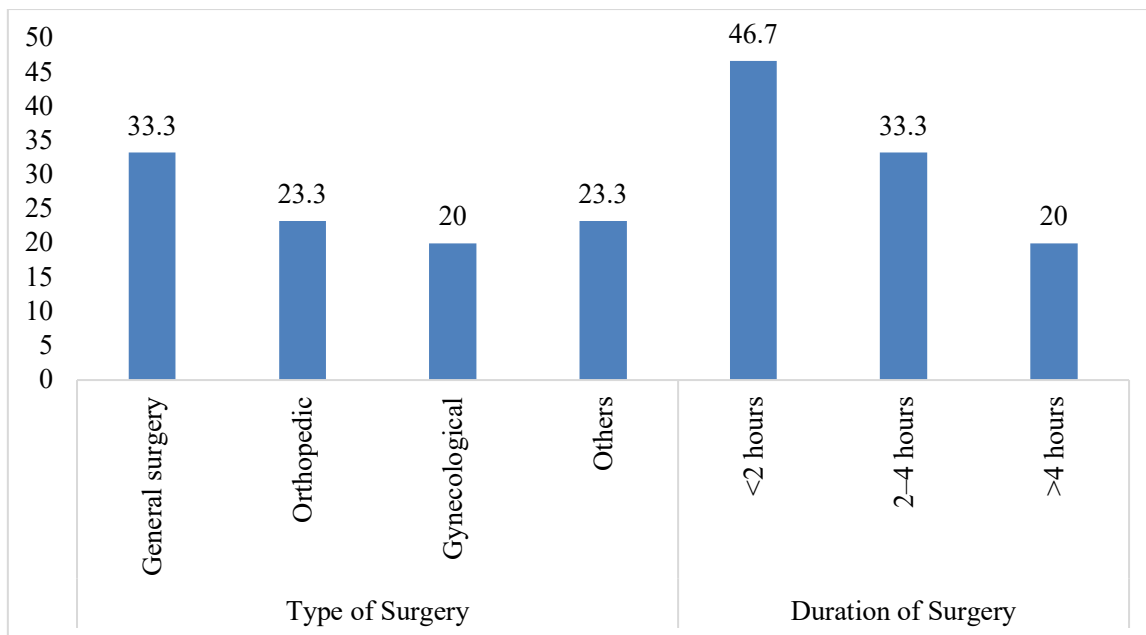


Figure 2: Visual Representation of Surgical Characteristics of Study Participants

The results show that general surgery was the most practiced type of surgery, and the number of orthopedic and gynecological surgery and other surgeries followed in fair proportions. The majority of the surgeries were shorter, almost half of them were done in less than 2 hours and only a few cases lasted more than 4 hours. The average time is 2.8 ± 1.4 hours, indicating the medium variation in time, indicating a combination of minor and moderate complex surgeries.

Table 3 indicates the distribution of perioperative complications on the 150 patients. The greatest complication was postoperative nausea and vomiting (45, 30%), then came hypotension (33, 22%), respiratory complications (hypoxia and bronchospasm 23, 15.3%). 20 patients were found to have hypertension (13.3%), and 15 patients experienced delayed recovery (10%). In 14 patients (9.3%), other minor complications were reported such as shivering and restlessness. All in all, the most common were gastrointestinal and cardiovascular complications.

Table 3: Perioperative Complications

Complication	Frequency (n)	Percentage (%)
Postoperative nausea & vomiting	45	30
Hypotension	33	22
Respiratory complications	23	15.3
Hypertension	20	13.3
Delayed recovery	15	10
Others (shivering, restlessness)	14	9.3

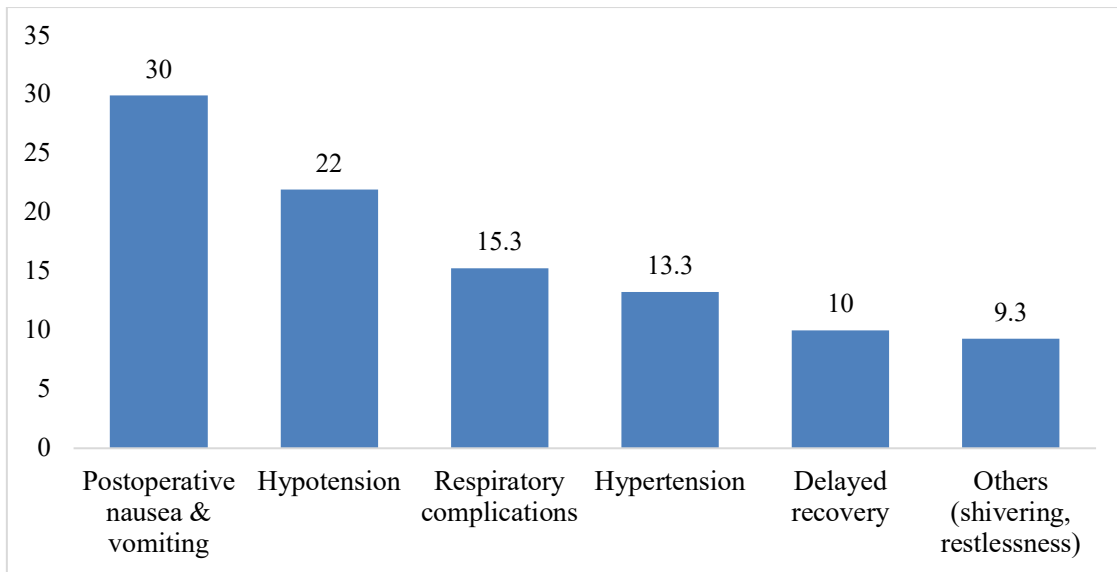


Figure 3: Visual Representation of Perioperative Complications

The results show that the most frequent complication during the perioperative period was the postoperative nausea and vomiting, then there were hypotension and respiratory complications. The more common were cardiovascular and gastrointestinal complications and the less common delayed recovery and minor complications such as shivering.

Table 4 shows the relationship between perioperative complications and ASA grade. The results showed that complications were more common in patients with higher ASA grades (III-IV), where they occurred in 60 cases (40%), as opposed to 90 cases (60%), in ASA I-II, with a much higher rate of complications in the higher-risk group. This indicates that ASA grade is an important predictor of perioperative complications.

Table 4: Association of ASA Grade with Perioperative Complications

ASA Grade	Patients with Complications (n)	Percentage (%)
I-II	54	36
III-IV	45	30
Total complications	99	66

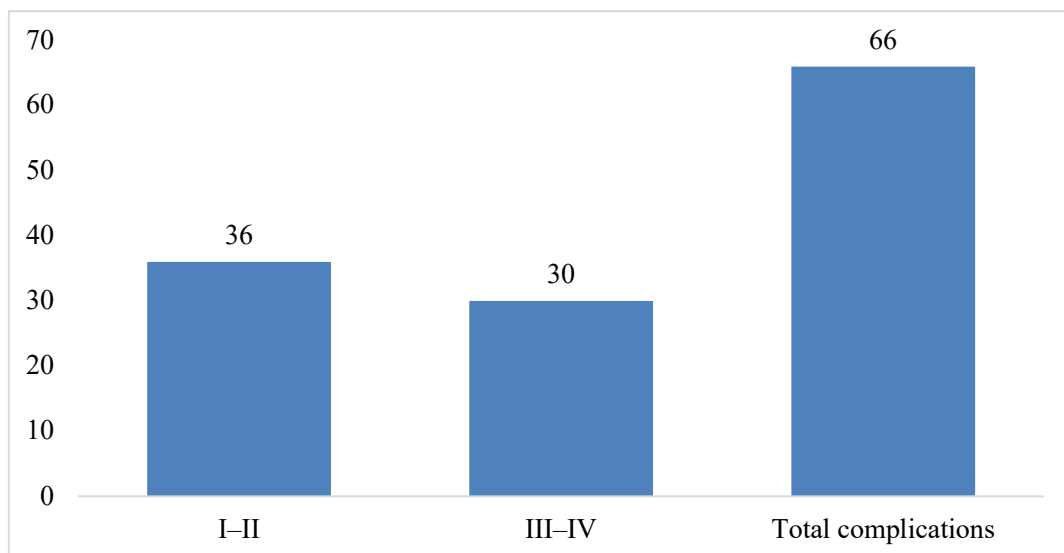


Figure 4: Visual Representation of Association of ASA Grade with Perioperative Complications

The results indicate that the perioperative complications were more frequent in patients with a higher ASA grade (III-IV) than in patients with

lower grades (I-II). This indicates that patients at the high risk before surgery are more prone to

complications and thus ASA grade is a significant predictor of postoperative outcomes.

Table 5 shows a distribution of perioperative complications by the length of time in surgery. Surgeries taking longer than 2 hours had more

complications. In patients having surgeries under 2 hours, a 30 out of 200 cases (20) had complications and 40 cases (26.7) had complications in the 2-4 hours range and 29 cases in the over 4 hours range (19.3). These results imply that the longer the duration of surgery, the more the perioperative risk.

Table 5: Association of Duration of Surgery with Complications

Duration of Surgery	Patients with Complications (n)	Percentage (%)
<2 hours	30	20
2-4 hours	40	26.7
>4 hours	29	19.3

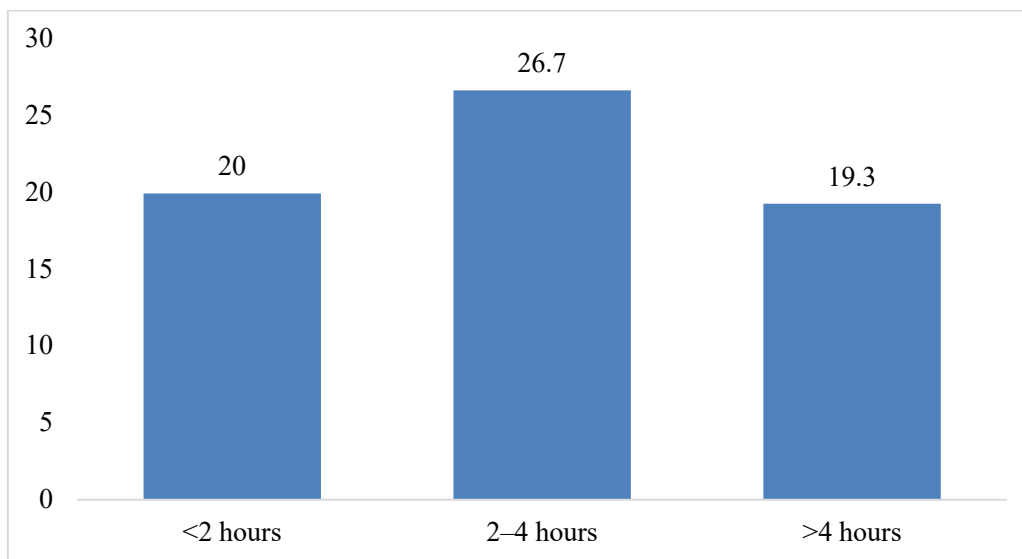


Figure 5: Visual Representation of Association of Duration of Surgery with Complications

The results show that the number of perioperative complications was higher in the case of surgeries taking longer than 2 hours, the highest percentage was found in the 2-4 hours category. Though the complications were a little less when the procedures took over 4 hours, the general tendency is that longer the surgical time, the more the risk of complications and the use of special care during the intraoperative monitoring of the prolonged surgeries may be crucial.

Discussion

The current study offers an in-depth discussion of the problems of perioperative complications in patients undergoing general anesthesia and identifies significant trends based on the patient-related factors, surgical, and clinical outcomes (Conzo et al., 2013) [12]. The results show that most of the patients were of middle age and were of ASA grade I- II meaning the population at risk of anesthesia was relatively low. However, a high percentage of patients with more advanced ASA grades (III-IV) was also observed and the patients with these more advanced grades had higher perioperative complication rate (Samson et al., 2013) [13]. This is aligned with what was previously known about ASA physical status; physical status is

a great predictor of perioperative morbidity whereby the underlying systemic disease patients were more vulnerable to physiological disequilibrium during anesthetic processes (Dogan et al., 2011) [14].

The complication distribution in this research showed that the predominant complications included postoperative nausea and vomiting (PONV), then there were hypotension and respiratory complications (Colwell et al., 2011) [15]. These results are also in line with the existing literature where PONV has been one of the most common postoperative complications because of the influence of anesthetic drugs, patient predisposition and nature of surgery (Li et al., 2012) [16]. Other significant changes in the cardiovascular complications like hypotension were also eminent and this was a project of the hemodynamic effects of anesthetic agents and fluid changes during surgery. Less common but still clinically significant because of potentially severe postoperative outcomes, respiratory complications continue to pose a significant problem. In general, most of the complications were treated according to the general perioperative care, with an accent on attentive monitoring and early interventions (Yu et al., 2016) [17].

The length of surgery and its complexity also were found to affect the complication rates (Kim et al., 2018) [18]. The researchers established a greater number of complications with the operations that are longer than two hours than shorter ones, which indicates that a greater risk of perioperative may be more prone to longer exposure to anesthesia and surgical stress (Chan et al., 2013) [19]. Although the maximum percentage of complications was indicated in the 24-hour group, the overall tendency is that the longer is the period of operation, the more physiologically unstable and exposed to adverse events is a patient. The results underscore the importance of meticulous intraoperative care, anesthetic methods, and prophylaxis especially in longer and more complex operations (Shi et al., 2017) [20]. Altogether, the findings emphasize the need to provide patient-focused perioperative care depending on the patient risk factors and surgical nature to reduce complications and enhance patient outcomes.

Conclusion

The retrospective study concludes that perioperative complications are not rare in patients who are general anesthetized, and the most frequent are postoperative nausea and vomiting, hypotension, and respiratory complications. The results indicate that patient-related variables, especially better ASA grades as well as surgical variables, in this case, better length of surgery, play a significant role in causing complications. Patients who experienced longer or more complicated procedures were more prone to adverse perioperative outcomes, and those with higher preoperative risk. Most of the complications that were witnessed could be treated and were not life threatening, but when not taken care of immediately they can extend the healing process and escalate the healthcare burden. These findings demonstrate the significance of thorough preoperative assessment, risk-profiling, thorough anesthetic planning, and round-the-clock intraoperative and postoperative monitoring. The targeted preventive strategies, in particular, high-risk patients, can be important to reduce the complication rates and enhance the patient safety, recovery, and clinical outcomes.

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