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The Effects of General Anesthesia on Obese Patients during Surgical Operations

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Abstract: **Background:** The condition known as obesity is marked by too much body fat compromising health.

Aims: Assessment the effects of general anesthesia on obese patients during surgical operations.

Methods: Patients hospitalized in Tehran's special care department of Tehran University of Medical Sciences hospitals (Shariati Hospital and Imam Khomeini Hospital) who fit the criteria for joining the study during 2024–2025 will be the cross-sectional study subjects. Patients will find themselves in the operation room. The IV line is set and normal saline serum is injected to all patients. The patient's body mass index registered at thirty or above. Data were gathered on a researcher-made questionnaire. Descriptive and inferential statistical tests as well as SPSS version 25 program were used in data analysis. Considered noteworthy was a P-value less than 0.05.

Results: Reaching 72.5%, the difficult intubation group had the highest percentage of participants intubated based on BMI. Though 27.5% of the participants showed low proportion of easy intubation. At 30-34.9 kg/mm¹ the mean systolic pressure was 127.7 ± 5.98; at 35-39.9 kg/mm¹ the mean systolic pressure was 135.04 ± 9.1. Furthermore, the group of persons with high body mass index had an average diastolic blood pressure greater. Comparatively to heart rate (77.4±6.56) following GA, heart rate (90.7±5.18) before GA of 30-34.9 kg/mm¹ revealed notable ($p<0.05$) variations. Heart rate (95.18±7.35) before GA exhibited notable ($p<0.05$) variations in the 35-39.9 kg/mm¹ group as compared to heart rate (84.4±2.42) following GA. Comparatively to oxygen saturation (99.84±0.1) after GA, oxygen saturation (99.94±0.1) before GA of 30-34.9 kg/mm¹ revealed non-significant ($p<0.05$) variations. Oxygen saturation (99.81±0.09) before GA indicated non-significant ($p<0.05$) differences in the 35-39.9 kg/mm¹ group as compared to oxygen saturation (99.74±0.13) following GA.

Conclusion: Finally, this research showed that individuals who were heavier had greater heart rates, blood oxygen levels, and systolic and diastolic blood pressure. Patients' systolic and diastolic blood pressure, heart rate, and blood oxygen levels did not differ statistically before and after general anesthesia.

Key points: obesity, BMI, blood pressure, and anesthesia.

1. INTRODUCTION

Abbreviations

BMI: Body Mass Index

AAP: American Academy of Pediatrics

MO: morbidly obese

DL: direct laryngoscopy

ERV: expiratory reserve volume

FRC: functional residual capacity

VC: vital capacity

TLC: total lung capacity

2. INTRODUCTION

The illness known as obesity is typified by too much body fat compromising health [1]. According to standardized development curves, a body mass index (BMI, which is calculated as weight in kilograms divided by height in meters squared) at the 95th percentile or higher for age and sex is frequently used as a clinical screening tool to identify teenagers who might benefit from therapy. In the United States, the prevalence of obesity among teenagers aged 12 to under 18 is approximately 21% [2, 3]. Adult obesity is highly predicted by adolescent obesity. Pharmacotherapy and metabolic and bariatric surgery are among the treatments for adolescent obesity; the terms metabolic and bariatric surgery have replaced the terms used for surgery, such as weight loss surgery and bariatric surgery, in order to recognize the mechanisms of action of the surgical procedures [4, 5, 6]. The American Academy of Pediatrics (AAP) published the Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents with Obesity in 2023, which highlighted new ideas regarding the approach to managing teen obesity [2]. Particularly in patients, obesity is seen as a high-risk factor with modifications in the respiratory and cardiovascular systems. Because of a higher risk of surgery, technical issues with regional anesthesia, and airway issues connected with general anesthesia, it also poses challenges in anesthetic management [7-9]. Most of morbidly obese (MO) patients can be safely cared for during the perioperative period with careful attention paid to comorbidities and risk factors [10]. Although it is harder to administer anesthesia and operate on obese patients. Moving the laryngoscope and doing direct laryngoscopy (DL) [11] is more difficult in an obese patient with a large tongue, additional oropharyngeal tissue, atlantoaxial joint constraint resulting from cervical and thoracic fat pads and presternal fat deposits. Furthermore, still lacking much of understanding is the effect of obesity on drug pharmacokinetics and pharmacodynamics. Altered medication distribution, clearance, and responsiveness to anesthesia that obese patients show can have major effects on drug dose and titration. Usually, nevertheless, obese individuals are not included in anesthetic clinical studies. Consequently, in pharmacokinetic and pharmacodynamic research, there are few guidelines on how to apply size indicators such as total body weight against optimal body weight [12]. Therefore, the purpose of this study is to find how general anesthesia affects obese individuals under surgery.

Aims of the study

Assessment the effects of general anesthesia on obese patients during surgical operations

3. METHODOLOGY

Design of the study

The present work is a cross-sectional one. Patients were scheduled for operations. IV lines were set and normal saline serum was injected to all patients. Prescribed for every patient using the same medication and with the necessary dosage are an anaesthetic induction and maintenance phases. The study covered the 120 eligible patients. Their records yielded patient data. At last both groups of

patients finished the questionnaire and checklist. Among the inclusion criteria were informed permission of the patient, obese people undergoing surgery, hospitalized under general anesthesia, and non-suffering from other ailments (hypertension, diabetes, cancer, lung disorders, and chronic conditions). Mild obesity, BMI 30.0–34.9 kg/m²; severe obesity, BMI ≥35 kg/m². Exclusion criteria covered any obese person under local anesthesia for surgery, patients who had issues like bleeding during operation, etc.

Administrative arrangement and ethical consideration

Ethical approval for the study was obtained from the ethics committee of Tehran University of Medical Sciences (TUMS). With (ethical code: IR.TUMS.SEP.REC.1403.125) in all procedures of the study. All of the collected information lacked personal information such as name, ID number, and any other identity.

Setting of the Study

The study has been conducted in the intensive care unit in hospitals affiliated with medical sciences hospitals in Tehran (Shariati Hospital and Imam Khomeini Hospital).

Sample of the Study

Non-probability (purposive sample) The number of patients included in the study is 120 obese people who underwent surgery under general anesthesia in the operating room of hospitals. Affiliated with Tehran University of Medical Sciences, such as Shariati Hospital and Imam Khomeini Hospital, which are selected based on the study criteria.

Statistical data analysis:

Descriptive and inferential statistical tests were used to evaluate the data using SPSS software version 25. A significant level was defined as a p-value of less than 0.05.

4. Results

The high percentage of participants with intubation according to BMI was found in the difficult intubation group, which reached 72.5%. While the low percentage of participants' easy intubation was found in 27.5%. The mean of systolic pressure according to BMI. The mean systolic pressure at 30-34.9 kg/mm³ was 127.7 ± 5.98, while at 35-39.9 kg/mm³, the mean systolic pressure was 135.04 ± 9.3. There were no significant ($p \leq 0.05$) differences in the systolic pressure between the two BMI groups. The mean of diastolic pressure according to BMI. The mean diastolic pressure at 30-34.9 kg/mm³ was 81.18 ± 5.04, while at 35-39.9 kg/mm³, the mean systolic pressure was 86.53 ± 6.7. There were no significant ($p \leq 0.05$) differences in the diastolic pressure between the two BMI groups. The heart rate before and during general anesthesia and according to BMI groups. The heart rate was compared in each BMI group before and during general anesthesia. Where heart rate (90.7±5.18) before GA of 30-34.9 kg/mm³ showed significant ($p<0.05$) differences compared to heart rate (77.4±6.56) after GA. Also, in the 35-39.9 kg/mm³ group, heart rate (95.18±7.35) before GA showed significant ($p<0.05$) differences compared to heart rate (84.4±2.42) after GA. The oxygen saturation before and during general anesthesia and according to BMI groups. The oxygen saturation was compared in each BMI group before and during general anesthesia. Where oxygen saturation (99.94±0.1) before GA of 30-34.9 kg/mm³ showed non-significant ($p<0.05$) differences compared to oxygen saturation (99.84±0.11) after GA. Also, in the 35-39.9 kg/mm³ group, oxygen saturation (99.81±0.09) before GA showed non-significant ($p<0.05$) differences compared to oxygen saturation (99.74±0.13) after GA (Table 1).

Table 1: The number and percentage of participants to intubation, Systolic Pressure, Heart Rate, Oxygen Saturation according to BMI

Variable		BMI		
		30-34.9 mild	35-39.9 sever	P-Value
Intubation	difficult	65(77.4%)	22(61.1%)	P>0.05
	easy	19(22.6%)	14(38.9%)	

Systolic pressure (mm Hg)	before GA	127.7±5.98	135.04±9.3	P>0.05
	during GA	124.5±4.5	129.52±5.31	
diastolic pressure (mm Hg)	before GA	81.18±5.04	86.53±6.7	P>0.05
	during GA	79.14±4.5	82.7±5.31	
Heart Rate	before GA	90.7±5.18	95.18±7.35	P<0.001
	during GA	77.4±6.56	84.4±2.42	
Oxygen Saturation	before GA	99.94±0.1	99.81±0.09	P>0.05
	during GA	99.84±0.11	99.74±0.13	

The complications with general anesthesia in patients. The obstructive sleep apnea rate during general anesthesia is 55.0%, and it's the most common complication in patients, followed by lung collapse, which reached 24.2% of patients during general anesthesia. On the other hand, the least common complication in patients using general anesthesia was hypotension, which amounted to 4.2%. The effects after general anesthesia on patients. In a mild group of BMI, nausea reached 31 patients, and it had the most common effects on patients, followed by vomiting, which reached 20 patients after general anesthesia. The least common effect in patients was hyperthermia, which reached 3 patients. In the severe group of BMI, nausea reached 16 patients, and it had the most common effect on patients, followed by vomiting, which reached 13 patients after general anesthesia. The least common effect in patients was hyperthermia, which reached 2 patients (Table 2).

Table 2: the complications of general anesthesia in patients

Complications	BMI	
	30-34.9 (mild)	35-39.9 (sever)
Obstructive sleep apnea	54(64.3)	12(33.3%)
Lung collapse	15(17.9%)	14(38.9%)
Laryngospasms	7(8.3%)	6(16.7%)
Aspiration	5(5.9%)	2(5.5%)
Hypotension	3(3.6%)	2(5.5%)
Hypothermia*	18()	12()
Hyperthermia*	3()	2()
Shivering*	16()	9()
Vomiting*	20()	13()
Nausea*	31()	16()
Delirium*	7()	4()

*After general anesthesia in patients

5. Discussion

Surgeons and anesthesiologists both have significant difficulties treating the obese patient. In the surgical environment, a good knowledge of the pathophysiologic effects of obesity and its anesthetic consequences is absolutely essential. The anesthesiologist must optimize multisystem function during the perioperative phase to achieve optimal outcomes by managing the greater risks and comorbidities that accompany obese patients [13]. With an average length of 5.5 hours [14], Balci et al. conducted a cross-sectional investigation to ascertain the risk of intraoperative pressure injuries in patients undergoing elective cranial surgery. Due in part to increased fat mass squeezing on blood arteries, surgically obese patients were shown to be more likely to suffer high-pressure injuries related to static friction forces [15]. The BMI index turned out to be an independent risk factor for development of pressure injuries. Therefore, intraoperatively, people with a higher BMI need particular care when compared to a non-obese patient to reduce these effects [14]. More padding is one such precaution. The study also looked at whether obesity might cause blood oxygen saturation to drop. Świąktowska et al. [16] noted dyspnea among obese individuals. The basic energy demand increases as body weight grows as well as the oxygen intake. Obesity reduces the

compliance of the diaphragm, chest wall, which results in breathing problems, more frequent exertional dyspnea, and dyspnea during rest. Under such circumstances, tiny bronchioles close and accompany aberrant ratios between ventilation and perfusion. Decline in lower respiratory tract compliance lowers expiratory reserve volume (ERV), vital capacity (VC), and total lung capacity (TLC). Hypoxia and hypercapnia [17, 18] may follow from these changes. According to Demir et al. [19], obesity increases the likelihood of postoperative pulmonary and gastrointestinal problems as well as discharge with morbidity, which is quite common with growing BMI, but it does not affect short-term mortality following open heart surgery.

6. Conclusion

At last, the findings of this study revealed that patients with more weight had systolic and diastolic blood pressure, heart rate, and blood oxygen higher. Before and after general anesthesia, systolic and diastolic blood pressure, heart rate, and blood oxygen levels of the patients showed no statistically significant variation. Consequently, it is advised that during intubation and operation overweight individuals pay extra attention to hemodynamic condition.

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Conflict of Interest

There are no conflicts of interest regarding this study.

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