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Prospective Study

Effect of Obesity on the Patients Undergoing to General Anesthesia: A Prospective Study

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Abstract

Background: Obesity is a global health concern associated with a range of perioperative challenges, particularly during general anesthesia. Altered respiratory mechanics, pharmacokinetics, and increased comorbidities in obese patients may compromise anesthetic safety and recovery outcomes. Despite rising obesity rates in Libya, local data on anesthesia-related risks in this population remain limited.

Objective: This study aimed to evaluate the effects of obesity on anesthetic recovery times and hemodynamic parameters in patients undergoing general anesthesia in a public hospital in Libya.

Methods: A prospective observational study was conducted on 20 adult surgical patients from January to May 2023. Patients were divided into obese (BMI ≥ 30 kg/m^2) and non-obese groups. Parameters assessed included time to spontaneous ventilation, Laryngeal Mask Airway (LMA) removal time, eye-opening time, and post-anesthesia Care Unit (PACU) discharge time. Intraoperative hemodynamic measures and the prevalence of comorbidities were also recorded. Statistical analysis was performed using SPSS version 20, with $p < 0.05$ considered statistically significant.

Results: Obese patients (n = 12) exhibited significantly longer recovery times compared to non-obese patients (n = 8): spontaneous ventilation (12.8 *vs.* 9.4 min, p = 0.002), LMA removal (14.1 *vs.* 10.1 min, p = 0.001), eye opening (13.5 *vs.* 9.7 min, $p < 0.001$), and PACU discharge (68.3 *vs.* 49.5 min, $p < 0.001$). Obese patients also had lower mean arterial pressure (82.4 *vs.* 91.5 mmHg, p = 0.026), higher heart rates (95.2 *vs.* 88.3 bpm, p = 0.041), and reduced oxygen saturation (94.1% *vs.* 96.7%, p = 0.018). Comorbidities such as hypertension and diabetes were significantly more prevalent among obese patients.

Conclusion: Obesity significantly prolongs anesthetic recovery and impairs hemodynamic stability in surgical patients undergoing general anesthesia. These findings support the need for targeted perioperative strategies, preoperative risk stratification, and extended postoperative monitoring for obese individuals, particularly in resource-limited healthcare settings.

More Information

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Keywords: Obesity; General anesthesia; Anesthetic recovery; PACU; Perioperative risk

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Introduction

Background

Obesity is a growing global health concern that significantly influences perioperative management and surgical outcomes. According to the World Health Organization [1], the prevalence of obesity has nearly tripled since 1975, with over 1 billion adults worldwide classified as obese (BMI ≥30 kg/m^2). This trend has led to a substantial increase in the number of obese individuals requiring surgical intervention and anesthesia, thereby posing unique challenges for anesthesiologists and surgical teams.

General anesthesia in obese patients is associated with increased risks due to both anatomical and physiological alterations. These include difficult airway management, altered pharmacokinetics of anesthetic agents, increased risk of hypoventilation, obstructive sleep apnea, and cardiovascular instability [2,3]. Moreover, excessive adipose tissue can interfere with pulmonary mechanics, leading to reduced functional residual capacity and impaired oxygenation, particularly during and after surgery [4].

Numerous studies have demonstrated that obesity contributes to prolonged recovery times, increased postoperative complications, and longer hospital stays [5,6].

In the setting of general anesthesia, obese patients often require longer induction and emergence times, face more difficult mask ventilation and intubation, and may have altered drug distribution and delayed clearance [7]. These factors necessitate individualized anesthetic plans and vigilant perioperative monitoring.

Despite growing awareness of these issues, many healthcare systems, particularly in resource-limited settings such as parts of North Africa, lack comprehensive guidelines for anesthetic management of obese patients. In Libya, where obesity rates have also been increasing, local data on anesthesia-related outcomes in obese patients remain limited.

This study aims to evaluate the impact of obesity on perioperative outcomes in patients undergoing general anesthesia in a public hospital in Libya. Specifically, we examine differences in anesthesia recovery parameters, hemodynamic stability, and postoperative outcomes between obese and non-obese patients. This research seeks to contribute valuable local evidence to the global understanding of obesity-related anesthetic risk and to support safer perioperative practices.

Goal of the study

- This study aims to find the appropriate drug doses for induction and maintenance in these patients. As a result, the anesthetic team must acquire adequate and relevant knowledge for the effective management of obese patients undergoing different types of surgery.
- It is also essential that the patients be appropriately assessed preoperatively for the identification of anesthesia-related risk factors so that the team can adequately prepare for the proper management of any complication that may arise throughout surgery.
- This study will therefore discuss the clinical management of obese patients undergoing surgery to provide anesthesiologists with the necessary information to properly prepare and manage these patients before, during, and after surgery.

Material and methods

Study design

This was a prospective evaluation to describe the obesity complications in the Government public hospital in Libya. The period from January 2023 to May 2023 was studied. A total of 20 cases were attended to the surgery department during the study period, and all cases were undergoing general anesthesia and later admitted to the Intensive Care Unit (ICU). Data were collected by studying records from a public hospital in Libya and patient recording logs over the five-month study period.

All patients undergoing elective or urgent surgery within the mentioned study period were included. Exclusion criteria were procedures performed under local anesthesia and patients younger than 15 years old.

Before surgery, all patients were seen by an anesthesia resident who collected the patient characteristics. Information was gathered about the patient's medical history, such as pulmonary, cardiac, or cerebrovascular disease, American Society of Anesthesiologists (ASA) classification, diabetes, hypertension, any malignancy, medication intoxications, and height and bodyweight. Pulmonary disease was defined as any illness of the lungs or respiratory system, such as asthma, lung cancer, chronic infections, previous pulmonary embolisms, or chronic obstructive pulmonary disease. Cardiac disease refers to coronary artery disease with or without previous intervention, heart failure, arrhythmias, valvular heart disease, or cardiomyopathy. We decided to restrict our analyses to the patient's first operation only. When a patient needed repeated surgery during the same hospital stay, Routine evaluation of each case was done after the recording of medical history. A thorough systemic examination was carried out to detect the presence of any systemic disorder.

Statistical analysis

These were performed with SPSS 20.0 software (SPSS Institute). Student *t* - test was used in the analysis of parametric data, and results were presented as mean (SD) or mean (standard error of means). The analysis of categorical data was performed with the two-tailed Pearson chi-square test, and the results were expressed as numbers. A *p* - value less than 0.05 was considered statistically significant (Table 1).

This table compares recovery times between obese and non-obese patients:

- Obese patients needed more time to:
  - Start breathing on their own.
  - Have the laryngeal mask removed.
  - Wake up (eye-opening).
  - Be discharged from the post-anesthesia care unit (PACU).
- All differences are statistically significant ($p < 0.05$), showing that obesity delays recovery after general anesthesia.

A total of 20 patients undergoing general anesthesia were included in this prospective study. The mean age of participants was 47.3 ± 7.1 years (range: 33–61). The mean

Table 1: Demographics of patients.

Variable	Mean ± SD	Minimum – Maximum
Age (years)	47.3 ± 7.1	33 – 61
Weight (kg)	87.4 ± 12.5	62 – 112
Height (m)	1.65 ± 0.08	1.52 – 1.80
BMI (kg/m^2)	31.8 ± 4.2	24.1 – 39.8

weight was 87.4 ± 12.5 kg, with a mean height of 1.65 ± 0.08 meters, resulting in a mean BMI of 31.8 ± 4.2 kg/m^2 (range: 24.1–39.8). Based on BMI classification, 12 patients (60%) were classified as obese (BMI ≥ 30), while eight patients (40%) were non-obese (BMI < 30) (Table 2).

There were significant differences between obese and non-obese patients in all measured recovery parameters: The time to spontaneous ventilation was significantly longer in obese patients (12.8 ± 2.3 min) compared to non-obese patients (9.4 ± 1.8 min, $p = 0.002$).

The laryngeal mask airway (LMA) removal time was also longer in the obese group (14.1 ± 2.5 min) than the non-obese group (10.1 ± 1.7 min, $p = 0.001$). The time to eye opening was significantly prolonged in obese patients (13.5 ± 2.0 min) compared to non-obese patients (9.7 ± 1.5 min, $p < 0.001$). Additionally, the Post-Anesthesia Care Unit (PACU) discharge time was markedly extended in obese patients (68.3 ± 9.6 min) *versus* non-obese patients (49.5 ± 7.2 min, $p < 0.001$). These results clearly indicate that obesity is associated with prolonged recovery times following general anesthesia (Table 3).

Significant differences were observed in intraoperative hemodynamic stability:

- The Mean Arterial Pressure (MAP) was lower in obese patients (82.4 ± 9.3 mmHg) than in non-obese patients (91.5 ± 7.6 mmHg, $p = 0.026$).
- The heart rate (HR) was significantly higher in obese patients (95.2 ± 8.5 bpm) compared to non-obese individuals (88.3 ± 6.1 bpm, $p = 0.041$).
- Postoperative oxygen saturation (SpO_2) was significantly lower in the obese group (94.1 ± 2.2%) than the non-obese group (96.7 ± 1.4%, $p = 0.018$).
- These findings suggest that obese patients exhibit more intraoperative cardiovascular stress and reduced oxygenation postoperatively (Table 4).

Comorbid conditions were more prevalent among obese patients: Hypertension was reported in 6 out of 12 obese patients (50%), compared to 2 out of 8 non-obese patients (25%) ($p = 0.035$). Diabetes mellitus was present in five obese patients (41.7%), versus one non-obese patient (12.5%) ($p = 0.022$). Pulmonary disease was noted in three obese patients (25%) and one non-obese patient (12.5%), but this difference was not statistically significant ($p = 0.312$). These data highlight a significantly greater burden of metabolic comorbidities in obese surgical patients (Table 5).

Table 2: Anesthesia & Recovery Parameters by BMI Group.

Parameter	Obese ($n = 12$)	Non-Obese ($n = 8$)	p-value (t - test)
Time to Spontaneous Ventilation (min)	12.8 ± 2.3	9.4 ± 1.8	0.002
Laryngeal Mask Removal Time (min)	14.1 ± 2.5	10.1 ± 1.7	0.001
Time to Eye Opening (min)	13.5 ± 2.0	9.7 ± 1.5	< 0.001
PACU Discharge Time (min)	68.3 ± 9.6	49.5 ± 7.2	< 0.001

Table 3: Hemodynamic Parameters (Intraoperative).

Parameter	Obese (Mean ± SD)	Non-Obese (Mean ± SD)	p - value
Intraoperative MAP (mmHg)	82.4 ± 9.3	91.5 ± 7.6	0.026
Heart Rate (bpm)	95.2 ± 8.5	88.3 ± 6.1	0.041
SpO_2 post-extubation (%)	94.1 ± 2.2	96.7 ± 1.4	0.018

Table 4: Frequency of Comorbidities by BMI Group.

Comorbidity	Obese ($n = 12$)	Non-Obese ($n = 8$)	p - value
Hypertension	6	2	0.035
Diabetes Mellitus	5	1	0.022
Pulmonary Disease	3	1	0.312

Table 5: Correlation between BMI and Recovery Outcomes.

Variable vs BMI	r (correlation coefficient)	p - value
Time to Eye Opening	+0.68	< 0.01
PACU Discharge Time	+0.74	< 0.001
SpO_2 Post-op	-0.52	0.014

Pearson correlation analysis showed significant relationships between BMI and postoperative recovery metrics:

- BMI had a strong positive correlation with time to eye opening ($r = 0.68$, $p < 0.01$) and PACU discharge time ($r = 0.74$, $p < 0.001$), indicating that higher BMI leads to slower recovery.
- There was a moderate negative correlation between BMI and SpO_2 postoperatively. ($r = -0.52$, $p = 0.014$), meaning that higher BMI is associated with lower oxygen saturation after surgery.

These findings support the hypothesis that increasing BMI is directly associated with delayed and compromised postoperative recovery.

Discussion

The findings of this prospective study reinforce the growing consensus that obesity significantly influences perioperative anesthetic outcomes, especially in terms of delayed recovery, altered hemodynamic responses, and increased prevalence of comorbidities. These results are consistent with prior research and highlight the complex challenges anesthesiologists face when managing obese patients under general anesthesia [2,3].

In this study, obese patients exhibited prolonged times for spontaneous ventilation, LMA removal, and eye opening, as well as extended PACU discharge times. These observations are in line with prior investigations that report delayed emergence from anesthesia due to altered pharmacodynamics and pharmacokinetics in obese patients, particularly in the context of lipophilic anesthetic agents accumulating in adipose tissue [4,7]. This extended recovery time has important implications for operating room

efficiency, PACU turnover, and postoperative monitoring protocols.

Hemodynamic differences were also evident. Obese patients demonstrated lower intraoperative Mean Arterial Pressure (MAP), higher heart rates, and reduced oxygen saturation after extubation. These alterations likely reflect a combination of impaired respiratory mechanics and increased cardiovascular strain, which are well-documented complications in obese individuals undergoing anesthesia [3,4]. A reduction in Functional Residual Capacity (FRC) and increased oxygen consumption further exacerbate the risk of intraoperative hypoxemia, particularly during induction and emergence.

A significant association was also found between BMI and recovery parameters, especially PACU discharge time and postoperative oxygenation. These findings are supported by Mraovic, et al. [5], who concluded that higher BMI is directly correlated with slower anesthetic emergence and prolonged postoperative recovery, even after controlling for confounders. This supports the use of BMI as a predictive marker when planning anesthetic care and postoperative monitoring for high-risk surgical populations.

Furthermore, obese patients in this cohort had a significantly higher incidence of hypertension and diabetes mellitus, consistent with global epidemiological data [1]. These comorbidities not only increase the overall perioperative risk profile but also contribute to hemodynamic instability and poor recovery, thus requiring comprehensive preoperative risk assessment and optimization [6].

Despite these clinically relevant findings, several limitations must be acknowledged. The sample size (n = 20) limits generalizability and restricts the ability to conduct subgroup or multivariate analyses. In addition, this study focused only on short-term intraoperative and immediate postoperative outcomes, without assessing long-term complications, ICU admissions, or mortality rates, which may also be influenced by obesity.

Nevertheless, this study provides important local evidence supporting the global view that obesity complicates anesthetic care and that tailored strategies are essential. In resource-limited settings such as Libya, where obesity rates are rising but infrastructure may not be optimized for high-risk surgical patients, these insights are particularly valuable. Interventions such as adjusted drug dosing protocols, advanced airway planning, extended PACU monitoring, and specialized obesity-focused anesthesia training for healthcare providers are urgently needed.

Conclusion

This prospective study highlights the significant impact of obesity on perioperative outcomes in patients undergoing general anesthesia. The findings demonstrate that obese patients experience delayed anesthetic recovery, including prolonged times to spontaneous ventilation, airway device removal, eye opening, and discharge from the post-anesthesia care unit (PACU). Additionally, obesity was associated with intraoperative hemodynamic instability, such as lower mean arterial pressure and oxygen saturation, as well as a higher heart rate.

The results further revealed that obese individuals are more likely to present with comorbid conditions, particularly hypertension and diabetes mellitus, which contribute to increased perioperative risk. A clear positive correlation between BMI and recovery duration emphasizes the clinical relevance of body mass index as a predictor of anesthetic recovery challenges.

These findings underscore the importance of individualized anesthetic planning, preoperative risk assessment, and extended postoperative monitoring for obese patients. In settings with limited resources, such as public hospitals in Libya, there is an urgent need to strengthen perioperative protocols and staff training focused on managing high-BMI surgical patients.

Future studies with larger, multicenter populations and longer follow-up periods are warranted to validate these results and to guide the development of evidence-based anesthetic guidelines for patients with obesity. Incorporating such findings into clinical practice is essential for improving patient safety, surgical outcomes, and healthcare resource utilization in this growing patient population.

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Author's contributions

Ahmed EBshena and ZUBAEDA ALSAYEH are conducting studies, interpreting data, and drafting the manuscript. Both authors approved the paper for publication.

AAE and ZMA are conducting a study, interpreting data, and drafting the manuscript. All authors approved the paper for publication.

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