# Perioperative Pain Control in Bariatric Surgeries

## *Systematic Review*

*Submitted for Partial Fulfilment of Master Degree in Anaesthesiology, Intensive Care and Pain Management*

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*The Candidate*
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# List of Abbreviations

| Abb. | Full term |
|---|---|
| *AHI* | *Apnea-Hypopnea Index* |
| *BMI* | *Body mass index* |
| *BP* | *Blood preasure* |
| *CIC* | *Continuous infusion catheter* |
| *DM* | *Diabetes Mellitus* |
| *DVT* | *Deep vein thrombosis* |
| *ECG* | *Electrocardiogram* |
| *IT* | *Intrathecal morphine* |
| *IVI* | *Intravenous infusion* |
| *LAGB* | *Laparoscopic adjustabla gastric band* |
| *LSG* | *Laparoscopic sleeve gastrectomy* |
| *METs* | *Metabolic equivalents* |
| *MMA* | *Multi modal analgesia* |
| *NRS* | *Numerical rating scale* |
| *NSAIDS* | *Non steroidal anti-inflammatory drugs* |
| *ORAE* | *Opioid-related adverse events* |
| *PCA* | *Patient controlled analgesia* |
| *PFTs* | *Pulmonary function tests* |
| *PRISMA* | *Preferred Reporting Items for Systematic Reviews and Meta-Analysis* |
| *PRM* | *Pulmonary recruitment maneuver* |
| *RCT* | *Randomized control trial* |
| *RYGB* | *Roux-en-Y gastric bypass* |
| *TAP* | *Transverses abdominis plane* |
| *VAS* | *Visual analog scale* |
| *WHO* | *World Health Organization* |

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# Aim of the Work

To review the literature about the evidence of perioperative pain control in bariatric surgeries to make the physicians know the safest and most efficient methods of anesthesia in this field.

# INTRODUCTION

Obesity is a medical condition in which excess body fat has accumulated to that extent that it may have a negative effect on health leading to reduced life expectancy and increased health problems. Obesity is becoming increasingly prevalent in developed countries and anesthesiologists will face larger numbers of obese patients undergoing bariatric surgery. The prevalence of obesity doubled in America between 1976-1980 and 1999-2000 increasing from 15.1 percent to 30.9 percent ***(Mathier and Ramanathan, 2007).***

Obesity is also a major health problem with clearly established health complications associated with genetic, behavioral, environmental, physiological, social, and cultural factors that result in energy imbalance and promote excessive fat deposition ***(Faith and Kral, 2006),*** So the levels of catecholamines and cortisol are often increased and contribute to metabolic and vascular abnormalities including an increased risk for coronary artery disease, hypertension, dyslipidemia, diabetes mellitus, gall bladder disease, degenerative disease, obstructive sleep apnea, socioeconomic and psychological impairment ***(Lee, 2011).***

Obesity is defined as abnormal or excessive fat accumulation that may impair health and it's measured by Body mass index (BMI) which is a simple index of weight-for-height that is commonly used to classify overweight and obesity in

adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m2) **(Table 1)**.

The World Health Organization (WHO) definition is that BMI greater than or equal to 30 is obesity. BMI provides the most useful population-level measure of obesity as it is the same for both sexes and for all ages of adults ***(WHO Media Center, 2015).***

## Classification of obesity

Overweight and obesity are classified according to BMI, waist circumference, and associated disease risk**(Table 1)**.

**Table (1):** Classification of overweight and obesity by BMI, waist circumference, and associated disease risk.

| | | | **Disease risk (relative to normal weight and waist circumference)** | |
|---|---|---|---|---|
| | **BMI ($kg/m^2$)** | **Obesity class** | **Men ≤ 40 BMI in (102 cm waist circumference)** | **>40 BMI in (102 cm waist circumference)** |
| | | | **Women ≤ 35 BMI in (88 cm waist circumference)** | **>35 BMI in (88 cm waist circumference)** |
| Underweight | <18.5 | | ------ | ------ |
| Normal | 18.5 to 24.9 | | ------ | ------ |
| Overweight | 25.0 to 29.9 | | Increased | High |
| Obesity | 30.0 to 34.9 | I | High | Very high |
| Morbid Obesity | 35.0 to 39.9 | II | Very high | Very high |
| Extreme obesity | ≥40 | III | Extremely high | Extremely high |

***(National Institutes of Health, National Heart, Lung, and Blood Institute, 1998)***

## Prevalence of obesity according to WHO:

In 2013, 42 million children under the age of 5 were overweight or obese. Once considered a high-income country problem, overweight and obesity are more recently on the rise in low- and middle-income countries, particularly in urban settings. In developing countries with emerging economies (classified by the World Bank as lower- and middle-income countries), the rate of increase of childhood overweight and obesity has been more than 30% higher than that of developed countries ***(WHO Media Center, 2015).***

In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. Overall, about 13% of the world's adult population (11% of men and 15% of women) were obese in 2014. In 2014, 39% of adults aged 18 years and over (38% of men and 40% of women) were overweight. The worldwide prevalence of obesity more than doubled between 1980 and 2014 ***(WHO Media Center, 2015).***

## ***Etiology of obesity***

Although obesity is most commonly caused by excess energy consumption (dietary intake) relative to energy expenditure (energy loss via metabolic and physical activity), the etiology of obesity is highly complex. It includes genetic, psychological, environmental, social, economic and even

political factors that interact in varying degree to promote the development of obesity ***(Aronne et al., 2009)***.

## ***Contributing Factors to the Obesity Epidemic:***

1. Food environment.
2. Decreases in physical activity.
3. Drug– induced weight gain.
4. Sleep debt.
5. Decline in cigarette smoking.
6. Endocrine disruptors.
7. Increasing gravid age and intrauterine effects.
8. Greater reproductive fitness of higher BMI individuals yielding the selection of obesity- predisposing genotypes
9. Changes in policy.
10. Infections.

**Bariatric surgeries** are solutions to provide significant and sustained weight loss options for morbidly obese patients.

## Types of bariatric surgeries

***Restrictive bariatric surgery:*** aims to reduce the volume of the gastric cavity, thereby resulting in development of satiety after the ingestion of a small volume of food e.g. vertical banded gastroplasty, sleeve gastroplasty, laparoscopic or

endoscopic insertion of gastric balloon and laparoscopic adjustable gastric band (LAGB) ***(Jung et al., 2017).***

***Malabsorptive bariatric surgery:*** aims to not only limits the size of the stomach by creating a small gastric pouch, but also involves shortening the length of the gut, thereby reducing the amount of food absorbed e.g. the Roux-en-Y gastric bypass (RYGB) which is the most common malabsorptive procedure performed. It is viewed as the "gold standard of bariatric operation combining gastric restriction with a degree of malabsorption ***(Sabharwal and Christelis, 2010; Quevedo et al., 2017).***

***Pain control considerations***

Morbidly obese patients are more likely to be immobile postoperatively and are at risk of deep vein thrombosis and pulmonary embolism, with a combined incidence of approximately 2%. Optimal analgesia ensures adequate ventilation and good pulmonary mechanics which reduce the risk of postoperative chest infections ***(Mcnatt et al., 2007).***

In bariatric surgeries, the goal of perioperative pain management is provision of comfort, improved respiratory function without causing inadequate sedation or respiratory compromise and early mobilization which in turn reduces the risk of deep vein thrombosis (DVT), pressure ulcers and respiratory complications including pneumonia. So it's important

in pain management in overweight patients is to choose the most suitable and safest analgesic techniques specific to this patient regarding patients' comorbidities and possible difficulties found in those patients ***(Schug and Raymann, 2011).***

## Important considerations and difficulties

Obesity is an exaggeration of normal adiposity and is a central player in the pathophysiology of diabetes mellitus, insulin resistance, dyslipidemia, hypertension, and atherosclerosis, largely due to its secretion of excessive adipokines. Obesity is a major contributor to the metabolic dysfunction involving lipid and glucose, but on a broader scale, it influences organ dysfunction involving cardiac, liver, intestinal, pulmonary, endocrine and reproductive functions.

### *1- Difficult intubation:*

It's a common difficulty faced in morbid obese patients with high incidence in patient with more than 60 cm neck circumference ***(Kluyts et al., 2011).***

So for easy intubation, planning for anesthesia should begin with preoperative physical examination to evaluate the usual factors associated with intubation difficulties for any size patient. These factors are: limited mouth opening, decreased range of motion of the neck, short sterno- and thyro-mental distances, prominent incisors with or without poor dentition, and the presence of a beard. The most predictive risk factors

associated with possible difficulty in morbidly obese patients are a Mallampatti score of III or IV and a neck circumference > 60 cm ***(Brodsky et al., 2002).***

Positioning should be done through supporting neck, head and stacking under chest in such a way that the external meatus of the ear is in a horizontal line with sternum. There is no supporting evidence about need for fibre-optic intubation ***(Marrel et al., 2007).***

***2- Gastric aspiration:***

Pulmonary aspiration of gastric content is common in morbid obese patients mostly those who are diabetic and gastroesophageal reflux disease patients, so preoperative prophylaxis with H2-blockers or proton pump inhibitors is advised in bariatric surgeries and rapid sequence intubation technique after adequate pre-oxygenation is needed for whom at risk ***(Kluyts et al., 2011; Mertens et al., 2006).***

***3- Obstructive sleep apnea (OSA)***

Another common complication which occurs in nearly 5% of morbid obese patients, OSA is defined as apneic episodes secondary to pharyngeal collapse that occur during sleep; it may be obstructive, central, or mixed ***(Tishler et al., 2003).***

OSA may occurs during anesthesia because human airway's soft tissue collapses during rapid eye movement sleep

as the muscle tone of the body relaxes and in obese patients larger soft tissue mass or abnormal tissue deposits increases extra luminal tissue pressure and lower the threshold for airway collapse, Also sedatives, narcotic analgesics and general anesthetics relax the upper airway and may worsen obstructive sleep apnea, So morbidly obese patients have high risks for OSA during bariatric surgeries ***(White, 2005).***

## Primary risk factors for sleep apnea

1. Weight gain or being overweight with a BMI >30 $Kg/m^2$.
2. Neck circumference [17inch (or 43.2 cm) in men; 16inch or (40.6 cm) in women].
3. Age >40.
4. Male gender.
5. Structural factors related to craniofacial anatomy.
6. Ethnicity.
7. Family history of sleep apnea ***(Tishler et al., 2003).***

The main complication of OSA related to surgeries and affects patient's mortality is Cardiovascular problems as sudden drops in blood oxygen levels that occur during obstructive sleep apnea increases blood pressure and strain the cardiovascular system leading to hypertension, coronary artery disease, heart attack, heart failure, arrhythmias, stroke and sudden death from a cardiac event ***(Mehra, 2016).***