Review Article

The Effect of Obesity on Surgical Results in General Surgery Patients: A Systematic Review of 1,680,694 patients

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ABSTRACT

The study examined the impact of obesity on general surgery patients, analyzing eleven studies with 1,680,694 patients. Results showed that obesity increases postoperative wound infection risk, blood loss, and recovery times. However, prospective studies found no increase in surgical complications or hospitalization expenses. Obesity may protect against venous thromboembolism and death, but post-operative complications in obese patients undergoing general surgical procedures remain controversial due to metabolic, pharmacologic, and systemic illnesses. Obesity increases surgical duration and SSIs, potentially increasing immediate complications.

Keyword: Obesity, BMI, General surgery, Complications Systematic review.

Introduction

Obesity is a medical condition characterized by an excess accumulation of body fat, which can have detrimental effects on an individual's health. There are several types of obesity, each with its own unique characteristics and risks [1]. Obesity is becoming more commonplace worldwide [1]. Diagnosing obesity typically involves measuring a person's Body Mass Index (BMI), waist circumference, and waist/hip ratio. These measurements help classify individuals into different categories of obesity, ranging from overweight to class I, class II, and class III obesity. Class III obesity, also known as morbid obesity, is associated with the highest risk of developing health complications due to the excessive amount of body fat present [2].

Obesity is frequently linked to a higher risk of death due to comorbid illnesses for example, type II diabetes mellitus, Hypertension, hit, and coronary artery diseases [2, 3]. Overall mortality rises by 30% with each 5-unit growth in body mass index (BMI) beyond 25 kg/ m2. [4]. Morbid obesity, is a severe form of obesity that significantly increases the risk of developing other health conditions such as diabetes, heart disease, and sleep apnea. Visceral obesity refers to the accumulation of fat around the abdominal organs, which is particularly concerning as it is associated with a higher risk of metabolic syndrome and cardiovascular disease. Abdominal obesity, on the other hand, is characterized by excess fat specifically around the waist area and is linked to an increased risk of insulin resistance and type 2 diabetes.

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Sarcopenic obesity is a combination of obesity and muscle loss, which can lead to decreased physical function and mobility [3]. Vascular comorbidities account for the majority of increased Patients with a BMI higher than the suggested range of 22.5-25 kg/m2 have a higher death rate. Obesity is viewed as a possible risk factor for poor postoperative results since it is rising more prevalent and is recognized to increase morbidity and mortality in the overall population. Obesity's effect on surgical outcomes is not completely clear, nevertheless, because results from a wide range of surgical research are contradictory. The obesity paradox refers to the fact that while obesity was linked to negative outcomes in certain research [5, 6], in other trials, it remained also not associated by significant opposing effects or had a defensive impact on survival [7, 8], Aside from perhaps an increased accidental of slight issues. Patients with morbid obesity, particularly those classified as class III, are at a significantly higher risk of experiencing postoperative complications compared to individuals with lower classes of obesity. Common postoperative complications in these patients include wound infections, deep vein thrombosis, pulmonary complications, and delayed wound healing. The excessive amount of adipose tissue in class III obesity can make surgical procedures more challenging and increase the risk of complications during and after surgery. Therefore, it is crucial for healthcare providers to carefully assess and manage the risks associated with obesity when planning surgical interventions for these individuals [8]. Surgery is impacted by the obesity epidemic not only in terms of a rise in obese individuals, but also in surgically treated obesity-related disorders [9, 10].Obese persons had higher survival rates, despite the medical hazards associated with obesity [11], as indicated by the current study. The general population [12], patients with heart failure [13], coronary artery disease [14], dialysis [15], in addition, peripheral arterial disease [16], among others, have been investigated in connection to the obesity paradox. Furthermore, a number of surgical populations have demonstrated a comparable survival advantage for obese patients in the postoperative phase [17]. The primary goalmouth of this appraisal is to explore the impact and consequences of fatness in patients having general surgery.

Methods

The present systematic review adhered to the PRISMA principles Guidelines for Preferred Reporting Items in Systematic Reviews and Meta-Analyses [18].

Study Design and Timeframe: The systematic review began in January 2024.

Search approach: To discover relevant literature, a thorough search was conducted in five main databases: PubMed, SCOPUS, Web of Science, Science Direct, and the Wiley Library. We narrowed our search to English and considered each database's particular criteria. The following keywords were translated into PubMed Mesh terms or topic terms in Scopus and used to discover related research: "Obesity," "BMI," "General surgery," "Surgical outcomes," and even "Complications." The Boolean operators "OR", "AND", and "NOT" were used to match the key phrases. The search yielded articles in entire English, freely available studies, and human trials.

Eligibility criterion. Selection criteria

We considered the following factors for our review.

- Summaries of research impact and sequalae of obesity in patients undergoing general surgeries.
- Individuals older than 18 years old (No pediatric patients were included in this study).
- Limited to human beings.
- Proficiency in English required.
- Articles are freely available.

Exclusion criteria: The following categories of articles were excluded from our review: letters, reviews, conference abstracts, unpublished data, case reports, and insufficient data. All authors had a conversation to resolve disagreements once the investigators had finished the eligibility evaluation.

Extracting data: The search method's findings were double-checked with Rayyan (QCRI) [19]. To examine the relevancy of the names and summaries, the researchers added presence and exclusion standards to the joint search results. The reviewers carefully assessed every manuscript that satisfied the inclusion requirements. The writers discussed dispute resolution approaches. The allowed study was submitted using a previously prepared data extraction form. The authors gathered data on research titles, authors, study years, nations, participants, gender, average BMI, patient kinds, and primary outcomes. A second spreadsheet was created to evaluate the risk of bias.

Strategy for data synthesis: The summary tables, which included data from pertinent studies, provided a qualitative overview of the investigation findings and components. Next data collection for the systematic review, the most effectual method for using data from the included study articles was identified.

Assessing the risk of bias

The Joanna Briggs Institute (JBI) [20]. key assessment criteria for studies providing prevalence data were applied in order to evaluate the research's quality. This technique was used to evaluate studies using nine questions. The question was given a score of 1 if the answer was in the affirmative. Any response that was no, unclear, or not applicable received a score of 0. For overall quality, ratings of less than 4, Five to seven, and more over eight, were classified as low, moderate, and high quality, respectively. Scholars appraised the quality of their study, and differences were resolved via debate.

Results

Search results: The systematic search turned up 180 study publications, with 67 duplicates removed. A total of 113 manuscripts were evaluated for title and abstract, and 82 were deleted. Only one article was discovered among the 31 reports that were searched. Finally, 30 manuscripts were screened for full-text review; 11 were rejected owing to inaccurate study findings, 5 due to improper population type, and 3 were letters to the editors. The systematic review included eleven study articles that met the eligibility criteria. (Figure 1) shows an overview of the research selection process. Characteristics of the included studies. (Table 1) illustrates the sociodemographic characteristics of the selected study papers. Our findings covered eleven studies and a total of 1,680,694 patients. Eight investigations were retrospective in character [21–26, 28, 31], whereas three were prospective in type [27, 29, 30]. Six studies were conducted in the USA [21, 22, 25, 29-31], two in The Netherlands [23, 26], one in Egypt [24], one in Switzerland [27], there is one in Canada [28]. (Table 2) displays the clinical features. There are six studies demonstrated that obesity increases the risk of postoperative wound infection, transfer, and discharge to a place other than their home, more blood loss during surgery, and longer recovery times [21–23, 25, 26]. One study included obese children and reported that obesity increases the risk of respiratory complications [24]. On the other hand, prospective studies reported that obesity does not increase the risk of surgical complications and has no bearing on hospitalization expenses [8, 17, 29]. One study reported that obesity is protective against venous thromboembolism (VTE) [27] and death [29].

Discussion

We think that this is the first thorough evaluation of the postoperative problems associated with general surgery in obese individuals. The majority of the research examined found that obesity increased the risk of postoperative wound infection, transfer, and discharge to a place other than their home, more blood loss during surgery, and longer recovery times [21–23, 25, 26]. Mullen et al. reported that obesity increases surgical time. Regarding immediate postoperative results, obesity may increase the chance of specific issues based on the operation performed. On the other hand, obesity might not have a negative effect on the results of long-term surgeries [30]. In line with our results Daniels [31], found that surgical site infections (SSIs) are frequently linked to obesity as a risk factor. It is impossible to draw direct comparisons without trustworthy and comparable definitions, yet they were unable to locate comparable data to back up their conclusions. Also, in plastic [32] and spine surgeries [33], compared to individuals who are not obese, obese patients experience more problems and a higher frequency of reoperations. Obese patients may be more susceptible to surgical wound infections due to pathophysiologic factors such as relative hypoperfusion/ischemia, dysregulated immunological and inflammatory responses, and reduced antibiotic administration [34]. Additionally, obese people frequently have higher wound edge tension, which reduces the amount of oxygen getting to the wound. Injuries connected to pressure may be more likely in obese people due to hypo-vascularity and their inability to properly move themselves. Moreover, skin to skin friction can result in ulceration, and superfluous skin folds provide a wet environment for microorganisms to flourish, which can induce infection and tissue deterioration [35]. This review also found that obese children and reported that obesity increases the risk of respiratory complications [24]. Similarly, Eichenberger et al. [36] reported that compared to patients who were not obese, general anesthesia caused significantly higher lung atelectasis in MO patients. Additionally, in MO patients, atelectasis persisted for at least 24 hours, whereas in non-obese individuals, it vanished. Obesity dramatically alters respiratory mechanics, and general anesthesia exacerbates these alterations even more. Reduced functional residual capacity (FRC) is a hallmark of these obesity-related alterations. This is mainly due to a decrease in expiratory reserve volume (ERV), which causes atelectasis and shunt physiology [37]. In addition, obesity raises lung resistance, lowers oxygenation, increases work of breathing, and reduces lung and chest wall compliance [38]. Obese people tolerate apnea for a shorter duration before desaturation as a result of the decreased FRC [39].

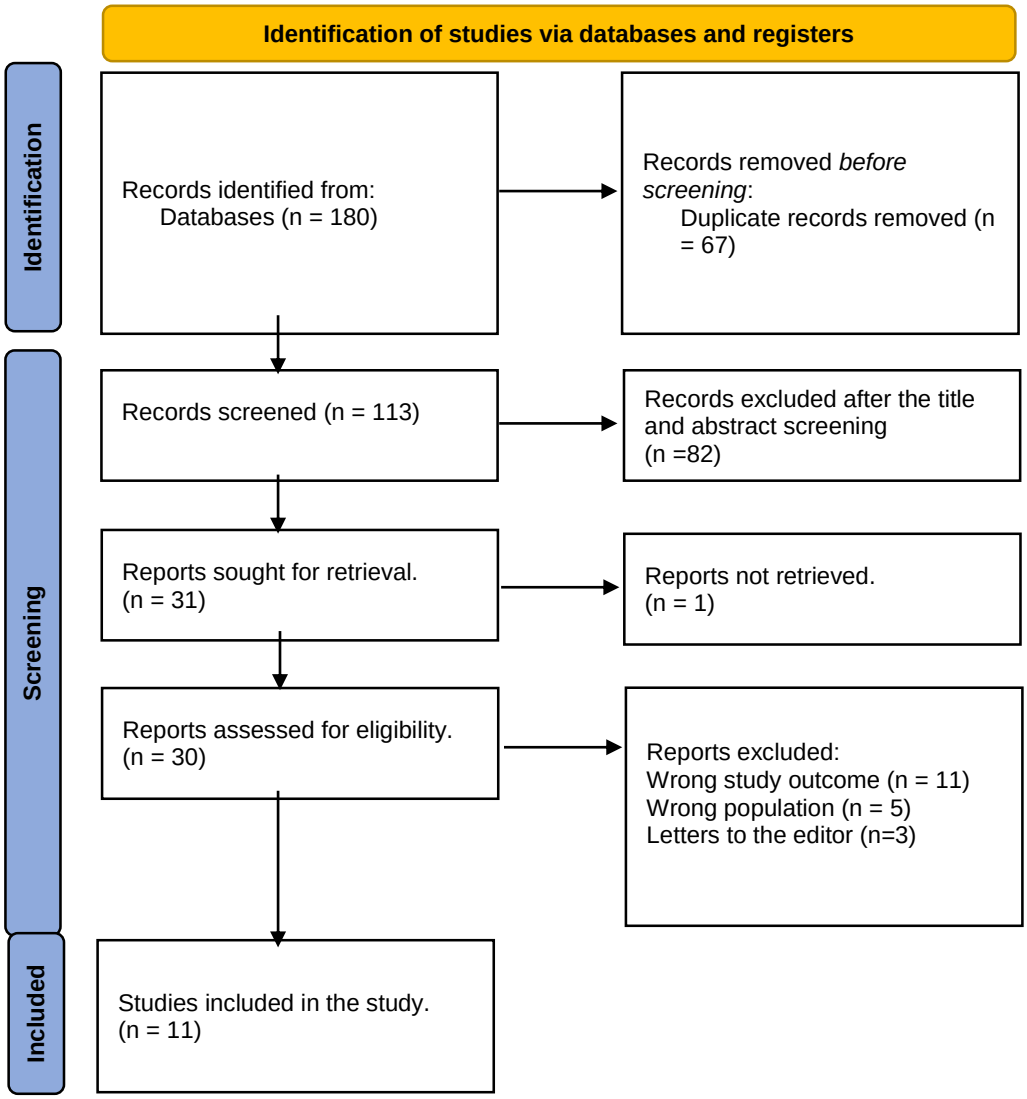

Figure 1: PRISMA flowchart summarizes the study selection process.

Table 1: Sociodemographic characteristics of the included participants.

Study	Study design	Country	Participants	Mean age	Gender (Females)
Georgino et al., 2020 [21]	Retrospective cohort	USA	157130	55±17	91302 (58.1)
Gupta et al., 2020 [22]	Retrospective cohort	USA	1378711	55.7	NM
Valentijn et al., 2013 [23]	Retrospective cohort	The Netherlands	10427	58 ± 16	10149 (93.3)
El-Metainy et al., 2011 [24]	Retrospective cohort	Egypt	1465	2 to 16	495 (33.8)
Jones et al., 2023 [25]	Retrospective cohort	USA	906	42.9 ± 16.2	491 (54.2)
Tjeertes et al., 2015 [26]	Retrospective cohort	The Netherlands	4293	55.5 ± 14.9	2076 (48.6)
Dindo et al., 2003 [8]	Prospective cohort	Switzerland	808	52·6 ± 14·4	494 (61)
Meade et al., 2014 [27]	Retrospective cohort	Canada	378	NM	NM
Buehler et al., 2015 [28]	Prospective cohort	USA	686	54.3 ± 14.1	381 (56)
Mullen et al., 2009 [17]	Prospective cohort	USA	118707	53.1	70987 (59.8)
Maloney et al., 2022 [29]	Retrospective cohort	USA	7183	58.2 ± 18.7	3807 (53)

*NM=Not-mentioned

Table 2: Clinical characteristics and outcomes of the included studies.

Study	Mean BMI	Type of patient	Main outcomes	JBI
Georgino et al., 2020 [21]	NM	Obese patients undergoing emergency general surgery procedures	Patients who were obese had higher chances of wound infection, transfer, and discharge to a place other than their home. Obese patients, however, had a somewhat lower chance of a 30-day readmission.	High
Gupta et al., 2020 [22]	29.75±7.3	Patients with extreme obesity undergoing non-bariatric general surgery	Following elective non-bariatric surgery, the risk of perioperative mortality, morbidity, and infectious and life-threatening complications showed a linear escalation for the extreme obesity subsets MO, SO, and SSO (morbid obesity, super obesity, and super-super obesity).	Moderate
Valentijn et al., 2013 [23]	25.8 ± 5.2	Obese patients undergoing general surgery procedures	Overweight patients had a reduced risk of postoperative mortality, but this risk was unrelated to any other BMI category. The low rate of cancer-related mortality in the overweight and obese categories served as the primary basis for validating the obesity paradox over the long-term follow-up.	Moderate
El-Metainy et al., 2011 [24]	31.1 ± 3.4	Obese children undergoing elective general surgery	The findings verified a rise in the prevalence of obesity and overweight status, as well as a link between obesity and unfavorable respiratory outcomes in children undergoing surgery and anesthesia.	Moderate
Jones et al., 2023 [25]	35.6 ± 4.7	Myosteatotic and sarcopenic obese patients undergoing general surgery	Reliability for poor surgical outcomes due to pathophysiologic skeletal muscle and adipose tissue is not exclusive to patients with cancer or fragile age.	Moderate
Tjeertes et al., 2015 [26]	33.5 ± 3.4	Obese patients undergoing general surgery procedures	Just being obese increases the risk of wound infection, more blood loss during surgery, and lengthier recovery times. The obesity paradox is validated by the association between obesity and enhanced long-term survival. Patients who are underweight have far higher risks of complications and fatality.	Moderate
Dindo et al., 2003 [8]	34·9 ± 6·0	Obese children undergoing elective general surgery	In and of itself, obesity does not increase the risk of surgical complications. It is no longer acceptable to have a regressive approach regarding general surgery on fat people.	High
Meade et al., 2014 [27]	NM	Obese patients undergoing general surgery procedures	Patients undergoing general surgery have a low rate of VTE, and those who are obese (BMI ≥ 35 kg/m2) seem to be sufficiently protected against VTE.	

				Moderate
Buehler et al., 2015 [28]	NM	Obese patients undergoing general surgery procedures	BMI-defined obesity and overweight had no bearing on hospitalization expenses, ICU admission requirements, or postoperative results. AKI was the only consequence that varied significantly by BMI group and was more prevalent in participants who were obese.	Moderate
Mullen et al., 2009 [17]	NM	Patients with obesity undergoing non-bariatric general surgery	Patients having non-bariatric general surgery who are overweight or moderately obese have "lower" crude and overall mortality rates when compared to patients who are "normal" weight.	Moderate
Maloney et al., 2022 [29]	64.2% >BMI 30 kg/m2	Obese patients undergoing general surgery procedures	Ironically, even after adjusting for any confounding variables, obesity seems to be protective against death. These results might be impacted by the obese population's higher rates of nonoperative management.	High

On the other hand, prospective studies in this review reported that obesity does not increase the risk of surgical complications and have no bearing on hospitalization expense [8, 17, 29]. One study reported that obesity is protective against venous thromboembolism (VTE) [27] and death [29]. The variability in the studies (study methodologies, definition of obesity and surgical result, kinds of surgery) and inadequate statistical power resulting from Small sample sizes in certain research may contribute to discrepancies among included studies. Many unique considerations must be made while caring for an obese surgery patient who is critically unwell. For instance, increasing body habitus can make technical aspects difficult, such as placement, monitoring, and vessel cannulation. As was previously mentioned, considering the variations in drug distribution and clearance, drug dosage in obese patients also warrants specific attention. There is a dearth of information regarding pharmacokinetic-guided dosage in obese patients. Antibiotics, sedatives/analgesics, and anticoagulants are frequently used medications in the intensive care unit (ICU) and may need special consideration [40]. Recovery for critically sick obese individuals requires nutritional therapy because obesity does not prevent acute ICU-related malnutrition from developing. As with all patients with severe illness, the American Society of Parenteral and Enteral Nutrition recommends early enteral nutrition. To establish positive nitrogen balance, protein requirements should be calculated using weight-based calculations and urine nitrogen, whereas calorie requirements should be evaluated using indirect calorimetry. High-protein, hypo-caloric diets can help obese people reach their nutritional goals. This comprehensive review is limited by its qualitative assessment only additionally, variability in defining obesity and classes of obesity were not extensively investigated. Moreover, we did not conduct sub-grouping for the reported post-operative complications in obese patients [41].

Conclusion

This review included controversial findings regarding post-operative complications in obese individuals who are undergoing general surgical operations. Because the fundamental reasons of the problems that may occur are metabolic, pharmacologic, and systemic illnesses, providing perioperative care for obese surgical patients remains a difficult task. It is commonly accepted that obesity has a negative impact on general surgery. Obesity in particular increases surgical duration and SSIs; as a result, it may increase

the risk of immediate complications. Nonetheless, obesity might not have a negative impact on the results of long-term surgery. Depending on the surgical approach, the result of the procedure, and/or racial disparities in obesity, obesity may have different effects on surgery.

Conflict of Interest

None

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None

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