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The Obesity Epidemic and its Implications in Anesthesia

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Abstract:

Background: Obesity is among the most prevalent risk factors affecting the physical and mental well-being of overweight patients, resulting in lower survival rates. This study aimed to evaluate clinical outcomes associated with the impact of obesity on anesthesia management.

Patients and methods: A total of 133 patients aged 25 years and above were diagnosed in different hospitals in Iraq between 17th February 2022 and 26th March 2023. The patients were categorized based on their obesity into three classes (Class I, Class II, Class III) and underwent two types of surgeries - gastric sleeve surgery and gastric bypass. Additionally, patients' postoperative well-being was evaluated using the WHOQOL-BREF questionnaire.

Results: The clinical results showed that obesity was the most important risk factor affecting the quality of life of elderly patients over the age of 60, and the infection rate reached 42.11%, with males having a higher infection rate, 62.41%, than females, 37.59%. Most patients were obese and had a body mass index. Body mass index (31-34.9) was 51.13%, and patients with BMI (>35) was 30.08%. The results of the WHOQOL-BREF quality of life assessment showed that the hospital was successful in managing the surgical procedure and improving patients' quality of life after surgery, despite the difficulty of the operation and the adverse effects of general anaesthesia. The assessment results showed that social relationships (71.88%), mental health (68.55%), and physical aspects (63.11%) were the most improved and effective for patients after surgery.

Conclusion: According to this recent study, patients' levels of obesity significantly affect their ability to undergo various bariatric surgery procedures. Nonetheless, our study revealed a definite improvement in the post-operative quality-of-life evaluation of obese patients regarding their physical, social, and mental health.

Key words:

Obesity; General anesthesia; Fentanyl; and WHOQOL-BREF.

Introduction:

Obesity is a global health problem that can have cardiovascular, metabolic, and even immunological implications [1]. It is recognised that obesity is a risk factor for developing complications following surgery, including cosmetic procedures such as abdominoplasty, augmentation, and reduction mammoplasty, among others [2-4]. The most common complications are surgical site infection and deep vein thrombosis, which are explained by the impact of obesity on the architecture and functionality of the immune system, the impact of obesity on circulatory mechanics, and the habits typically associated with obesity, such as physical inactivity [5,6]. Given this evidence, it is time to consider new strategies to prevent as many complications as possible in this subpopulation, for which new, more rigorous research with novel protocols is needed. [7]

Obesity is a non-communicable, complex, multifactorial, and highly preventable chronic disease that, together with overweight, now affects one-third of the world's population. If current behaviours continue, it is estimated that by 2030, about 38% of the adult population will be overweight, and 20% will be obese [8]. Obesity is typically defined as excess weight relative to body size, but this definition lacks rigour because it does not encompass the phenotypic aspects associated with this entity, where visceral adiposity, metabolic dysregulation, low-grade chronic inflammation, endothelial dysfunction, among many other molecular consequences of the adipopathy inherent in obesity, stand out. [9-11]

Although major complications are rare, they can cause prolonged morbidity and have a significant economic impact, which is usually not covered by the patient's insurance [12,13]. For this reason, it is important to identify the risk factors that could sabotage the results of any aesthetic procedure. As mentioned above, obesity is an independent risk factor for post-operative complications, regardless of the surgical setting. Surgery does not escape this reality, as a study of around 128,000 people has shown that overweight and obese patients have a higher risk of post-operative infection. [14,15].

Patients and methods:

A cross-sectional study was conducted to evaluate the outcomes in obese patients and their impact on intraoperative anaesthesia and to analyze complications and quality of life of patients after surgery. One hundred thirty-three patients aged between 25 and over 60 years were diagnosed in different hospitals in Iraq from 17th February 2022 to 26th March 2023 with a BMI between (<30.9, 31-34.9, >35). Patients were classified according to their degree of obesity (first degree, second degree, third degree) and underwent two types of surgical procedures: one was gastric sleeve surgery, and the other was gastric bypass. Both types of surgery were performed on patients under general anaesthetic. The same anaesthesia technique was used, which consists of general anaesthesia with the use of opioids through fentanyl and determining the size of the wound given to the patient. In addition, patients' postoperative quality of life was assessed using the WHOQOL-BREF, and patients' postoperative complications and length of hospital stay were recorded. The results of the study were analysed, and all data were presented using SPSS version 22.0.

Baseline demographic characteristics of obese patients were recorded before surgery, including age, sex, BMI, comorbidities, type of surgery, anaesthesia used, and ASA grade into which obese patients were classified (class I, class II, class III). Specialized data were collected to define haemodynamic changes in obese patients, including heart rate, diastolic arterial pressure, and systolic blood pressure.

This study identified data on patients who underwent both gastric sleeve and gastric bypass surgery, both of which were performed using general anaesthesia with opioids, including fentanyl. As a result, our study identified clinical outcomes for patients during surgery, including duration of

surgery, rate of blood loss during surgery, blood transfusion data, total duration of general anaesthesia, and length of hospital stay. For the pharmacokinetics of fentanyl used in obese patients, the following patient data were determined: TBW, dose (µg), dose (µg/kg TBW), route of administration, and sampling time (h).

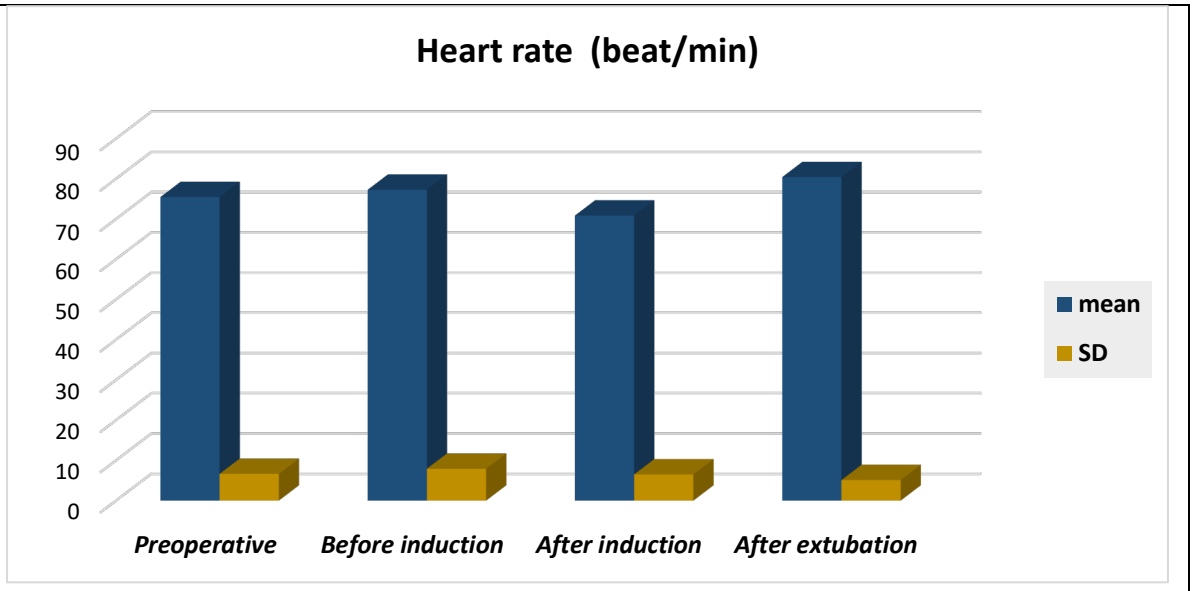
In terms of postoperative outcomes, the complications associated with post-operative patients were evaluated, and as a result, their quality of life was assessed using the WHOQOL-BREF, which represents the World Health Organization's quality of life, as the WHOQOL-BREF score scale ranges from (0 - 100), where 0 represents the worst. The WHOQOL-BREF is a questionnaire that assesses four domains in addition to physical health: mental health, social relationships, and environment.

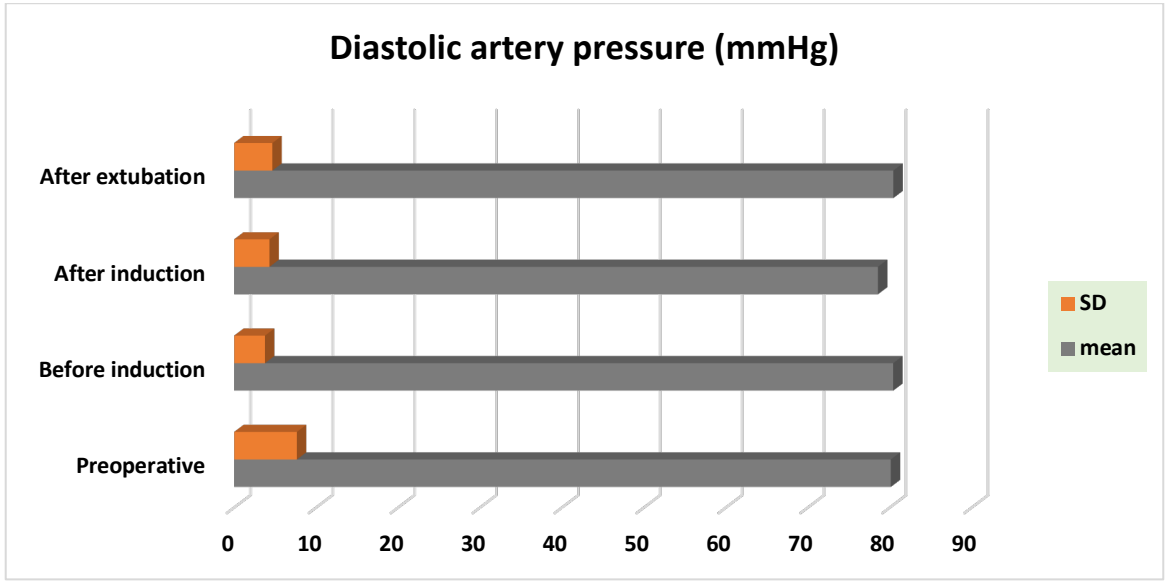
Results:

Table (1) Baseline demographic characteristics outcomes of obese patients.

Variables	***Number of patients, [133]***	***Percentage, [%]***
Age [years], N (%)		
25-30	12	9.02%
35-40	25	18.80%
45-55	40	30.08%
> 60	56	42.11%
Sex, N (%)		
Males	83	62.41%
Females	50	37.59%
BMI [kg/m3], N (%)		
< 30.9	25	18.80%
31-34.9	68	51.13%
> 35	40	30.08%
Associated comorbidities, N [%]		
cardiovascular	16	12.03%
High blood pressure	30	22.56%
Type 2 diabetes	20	15.04%
Musculoskeletal problems	13	9.77%
High cholesterol and triglyceride levels	14	10.53%
Breathlessness	30	22.56%
Psychological problems	10	7.52%
ASA grade, *N [%]*		
I	25	18.80%
II	68	51.13%
III	40	30.08%

Types of surgeries		
Gastric sleeve	79	59.40%
Gastric bypass	54	40.60%





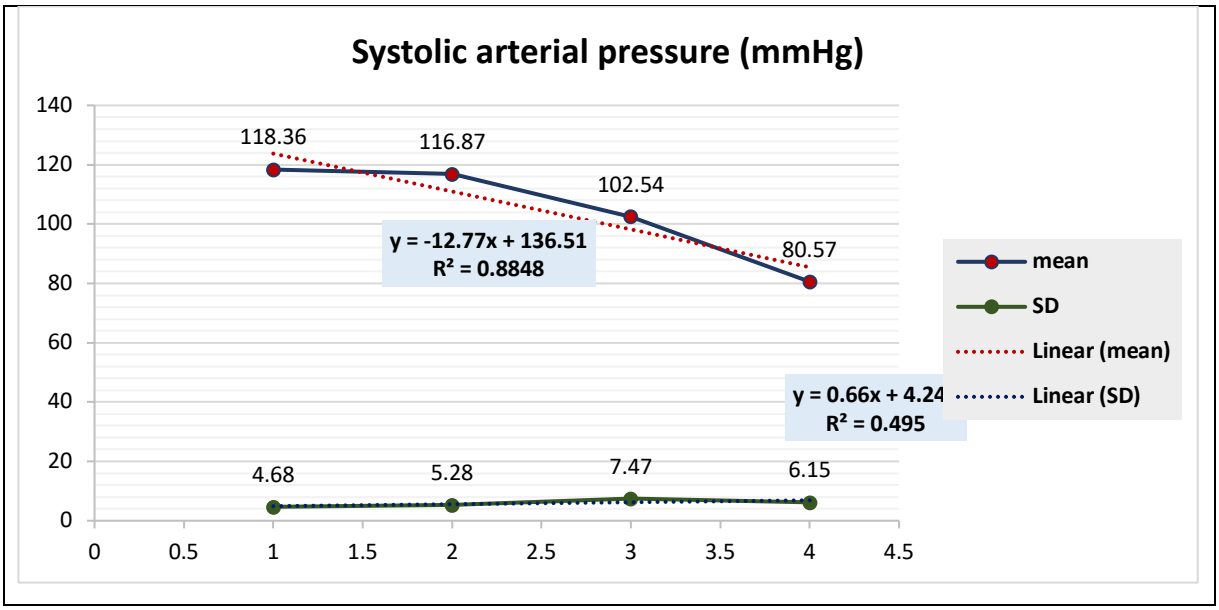


Figure 1: Identify hemodynamic changes of obese patients.

Table (2) Clinical intraoperative outcomes.

Variables	***Intraoperative outcomes***
Duration of surgery [min], (mean ± SD)	
Gastric sleeve [min]	*43.21 ± 20.56*
Gastric bypass [min]	*137.0 ± 43*
Intraoperative blood loss (ml), (mean ± SD)	
Class I	*472.53 ± 96.43*
Class II	*517.23 ±87.86*
Class III	*595.42 ± 92.56*
Blood transfusion data, N [%]	
Class I [< 30.9]	*7 [5.26%]*
Class II [31-34.9]	*20 [15.04%]*
Class III, [> 35]	*28 [21.5%]*
Total time of general anaesthesia [min]	

Gastric sleeve [min]	*83.27 ± 11.48*
Gastric bypass [min]	*237.60 ± 48.40*
Length of stay in hospital, [days]	
Gastric sleeve	*3.5 ± 0.81*
Gastric bypass	*6.2 ± 2.8*

Table (3) Fentanyl pharmacokinetics used for obese patients.

Parameters	**Patients with gastric sleeve**	**Patients with gastric bypass**
TBW (kg)	*138.77 ± 16.84*	*136.6 ± 15.1*
Dose (µg)	*139.21 ± 51.70*	*137.0 ± 50.0*
Dose (µg/kg TBW)	*1.0 ± 0.8*	*1.0 ± 0.5*
Mode of administration	*Bolus dose*	*Bolus dose*
Sampling time (h)	*> 24 hours*	*> 24 hours*

Table (4) Post-operative complications.

Variables	***Gastric sleeve***	***Gastric bypass***	***P-value***
Infection	3 [5.56%]	2 [2.53%]	*0.0412*
Blood clots	2 [3.70%]	2 [2.53%]	*0.0251*
kidney complications	3 [5.56%]	1 [1.27%]	*0.0028*

Slower healing	1 [1.85]	1 [1.27%]	*0.048544*

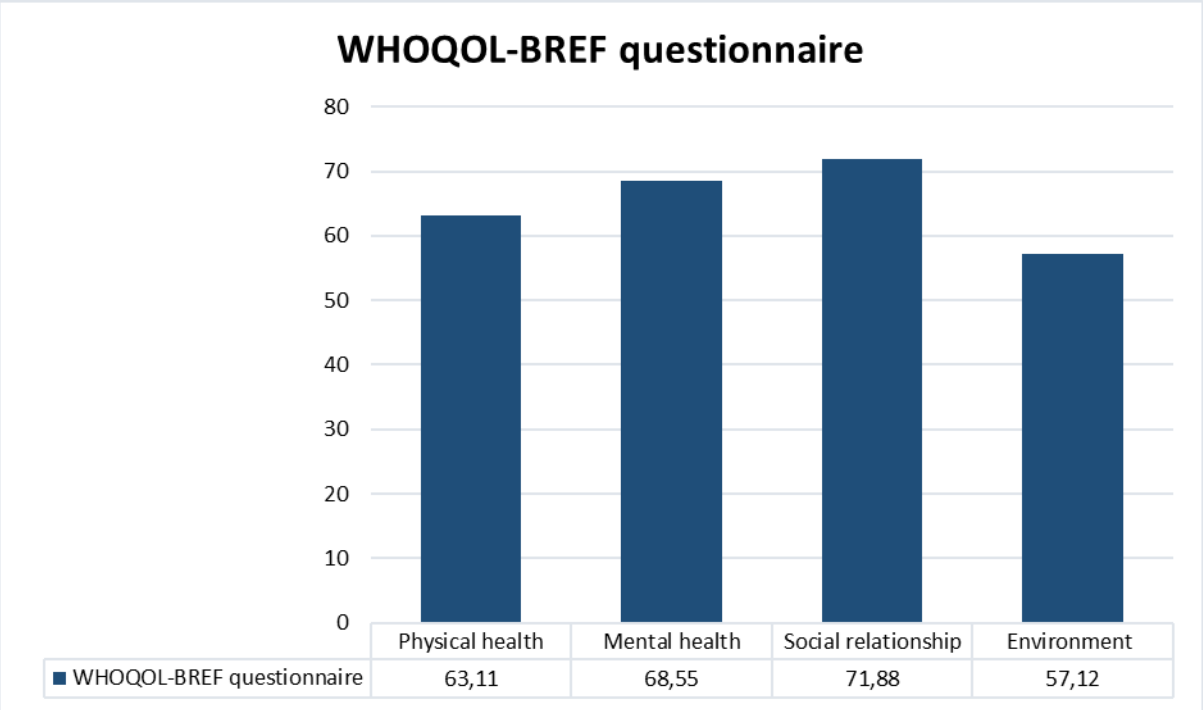


Figure 2: Assessment of quality-life of obesity patients by WHOQOL-BREF.

Discussion:

Our study analyzed clinical and demographic data to evaluate the quality-of-life outcomes of postoperative obese patients and its impact on anesthesia. Clinical results showed that obesity is the most risk factor affecting the quality of life of elderly patients over the age of 60, and the infection rate reached 42.11%, with males having a higher infection rate, 62.41%, than females, 37.59%. Most of the patients were obese and had a mass index. Body mass index (31-34.9) was 51.13%, and patients with BMI (>35) was 30.08%. Regarding the comorbidities associated with obesity, these clinical results showed that type 2 diabetes (15.04%), cardiovascular problems (12.03%), and high blood pressure (22.56%) are the most influential risk factors for obese patients, whether before surgery or after surgery, which leads to In dyspnea, the case rate was 22.56%. Based on the ASA grade, the majority of patients were ASA III, which was 30.08%.

In addition, we determined the hemodynamic changes of obese patients before surgery, where the heart rate was (75.46 ± 6.65), diastolic blood pressure (80.137 ± 7.66), and systolic blood pressure (118.36 ± 4.68).

Regarding surgical outcomes, our study recruited 133 patients who underwent two types of surgery, one of which was gastric sleeve surgery, with 79 patients, and gastric bypass surgery, with 54 patients. The duration of surgery for both gastric sleeve surgery (43.21 ± 20.56) and gastric bypass surgery (137.0 ± 43), and the rate of patients to They received blood transfusions, which included Class I with (5.26%), Class II with (15.04%), and Class III with (21.5%). The total time for general anesthesia in gastric sleeve surgery (83.27 ± 11.48) and gastric bypass surgery (237.60 ± 48.40), and the length of hospital stay for gastric sleeve patients (3.5 ± 0.81), while the length of stay for patients who underwent gastric bypass surgery (6.2 ± 2.8).

Opioids were used, which showed the pharmacokinetics of fentanyl used for obese patients, TBW (kg) was (138.77 ± 16.84) for gastric sleeve patients and (136.6 ± 15.1) for gastric bypass

patients, Dose (µg) was (139.21 ± 51.70) For gastric sleeve patients and (137.0 ± 50.0) for gastric bypass patients, Dose (µg/kg TBW) was (1.0 ± 0.8) for gastric sleeve patients and (1.0 ± 0.5) for gastric bypass patients, as the administration method for fentanyl was by Bolus dose and was Sampling time is more than 24 hours.

Regarding postoperative outcomes, our study recorded the complication rate for obese patients after gastric bypass surgery as only 6 cases, while for patients who underwent gastric sleeve surgery, it was 9 cases. In addition, obese patients who underwent both types of surgery were evaluated under general anesthesia, and the results of the quality-of-life assessment by WHOQOL-BREF showed that the hospital was successful in managing the surgical procedure and improving the quality of life of patients after surgery despite the difficulty of the operation and its adverse effect under general anesthesia. The evaluation results showed that the social relations aspect (71.88%), mental health (68.55%), and physical aspect (63.11%) were the most improved and effective for patients after surgery.

Previous studies have shown that obesity is a factor that significantly affects patients before and during surgery, causing sleep apnoea and increasing the risk of complications during and after surgery. Titration of drug doses is important due to unclear pharmacokinetic and pharmacodynamic properties in obese patients [16]. The management of anaesthesia during bariatric surgery is challenging and of paramount importance because of the adverse effects of surgery, prolonged operative and recovery times, and the need for blood transfusions, which prolong the length of hospital stay [17]. Recent studies have shown that high cholesterol and glucose levels are the most important factors affecting obese patients, which makes men more susceptible to obesity and more dangerous to their quality of life during surgery compared to women. Surgery in obese people increases the risk of surgical site infection and delayed healing due to reduced blood supply to fat tissue. Many obese people also have diabetes, which increases the risk of infection after surgery [18]. Some studies have found that the use of fentanyl with general anaesthesia is associated with better and faster recovery because fentanyl has a faster onset and better duration of action, which is attributed to reducing pain after surgery and comforting patients without the need for additional analgesics after surgery. [19,20]

Conclusion:

This current study indicates that obesity has a significant impact on patients during the conduct of different kinds of bariatric surgeries. However, our findings found a clear improvement in the quality-life assessment of obesity patients post-operative in terms of the physical side, social relationships side, and mental health side. Post-operative complications occur with 15 patients, with infection is the most common with five patients. Our study demonstrates Fentanyl can provide effective pain relief during and after surgery, whereas fentanyl use in combination with general anesthesia can be safer treatment, which causes patient comfort and reduces the need for additional pain medication. This study recommends conducting future studies associated deeply with obesity's effect on surgery under general anesthesia with fentanyl to create focused therapies that will enhance patients' results following bariatric surgery. Furthermore, it adds to the expanding body of knowledge on how bariatric surgery affects quality of life, which will direct future study in this field.

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