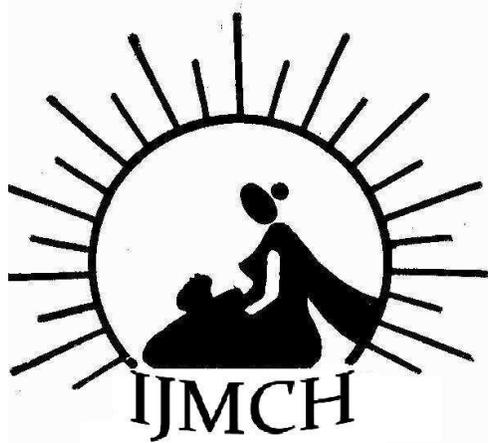


**Volume 12 (2), 2010**

**Obesity in Females and Anaesthesia**

*Dr Shruti Sharma*

[www.ijmch.org](http://www.ijmch.org)



# **INDIAN JOURNAL OF MATERNAL AND CHILD HEALTH**

Obesity is a growing problem in the western as well as developing world. The World Health Organisation (WHO) describes obesity, which is more common in women

**EDITORIAL****Obesity in Females and Anaesthesia****Dr Shruti Sharma**

Associate Intensivist, Intensive Care Unit, DMC &amp; Hospital, Ludhiana

Email: [shruti\\_sarit@yahoo.co.in](mailto:shruti_sarit@yahoo.co.in)

Obesity is a growing problem in the western as well as developing world. The World Health Organisation (WHO) describes obesity, which is more common in women, as a pandemic and warns that the greater future burden of obesity will affect developing countries. The obesity pandemic originated in the US and crossed to Europe and the world's other rich nations before, remarkably, it penetrated even the world's poorest countries especially in their urban areas.<sup>(1)</sup>

Higher prevalence of obesity and abdominal obesity has been seen in women compared with men in many developing countries, consistent with the sedentary lifestyle. For example, the prevalence of obesity in adults in Seychelles was 5-fold more in women compared with men (20.9 vs. 4.2%, respectively).<sup>(2)</sup> Furthermore, in this population, the prevalence of obesity in women increased from 8.9% at age 25–34 yr to 29.4% at age 35–44 yr and reached a plateau thereafter, whereas the prevalence did not change with age in men. Other developing countries show similar trends regarding higher prevalence of obesity in women.<sup>(3,4)</sup>

**Obesity and related morbidity:** Obesity increases the risk of many physical and mental conditions. A combination of medical disorders which includes: type 2 diabetes mellitus, high blood pressure, high blood cholesterol, and high triglyceride levels is called metabolic syndrome.<sup>(5)</sup> Complications are either directly caused by obesity or indirectly due to poor diet or a sedentary lifestyle. One of the strongest associations is with type 2 diabetes mellitus. Health effects occur either due to increased fat mass (such as osteoarthritis, obstructive sleep apnea) or those due to the increased number of fat cells (diabetes, cancer, cardiovascular disease, non-alcoholic fatty liver disease).<sup>(6)</sup> Increases in body fat alter the body's response to insulin, potentially leading to insulin resistance. Increased fat also creates a proinflammatory state and a prothrombotic state.<sup>(7,8)</sup>

**Obesity and Anaesthesia:** Surgery in obese females has always been a challenge to an anaesthetist. These patients come either for general surgery or for certain high-risk surgeries like cardiac, laproscopic, bariatric and obstetric surgeries. When these patients come for anaesthetic check up, following points are to be taken into consideration:

- i. **Anatomical:** Excess of fat can cause difficulty in giving blocks due to difficult positioning and difficult needle placement. During general anaesthesia, they can have difficult intubation, difficult ventilation and problems during extubation.
- ii. **Respiratory and cardiovascular:** Patients can have hypoxia, obstructive sleep apnea, hypertension, coronary artery disease, increased workload on heart and heart failure. Attention should focus on airway, cardio-respiratory status, systemic hypertension, pulmonary hypertension, signs of right and/or left ventricular failure, and ischemic heart disease. Signs of cardiac failure such as increased jugular venous pressure, added heart sounds, pulmonary crackles, hepatomegaly, and peripheral edema may be difficult to detect. The most common symptoms of pulmonary hypertension include exertional dyspnea, fatigue, and syncope, which reflect an inability to increase cardiac output during activity.<sup>(9)</sup> Identification of tricuspid regurgitation with echocardiography is the most useful confirmation of pulmonary hypertension.<sup>(10)</sup> An electrocardiogram may demonstrate signs of right ventricular hypertrophy, such as tall precordial R waves, right axis deviation, and right ventricular strain. Chest radiograph may show evidence of underlying lung disease and evidence of prominent pulmonary arteries. Mild to moderate pulmonary hypertension warrants avoidance of hypoxemia, nitrous oxide and other drugs that may further worsen pulmonary vasoconstriction. Inhaled anaesthetics may be beneficial because they cause bronchodilation and decrease hypoxic pulmonary vasoconstriction.<sup>(11)</sup>
- iii. **Endocrine and metabolic:** The obese patients usually have concomitant type 2 diabetes mellitus, thyroid disorders, hyperglycemia, hypertriglyceridemia and electrolyte abnormalities and should be evaluated for the same during pre-operative check-up.
- iv. **Nutritional:** Improper diet and intermittent starvation for losing weight can lead to nutritional abnormalities including vitamin B12, iron, calcium, and folate

deficiencies. With rapid weight loss, patients may also be protein depleted. Electrolyte and coagulation indices should be checked before surgery, particularly if patient compliance has been poor or if the patient is acutely ill. Chronic vitamin K deficiency can lead to an abnormal prothrombin time with a normal partial thromboplastin time because of deficiency of clotting factors II, VII, IX, and X.<sup>(12,13)</sup>

- v. Peripheral and central venous access and arterial cannulation sites should be evaluated during the preoperative examination and the possibility of invasive monitoring should be discussed with the patient. Baseline arterial blood gas measurements will help to evaluate carbon dioxide retention and provide guidelines for perioperative oxygen administration and possible institution of and weaning from postoperative ventilation.

Laparoscopic surgeries and caesarean section are the most common surgeries being performed in obese females.

**Laparoscopy and Anesthesia:** Pneumoperitoneum causes systemic changes during laparoscopy. The gas most often used for this purpose is carbon dioxide. Positioning, such as Trendelenburg (head down), can worsen the systemic changes of pneumoperitoneum.<sup>(14)</sup> Systemic vascular resistance is increased with increased intraabdominal pressure (IAP). It affects the venous return and myocardial performance.<sup>(15)</sup> Compression of the inferior vena cava occurs at an IAP >20 mm Hg, with decreased venous return from the lower body and consequent decreased cardiac output.<sup>(15)</sup> Increased renal vascular resistance decreases renal blood flow and GFR. Abdominal viscera further exert weight on the diaphragm during Trendelenburg positioning, causing a reduction in vital capacity. Sometimes cephalad displacement of the diaphragm and carina from pneumoperitoneum can cause displacement of a firmly secured endotracheal tube. Hypercarbia and hypoxemia may be caused by ventilation-perfusion mismatch because of restriction of diaphragmatic mobility from pneumoperitoneum that leads to uneven distribution of ventilation to the nondependent part of the lung. Absorption of carbon dioxide can worsen hypercarbia and acidosis, which can be offset by hyperventilation. Catastrophic complications that should be kept in mind include massive gas embolism, pneumothorax, & mediastinal emphysema.<sup>(16)</sup>

**Obese pregnant females and Anaesthetic considerations:**

Physiological changes occur in both pregnancy and obesity which can be additive, resulting in significant challenges for the anaesthetist. Morbid obesity is often associated with infertility but many women become pregnant when weight is lost. Obese women may already have pre-existing disease with end organ damage e.g. diabetes, hypertension & ischemic heart disease.

Obesity increases almost all the complications of pregnancy and delivery :<sup>(17)</sup>

- Increased miscarriages.
- Increased fetal abnormality e.g. cardiac and neural tube defects and detection may be difficult due to sub-optimal view at ultrasound.
- Increased premature delivery.
- Gestational diabetes
- Pre-eclampsia (risk increases with increasing BMI).
- Increased post partum haemorrhage.
- Peripartum cardiomyopathy.
- Increased risk of Caesarean section (CS). This risk increases as BMI increases and over 40% of women with BMI >40 may require caesarean delivery.
- Increased risk of thromboembolic events.
- Increased wound infection/ wound breakdown.
- Increased infection of the uterus (endometritis).
- Low vaginal delivery rate after CS with increased risk of uterine rupture.
- Increased rate of induction e.g. for large baby /diabetes/ pre eclampsia. Induction may often be unsuccessful in the obese.
- Increased augmentation of labour.
- Increased postnatal depression reducing the chance of successful weight loss post delivery.
- The uterus in the obese can be infiltrated by fat, like other organs including the liver and heart, and this may explain its poor contractile ability both pre and post delivery. Pushing can be ineffective and intra-abdominal fat can obstruct labour.

**Anaesthesia in obese parturients:**

The safety of obstetric anaesthesia for caesarean delivery has improved because of the increasing use of regional anaesthesia and better management of general anaesthesia in modern clinical practice. However, the incidence of obesity, with its attendant health, anaesthetic and obstetric risks, has increased significantly. Obesity in parturients is also associated with an increased caesarean delivery rate and risks of adverse obstetric and perinatal outcomes.

Regional anaesthesia, when compared with general anaesthesia, offers several advantages, including minimal airway intervention, minimal cardiopulmonary depression, decreased intra- and postoperative opioid and sedative requirements, decreased postoperative nausea and vomiting, and shortened hospital stay.

Considerations in obese parturients while giving regional anaesthesia are :<sup>(18)</sup>

1. It can be technically difficult to perform due to problems with patient positioning.
2. A failed or incomplete block may require general anesthesia and tracheal intubation.
3. Obese patients normally have smaller cerebrospinal fluid (CSF) volumes than normal weight patients, and these changes are further exaggerated in the obese parturient. Further decreased CSF volume due to increased abdominal pressure (obesity or pregnancy) may produce more-extensive neuraxial blockade.
4. The epidural space volume is also reduced, due to adipose infiltration and increased venous distension from aortocaval compression and increased intra-abdominal pressure, resulting in higher spread of local anaesthetic and in higher risk of hypotension and respiratory difficulty.

Although regional anaesthesia is much safer than general anaesthesia, it is worth reminding that approximately a quarter of all obstetric anaesthesia related deaths are associated with the administration of regional anaesthesia (70% with epidural anaesthesia, 30% with spinal anaesthesia). Therefore, the major challenges in regional anaesthesia for obese pregnant women are the identification of appropriate dose and to handle the complications.

General anaesthesia presents many challenges and should be avoided if possible for a number of reasons. There are many airway and ventilation challenges. It is well known that failed intubation is more common in the pregnant (1:250) than non-pregnant woman (1:2000) and pregnant women are at increased risk of regurgitation and acid aspiration.<sup>(17)</sup>

Due to decreased FRC and increased oxygen consumption, pregnant obese women desaturate rapidly following induction. Head and neck positioning for intubation can be very difficult in the obese parturient and time should be taken to ensure that the best position is achieved prior to induction.

Adequate pre-oxygenation is essential and measures to avoid aorto-caval compression should be taken. A full range of difficult intubation equipment should be immediately available and awake fiberoptic intubation is an option if general anaesthesia is required and difficult intubation is predicted. Once intubated, airway pressures may be high. Positive End Expiratory Pressure (PEEP) can help with oxygenation and head up positioning may improve respiratory compliance.<sup>(17)</sup>

#### **Postoperative Care in obese patients:**

Effective analgesia is essential to manage post operative pain, encourage mobilisation and help reduce the risk of thromboembolic complications. Analgesics e.g. paracetamol and non-steroidal anti-inflammatory drugs, if not contraindicated, should be prescribed regularly and may help reduce the requirements for opioids and limit their associated side effects. Care should be taken at extubation. In the obese, it may be preferable to extubate women awake in the sitting position to optimise ventilation. Post operative physiotherapy should be organised and pressure relieving mattresses should be used to prevent pressure sores. Post-operative oxygen therapy may reduce the risk of hypoxia that in turn reduces infection. If the patient is normally on CPAP at night this should be continued.<sup>(19)</sup> Women should be encouraged to mobilise as soon as possible as this helps with respiratory mechanics and prevention of thromboembolic complications. A 45% incidence of atelectasis has been reported in obese patients after upper abdominal surgery, and initiation of continuous positive airway pressure (CPAP) treatment has been advocated, starting in the recovery room and continuing overnight, to prevent postoperative acute airway obstruction.<sup>(20,21)</sup>

Obese parturients are at high risk of thromboembolic complications and this risk is increased if they have undergone an operative procedure. Early mobilisation should be encouraged, dehydration avoided and calf compression devices used in all patients. In addition, post delivery heparin thromboprophylaxis should be prescribed.

Obesity is associated with many physiological changes that can result in a reduced ability to cope with the demands of any surgery, pregnancy, labour and delivery. These women are at high risk and present a real challenge to the anaesthetist and all the team involved in their

care. Management should be planned in advance and the necessary equipment and expertise made available.

#### REFERENCES:

1. Andrew M Prentice. The emerging epidemic of obesity in developing countries. *International Journal of Epidemiology* 2006; 35(1):93-9.
2. Tappy L, Bovet P, Shamlaye C. Prevalence of diabetes and obesity in the adult population of Seychelles. *Diabet Med* 1991; 8:448-52.
3. Azizi F, Salehi P, Etemadi A, Zahedi-Asl S. Prevalence of metabolic syndrome in an urban population: Tehran Lipid and Glucose study. *Diabetes Res Clin Pract* 2003; 61:29-37.
4. Wijendran V, Bendel RB, Couch SC, Philipson EH, Thomsen K, Zhang X et al. Maternal plasma phospholipid polyunsaturated fatty acids in pregnancy with and without gestational diabetes mellitus: relations with maternal factors. *Am J Clin Nutr* 1999; 70:53-61.
5. Grundy SM. Obesity, metabolic syndrome, and cardiovascular disease. *J Clin Endocrinol Metab* 2004; 89(6):2595-2600.
6. Bray GA. Medical consequences of obesity. *J Clin Endocrinol Metab* 2004; 89(6):2583-9.
7. Shoelson SE, Herrero L, Naaz A. Obesity, inflammation, and insulin resistance. *Gastroenterology* 2007; 132 (6):2169-80.
8. Shoelson SE, Lee J, Goldfine AB. Inflammation and insulin resistance. *J Clin Invest* 2006; 116(7):1793-80.
9. Nauser TD, Stites SW. Diagnosis and treatment of pulmonary hypertension. *Am Fam Physician* 2001; 63:1789-98.
10. Schiller NB. Pulmonary artery pressure estimation by Doppler and two-dimensional echocardiography. *Cardiol Clin* 1990; 8:277-87.
11. Konduri GG, Garcia DC, Kazzi NJ et al. Adenosine infusion improves oxygenation in term infants with respiratory failure. *Paediatrics* 1996; 97:295-300.

12. Stoelting RK, Dierdorf SF. Anaesthesia and co-existing disease, 4th ed. Philadelphia: Churchill Livingstone, 2002.
13. Consensus conference: fresh-frozen plasma-indication and risks. JAMA 1985; 253:551-3.
14. Coskun F. Anaesthesia for gynaecologic laparoscopy. J Am Assoc Gynecol Laparosc 1999; 6:245-58.
15. Babatunde O Ogunnaike, Stephanie B Jones, Daniel B Jones, David Provost, Charles W Whitten. Anaesthetic Considerations for Bariatric Surgery. Anesthesia and Analgesia 2002; 95(6): 1793-1805.
16. Harman PK, Kron IL, Mclachlan HD et al. Elevated intrabdominal pressure and renal function. Ann Surg 1982; 196:594-7.
17. Sally Ann Nortcliffe. Anaesthesia Tutorial of the Week ATOTW 141, Obstetric Anaesthesia and Obesity, 06/07/2009. Available from: <http://www.frca.co.uk/Documents/141%20Obstetric%20anaesthesia%20and%20obesity.pdf>. (last cited on 14.05.2010)
18. Leykin Y, Pellis T. Pathophysiological and Perioperative Features of Morbidly Obese Parturients: Regional Anaesthesia & Analgesia for Labor. Expert Rev of Obstet Gynecol 2009; 4(3):313-319.
19. Soderberg M, Thomson D, White T. Respiration, circulation, and anesthetic management in obesity: investigation before and after jejuno-ileal bypass. Acta Anaesthesiol Scand 1977; 21:55-61.
20. Oberg B, Poulsen TD. Obesity: an anaesthetic challenge. Acta Anaesthesiol Scand 1996; 40:191-200.
21. Sugerman HJ. Pulmonary function in morbid obesity. Gastroenterol Clin North Am 1987; 16:225-37.