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Post-Operative Respiratory Complications in Obese Patients Under General Anesthesia

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Abstract

Background: Postoperative problems affect four percent of surgery patients and may be more common in obese persons. It is the second most common cause of death in the United States. Obese patients are more likely to have postoperative respiratory failure than cardiac complications from surgery under general anesthesia.

Objective: The objective of this study is to recognize and decrease post-operative pulmonary complications in obese patients. And also decrease the hospital stay and enhance recovery.

Methodology: Study included 60 patients. All these patients had a BMI of greater than 30. All these patients had a preoperative pulmonary function test and all these patients underwent a surgery under general anesthesia. Most of these patients develop post-operative pulmonary complications. Most common complications include pneumonia, respiratory failure and atelectasis.

Results: Obesity increases the risk of respiratory problems after surgery, with pneumonia and respiratory failure being the most common complications. These complications can lead to longer hospital stays, higher morbidity, and increased medical expenses.

Conclusion: Following surgery, obesity raises the risk of respiratory issues; the most frequent complications are pneumonia and respiratory failure. Longer hospital stays, greater morbidity, and higher medical costs are the results of these complications. Prioritizing respiratory care and using a multidisciplinary team approach can help lower these complications and enhance patient safety and quality of life. To improve respiratory outcomes, future research should concentrate on enhancing risk prediction and creating individualized treatments.

Key words: Obesity, complications, postoperative, BMI

Introduction:

Airway management in obese patients demands careful pre-operative assessment, emphasizing optimal positioning, good preoxygenation, and taking into account how neck circumferences are bigger, and certain other factors might cause intubation to be more difficult; strategies often include using a "ramped" position, video laryngoscopes, and easy availability of alternative airway devices such as supraglottic airways and always ensuring oxygen saturation is maintained during the whole process.

Obese patients are more likely to have postoperative respiratory failure than cardiac complications from surgery under general anesthesia. Its major effects include longer hospital stays and higher medical costs; over one-fifth of patients with PPC die within 30 days of major surgery, compared to 2.5 to 3% of patients without one. The causes of postoperative respiratory complications include a 15–20% decrease in FRC, changes in ventilation distribution with IPPV, low cardiac output, atelactasis, lung tissue compression, early airway closure, rapid absorption of gases from alveoli where airways are narrow and closed, airway obstruction, and hypoxia.

Postoperative problems affect four percent of surgery patients and may be more common in obese persons. Obesity is an important public health problem in the industrialized world, and its burden is increasing. It causes approximately 300,000 deaths annually and will likely cost an estimated $117 billion in overall health expenditures [1] ; thus, it is the second most common cause of death in the United States. The most recent data from the USA National Center for Health Statistics reveal that almost 60 million adults over 20 are obese, or 30% of the population. [2]

The perioperative implications of these critical issues for anesthesiologists and surgeons become an essential critical understanding since the obese patients are prone to suffering with cardiovascular disease, respiratory function impairment, type-2 diabetes pathology, gastroesophageal reflux, difficult airway, postoperative complications, and difficulty in regional anesthesia. [3] Fat patients are more liable to develop atelectasis and desaturate faster and become reliant on the ventilator. Many methods exist by which a patient's respiratory problems can be minimized. Some of these intraoperative measures include preoxygenation, use of CPAP, and use of PEEP. Desaturation occurs much quicker in obese persons compared with normal-weighted patients, thus preoxygenation serves to prevent such desaturation. The preoxygenation effect is increased by applying CPAP or maintaining a 25-head-up position. [4]

Alveolar overdistention and volutrauma are commonly induced by tidal volumes based on actual body weight. In patients with acute respiratory distress syndrome, [5] a low tidal volume of 6 ml/kg based on ideal body weight can reduce mortality, [6] although several studies demonstrated that low tidal volumes benefit the heaviest BMI group. When patients are morbidly obese, PEEP is also beneficial. When compared to controls who are not fat, the use of PEEP significantly improves lung volumes, compliance, oxygenation, ventilation, and lowers intra-abdominal pressure. [7] Twenty morbidly obese patients following bariatric surgery had their respiratory system compliance increased and the alveolar–arterial oxygenation disparity lowered when PEEP was added to the head-up body posture. [8] Due to secondary, potentially restrictive respiratory conditions and poor thoracic compliance, the obese patient requires cautious ventilation treatment. In addition, because opiate sensitivity increases the severity of nocturnal hypoxia, obese patients with OSA and OHS may be at a higher risk for respiratory problems in the immediate postoperative period 9. Obesity also makes breathing more difficult after surgery because lung atelectasis makes the patient breathe at lower lung volumes,10 which leads to early airway closure and expiratory flow limitation, which develops intrinsic PEEP. [9]

To avoid excessive peak and plateau airway pressures, and barotrauma, the clinician should scrutinize when most appropriate tidal volume is decided about a patient who needs prolonged ventilation. This must be based on ideal rather than actual body weight. The obese patient exhibits atelectasis, where there is a decreased volume of lungs with increased resistance of the airway due to general anesthesia and surgical effects. General anesthesia with obesity leads to a loss in the respiratory compliance with the chest wall. So, any target tidal volumes provided by IBW should be taken with proper interpretations regarding the inflation pressure to be subsequently altered based on the levels of gas exchange. [10]

Pelosi and colleagues compared morbidly obese subjects with non-obese subject 13 and demonstrated that the addition of PEEP at 10 cm H2O improved oxygenation and increased

elastance. Clinically relevant is that in the obese population, a low tidal volume combined with a high fraction of inspired oxygen can lead to the gradual development of atelectasis, with secondary hypoxemia and hypercapnia [11]. Using peak inspiratory pressures high enough to open collapsed lung areas and PEEP to maintain the alveoli open during expiration should be the main objectives of mechanical ventilation in this patient population. [12] Due to decreased chest wall compliance, obese people have more pleural pressures. Lower transpulmonary pressure and decreased lung distension result in a different "safe" peak plateau pressure in obese patients than in non-obese patients. Therefore, oesophageal pressure monitoring is applied to indirectly measure transpulmonary pressures, which can be helpful for the doctor while administering the ventilator strategy to patients with complex physiological conditions. [13]

Because of decreased respiratory system compliance [14] and greater airway resistance, obesity is associated with increased work of breathing.18 Lung volume is diminished because of obesity, which causes an increase in visceral fat and abdominal volume. Because of (I) the restrictive effect of mass loading on the chest wall, (II) a propensity to breathe at low lung volumes, and (III) the effect of fat distribution that contributes to high pleural pressures and results in low end expiratory volumes with expiratory flow limitation when supine, obese people may have a 35% reduction in respiratory system compliance. [15]

Patients having a higher Obesity Surgery Death Risk Score (OS-MRS: 4–5) at bariatric surgery have been found to have a higher surgical death rate compared to low-risk patients (OS-MRS: 0–1). There is one point from OS-MRS provided for each of the five preoperative variables: arterial hypertension, male sex, BMI >50 kg/m2, age >45, and pulmonary thromboembolism risk factors, such as previous venous thromboembolism, hypoventilation, PH, or presence of an inferior vena cava filter. [16]

However, it should be highlighted that the proportion of underweight individuals in the trial is rather small, and results—particularly those pertaining to short-term complications—should be evaluated cautiously. Although not statistically significant, a higher percentage of patients in the current study who underwent thigh-risk surgery were underweight. There were more smokers in the underweight group, which could have been a confounding factor because smoking is linked to chronic illnesses, weight loss, and wound infections. [17]

Morbidly obese patients have lower total lung capacity, reduced functional residual capacity, and lower vital capacity. Alveolar arterial oxygenation gradient is heightened, and atelectasis was shown to be present for more than 24 hours in morbidly obese patients compared with disappearance in the non-obese. The potential should be considered to have increased chance of pulmonary complication in these patients postoperation. Pulmonary complications secondary to residual atelectasis may lead to desaturation. Pneumonia, bronchospasm, atelectasis, acute respiratory insufficiency, prolonged ventilation, and bronchial infections were present in 33.9% of patients with mild to moderate COPD who underwent general surgery. The risk factors for increased pulmonary complications were male gender, amount of smoking, duration of surgery over 270 minutes, low FEV1/FVC ratio, and chest or upper abdominal incision. [18]

Mask ventilation and intubation can be challenging in the morbidly obese patient due to increased tissue behind the posterior wall of the pharynx. The best predictors of potential difficulty with tracheal intubation have been reported to be a Mallampati score of III or IV and an increased neck circumference. These should be kept in mind when planning extubation after thoracic surgery in the morbidly obese patient, whether with a double-lumen tube or single-lumen endotracheal tube with bronchial blocker. The plan for extubation should account for the early ease of mask ventilation, ease or difficulty with intubation (should repeat intubation be required), and type of procedure performed. Bartels et al. conducted a comparison of transmediastinal versus

transthoracic esophagectomy, with early extubation by 6 hours after transthoracic esophagectomy prolongs ICU length of stay and increases the rate of mortality. [19]

METHODOLOGY:

Study Design:

Type: Cross-Sectional design

Study Duration:

The study was conducted over a period from September 2024 to March 2025.

Clinical Settings:

The study will be conducted in Surayya Azeem Hospital with a dedicated obstetric surgical unit.

Sample Size:

A convenience sampling method will be utilized to recruit approximately 60 patients who meet the inclusion criteria during the study period.

Sampling Technique:

Simple random sampling from the hospital surgical database. Patients underwent TKR were selected randomly.

Selection Criteria:

Sample Selection:

Inclusion Criteria: Patients undergoing surgery with;

- Respiratory complications
- OSA
- BMI greater than 30

Exclusion Criteria:

Young Patients undergoing surgeries with no pulmonary complications will be excluded.

RESULTS

The study included 60 patients. The demographic information of these patients did not differ significantly. 21 out of 60 patients were female and 39 patients were male. Shown in **figure 1.**

BMI of all these patients was greater than 30. All these patients underwent a surgery under general anesthesia. Most of these patients underwent an elective surgery. Shown in **figure 2**. Most of the surgeries lasted 1 to 2 hours. Preoperative comorbidities are listed in **table 3**. Most common preoperative complications among these patients were hypertension, sleep apnea and chronic obstructive pulmonary disease.

All these patients had a preoperative pulmonary function test. Most of the patients had Spirometry. 9 patients had arterial blood gas analysis.

Most common intraoperative complication that occur are hypoxemia, Hypercapnia and respiratory acidosis. Shown in **table 5**. Post-operative respiratory complications are shown in **table 6**. Most common respiratory complications are pneumonia, atelectasis and respiratory failure.

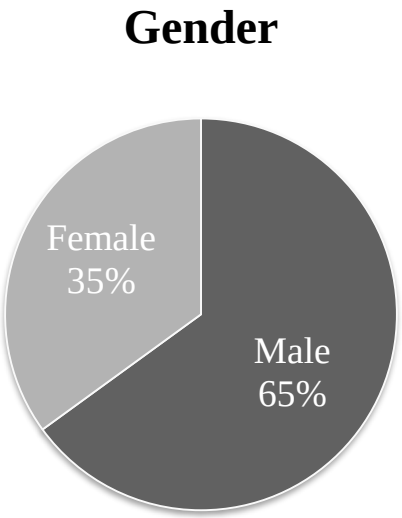

Figure 1: A Pie Chart showing the gender of the participants.

Duration of Surgery					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**1 to 2 Hours**	38	63.3	63.3	63.3
	Less Than or Equal to 1 hour	3	5.0	5.0	68.3
	More Than 2 Hours	19	31.7	31.7	100.0
	Total	60	100.0	100.0	

Table 1: Presents the duration of surgery patients underwent. 38 out of 60 patients underwent a surgery lasting 1-2 hours, 3 patients underwent a surgery lasting less than or equal to 1 hour. And remaining 19 patients underwent a surgery which last more than 2 hours.

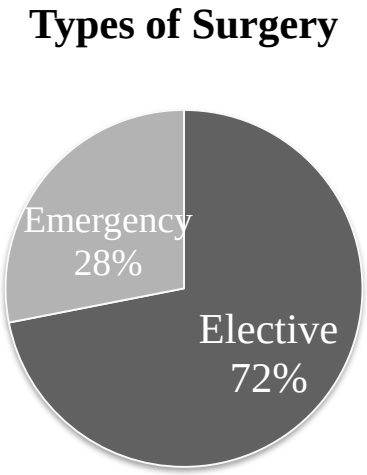

Figure 2: A Pie Chart represents the type of surgery. Most of the participants underwent an elective surgery.

Pre-Operative Comorbidities					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Chronic obstructive pulmonary disease**	10	16.7	16.7	16.7
	Diabetes	3	5.0	5.0	21.7
	Diabetes, Chronic obstructive pulmonary	1	1.7	1.7	23.3
	Diabetes, Sleep apnea	3	5.0	5.0	28.3
	Hypertension	6	10.0	10.0	38.3
	Hypertension, Chronic obstructive pulmonary	1	1.7	1.7	40.0
	Hypertension, Diabetes	2	3.3	3.3	43.3
	Hypertension, Diabetes, Sleep apnea	1	1.7	1.7	45.0
	Hypertension, Sleep apnea	24	40.0	40.0	85.0
	Sleep apnea	9	15.0	15.0	100.0
	Total	60	100.0	100.0	

Table 2: This table shows the comorbidities of the patients preoperatively. Most common comorbidities among the patients were hypertension, sleep apnea and chronic obstructive pulmonary disease.

Pre-Operative Respiratory Function Test					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Arterial blood gas (ABG) analysis**	9	15	15	15
	Pulse oximetry	1	1.7	1.7	16.7
	Pulse oximetry, Arterial blood gas (ABG)	1	1.7	1.7	18.4
	Spirometry	49	81.6	81.6	100.0
	Total	60	100.0	100.0	

Table 3: This table shows the preoperative respiratory function test type. Most of the patient had Spirometry to test their pulmonary function the 2nd most common test was arterial blood gas analysis.

Type of ventilation					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Pressure Controlled Ventilation**	58	96.7	96.7	96.7
	Pressure Support Ventilation	2	3.3	3.3	100.0
	Total	60	100.0	100.0	

Table 4: This table shows the type of ventilation patients had intraoperative. The commonly used mode of ventilation was pressure controlled ventilation.

Intraoperative Complications					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Hypercapnia**	11	18.3	18.3	18.3
	Hypoxemia	43	71.7	71.7	90.0
	Hypoxemia, Hypercapnia, Respiratory acidosis	1	1.7	1.7	91.7
	Respiratory acidosis	5	8.3	8.3	100.0
	Total	60	100.0	100.0	

Table 5: This table shows the intraoperative complications occurred among the patients. Most common complication occurred is hypoxemia.

Post Op Respiratory Complications					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Atelectasis	4	6.7	6.7	6.7
	None	23	38.3	38.3	45.0
	Pneumonia	21	35.0	35.0	80.0
	Pneumonia, Atelectasis	4	6.7	6.7	86.7
	Respiratory failure	6	10.0	10.0	96.7
	Respiratory failure, Atelectasis	1	1.7	1.7	98.3
	Respiratory failure, Pneumonia	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Table 6: This table presents the post-operative respiratory complications. The most common complication was pneumonia and respiratory failure.

Discussion:

Four percent of surgical patients experience postoperative complications, which may be particularly prevalent in obese individuals. (1) In the developed world, obesity is a significant public health issue that is becoming more prevalent. It is the second most prevalent cause of mortality in the United States, accounting for over 300,000 fatalities each year and probably costing $117 billion in total health expenses (2). Nearly 60 million persons over 20 are obese, making up 30% of the population, according to the most recent data from the USA National Center for Health Statistics. [20]

A significant portion of the population is obese. They face a lot of respiratory complications intraoperative and post-operative. The most common complication is the respiratory failure developed post-operative.

Given that obese patients are more likely to experience cardiovascular disease, respiratory function impairment, type-2 diabetes pathology, gastroesophageal reflux, difficult airway, postoperative complications, and difficulty with regional anesthesia, anesthesiologists and surgeons must have a thorough understanding of the perioperative implications of these crucial issues. [21]

Patients who are overweight are more likely to get atelectasis, desaturation more quickly, and require a ventilator. There are several ways to reduce a patient's respiratory issues. Preoxygenation, CPAP, and PEEP are a few of these intraoperative techniques. Preoxygenation helps to avoid desaturation since it happens significantly more quickly in obese individuals than in people of normal weight. Maintaining a 25-head-up posture or using CPAP increases the preoxygenation effect. [22]

Conclusion:

Obesity has been shown to be significantly associated with a higher frequency of respiratory problems following surgery. According to our research, the most frequent post-operative complications among obese patients requiring general anesthesia are pneumonia and respiratory failure. In addition to lengthening hospital stays, these complications—which include pneumonia, respiratory failure, and atelectasis—also raise morbidity and medical expenses.

We may successfully lessen the burden of postoperative respiratory difficulties in this high-risk patient population by using a multidisciplinary team approach and giving respiratory treatment first priority. This will eventually enhance patient safety and quality of life. To improve respiratory outcomes, future studies should concentrate on improving risk prediction algorithms and creating tailored therapies.

References

[1] "Perioperative medicine: NHLBI working group deliberations and recommendations.," J Cardiothorac, no. 18, pp. 1- 6 , 2004.

[2] "The Surgeon-General's call to action to prevent and decrease overweight and obesity.," Surgeon-General, 2001.

[3] "Overweight and obesity. Prevention," Centers for Disease Control , vol. 01, pp. 1-, 2005.

[4] Dominguez-Cherit G, "Anesthesia for morbidly obese patients.," World J Surg, no. 22, pp. 969 - 973, 1998.

[5] Coussa M, "Prevention of atelectasis formation during the induction of general anesthesia in morbidly obese patients," Anesth Analg, no. 98, pp. 1491 - 5, 2004.

[6] Gander S, "Positive end-expiratory pressure during induction of general anesthesia increases duration of nonhypoxic apnea in morbidly obese patients," Magnusson L. , vol. 2, no. 100, pp. 580 - 4, 2005.

[7] Network, "Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome.," The Acute Respiratory Distress Syndrome, no. 342, pp. 1301 - 8, 2000.

[8] O'Brien JM, "Excess body weight is not independently associated with outcome in mechanically ventilated patients with acute lung injury.," no. 140, pp. 338 - 45, 2004.

[9] Schumann R, "Update on best practice recommendations for anesthetic perioperative care and pain management in weight loss surgery," no. 17, pp. 889 - 94, 2009.

[10] Hodgson LE, "Respiratory management of the obese patient undergoing surgery.," vol. 5, no. 7, pp. 943 - 952, 2015.

[11] Khuri SF, "Determinants of long-term survival after major surgery and the adverse effect of postoperative complications," no. 242, pp. 326 - 41, 2005.

[12] Eichenberger A, "Morbid obesity and postoperative pulmonary atelectasis: an underestimated problem.," no. 95, pp. 2788 - 92, 2002.

[13] Taylor S, "Postoperative day one: a high risk period for respiratory events.," no. 190, pp. 752 - 6, 2005.

[14] Salome CM, "Effect of obesity on breathlessness and airway responsiveness to methacholine in non-asthmatic subjects.," no. 32, pp. 502 - 9, 2008.

[15] Marik P, "The obese patient in the ICU.," no. 113, pp. 492 - 8, 1998.

[16] Reinius H, "Prevention of atelectasis in morbidly obese patients during general anesthesia and paralysis: a computerized tomography study," Anesthesiology, no. 111, pp. 979 - 87, 2009.

[17] Galal W, "The obesity paradox in patients with peripheral arterial disease.," Chest, vol. 5, no. 134, pp. 925 - 30, 2008.

[18] De Albuquerque Medeiros, "Postoperative lung complications and mortality in patients

with mild-to-moderate COPD undergoing elective general.," Archivos de Bronconeumologia, vol. 37, 2001.

[19] H. Bartels, "Early extubation vs.late extubation after esophagus resection: a randomized, prospective study.," Langenbecks Archiv fur Chirurgie, vol. 115.

[20] von Ungern-Sternberg, "Effect of obesity and thoracic epidural analgesia on perioperative spirometry.," British Journal of Anaesthesia, 2005.

[21] Dominguez-Cherit G, "Anesthesia for morbidly obese patients.," World J Surg, no. 22, pp. 969 - 973, 1998.

[22] Coussa M, "Prevention of atelectasis formation during the induction of general anesthesia in morbidly obese patients.," Anesth Analg, no. 98, pp. 1491 - 5, 2004.