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EVALUATION OF CORRELATION BETWEEN OBESITY AND ANAESTHESIA MANAGEMENT

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Abstract:

Obesity has become much more common practically everywhere in the world. Inadequate airway management is the most common reason of anaesthesiology problems, accounting for 30% of deaths, with anaesthesia being the primary reason. With this background, in the present study, we aim to evaluate the correlation between obesity on effect of anaesthesia in the patients. This is a case-control study. It was conducted It was conducted at Al-Saffir hospital between April 2021 to November 2021. The 10 women were enrolled in this study. The enrolled patients were divided into two groups, *i.e.* obese patients treated with anesthesia group (OAG, n=5) and non-obese patients treated with anesthesia group (NOAG, n=5) based on their body mass index (BMI). Both the groups of patients were operated after incorporation of spinal anesthesia. The patients with history of heart and lung disease were not enrolled. Similarly, patients undergoing these two surgery were also excluded from the study. The obese patients (46.1± 8.3 kg/m^2) showed significant ($p \leq 0.01$) increase in the BMI as compared to NOAG (26.4±3.1 kg/m^2). In the obese patient, heart rate cardiac output was significantly increase as compared to non-obese patients. In the obese patients, heart rate, cardiac output, mean arterial pressure, was found to be increased as compared to non-obese patients. In the obese patients, stroke volume, systolic and diastolic were found to be decrease as compared to non-obese patients. The tidal volume, and respiratory rate was found to be increased in both the groups. Similarly, expiratory reserve volume was decreased in both the groups. In the obese patients, PO2 and PCO2 leval was found to be > 65 mmHg and > 45 mmHg, respectively. The present study can be concluded as the proper anesthesia management should be taken to treat obese patients during operations. Many anesthesiologists prefer to resuscitate the nerves at the operating table. A suitable high-end theater table should be used. There should be enough trained and experienced staff in the theater to assist with evacuating the patient quickly, if necessary during training. Normal monitoring should include a cuff for the right blood pressure cuff.

Keywords: Obesity, Body mass index, Anesthesia, Anesthesia management

INTRODUCTION

Obesity is described as an excessive fat in the body (WHO, 2021). When, excess fat has a detrimental effect on a person's physical and mental health, as well as his or her life span, he or she is called obese. Obesity is defined by the World Health Organization (WHO) as an indicator of body weight (BMI) of more than 30 kg per square meter of body area (BMI 30 kg / m2) (Edmond and Chau, 2013). Obesity is so prevalent in the world that it is beginning to eradicate malnutrition and infectious diseases as the leading cause of illness. Obesity is associated with diabetes, heart disease, certain types of cancer, and especially respiratory problems. Obesity has become a global epidemic due to genetic predisposition, increased food intake, and a decrease in the need for physical activity in modern culture. Obesity should no longer be considered a cosmetic issue that affects a small number of people, but rather as a global epidemic (Kopelman, 2000).

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Obesity has become much more common practically everywhere in the world. Inadequate airway management is the utmost common reason of anaesthesiology problems with anaesthesia being the primary reason. Alternative methods of identifying obstructive sleep apnea and anticipating problematic tracheal intubation in the preoperative phase may ensure obese people have fewer anaesthetic problems (Edmond and Chau, 2013). Loss of sensation and consciousness is referred to as anaesthesia (Askitopoulou et al, 2000). The term "local anaesthesia" indicates a lack of sensation that is limited to a specific part of the body. The conduction process suppression in the peripheral nerve tissue is the general prevalent reason of feeling loss. Mechanical trauma, anoxia, low temperature, and a number of chemical irritants such as alcohol or phenol can all affect nerve conduction in different ways (Covino, 1972). Obesity is a worldwide epidemic disease, according to the World Health Organization (WHO). The rising incidence is a challenge not just for clinicians in specialised centres, but also for the wider population (De Lorenzo et al, 2019). Obesity-related comorbidities and unique anaesthetic issues constitute a significant challenge to the anesthesiologist (Domi and Laho, 2012).

Obese patients will progressively be seen by anesthesiologists in their regular practise. The accumulation of body fat has an impact on organ functions that have already been affected by general anaesthesia and surgery that needs certain procedures. The anaesthetic care team's logistical and technical capabilities, as well as their specific skills and knowledge, help to reduce the danger of anaesthesia in obese patients. Obesity is not regarded an adverse predictive factor in surgical patients, despite reduced organ activity. Overweight and obesity, as defined by the World Health Organization, are described as abnormal or excessive fat accumulation that causes a health risk (De Lorenzo et al, 2019). Based on the preoperative history and physical examination, individualised perioperative management is required. Modern anaesthetics drugs (desflurane, sevoflurane or propofol, and remifentanil, respectively) allow for quick recovery and early mobilisation post-surgery. Prior to the onset of problems, adequate monitoring, such as repeated blood gas analyses and intra-arterial blood pressure monitoring are involved in enhancement of patients safety (Schroder et al, 2001).

There are few randomised trials that establish that general anaesthetic is beneficial than another. After desflurane anesthesia, immediate postoperative recovery is faster and more convenient for obese patients with laparoscopic gastroplasty than propofol or isoflurane anesthesia. In addition, obese adults who underwent severe abdominal surgery wake up sooner after desflurane anesthesia than after sevoflurane anesthesia, and desflurane patients reported higher oxygen saturation when they enter the intensive care unit; however, neither group had occasional illness. Others, on the other hand, found no difference in patients undergoing laparoscopic bypass surgery between desflurane and sevoflurane (Poirier et al, 2009). Consequent conditions and surgical requirements determine whether morbidly obese patients are admitted to an intensive care unit after surgery. Inadequate pulmonary gas exchange is the primary reason for admission. In morbidly obese individuals, this interdisciplinary methodology will minimize the anaesthesia danger and prevent difficulties (Schroder et al, 2001).

Obesity in children is becoming more common. Obese children have comorbidities and perioperative problems, particularly those related to airway management and ventilation. Obesity also affects the pharmacokinetics of anaesthetic drugs, making it difficult to estimate adequate drug doses. Obesity among children is on the rise all across the world. Obesity has risen in Europe in the previous two decades, and 20 million children under the age of five are obese worldwide. The primary cause of childhood obesity is excessive calorie consumption, which accounts for more than 90% of cases. The minority of the instances are caused by underlying illnesses. Because of the rising frequency of paediatric obesity, anaesthesia for obese children is becoming more popular. The anaesthetic care of many obese children is complicated by complications. Total, lean and ideal body weights should be used to determine dosage. Airway blockage, intra-operative oxygen deficiency, and problematic mask breathing are all more likely in obese children (Sahoo et al, 2015).

In children undergoing respiratory anaesthesia, the bispectral index (BIS) has been proven to improve clinical beneficial outcomes. Propofol should be given to Morbidly Obese (MO) patients in titrations based on processed Electroencephalogram (EEG) values. In the absence of evidence-based dosing guidelines for propofol regulation in this MO paediatric group, using solely on clinical factors to dose Total Intra-Venous Anesthesia (TIVA) with propofol can result in an excessive depth of anaesthesia. In this administration, BIS monitoring informs anesthesiologists about the significant trend of anaesthetic depth and helps to

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avoid overuse of propofol and its detrimental effects (Chidambaran et al, 2018).

Nearly 1-2% of all anaesthetized patients are morbidly obese (BMI > 35 kg/m^2), according to the American Society of Anesthesiologists. When compared to lean patients, perioperative mortality is much higher (up to 20%). Patients who are very obese are at a higher risk of cardiopulmonary damage. In 13-20% of obese patients, difficult airway management is observed. Hypoxia is frequently found as a result of rapid desaturation during anaesthesia induction (Schroder et al, 2001). With this background, in the present study, we aim to evaluate the correlation between obesity on effect of anaesthesia in the patients.

METHODOLOGY

Patient enrolment

This is a case-control study. It was conducted It was conducted at Al-Saffir hospital between April 2021 to November 2021. The enrolled women (n=10) were divided into two groups, *i.e.* obese patients treated with anesthesia group (OAG, n=5) and non-obese patients treated with anesthesia group (NOAG, n=5) based on their body mass index (BMI). Both the groups of patients were operated after incorporation of spinal anesthesia. The patients with history of heart and lung disease were not enrolled. Similarly, patients undergoing these two surgery were also excluded from the study.

Study parameters

In the present study, height and weight of enrolled women were measured. Various physiologic changes on the respiratory and cardiovascular system were evaluated. Serum PO2 and PCO2 levels were evaluated in detailed. The postoperative parameters were compared between two groups.

Statistical analysis

The data were represented as mean ±SD (standard deviation) (n=5). The data were evaluated by the Graphpad prism software (version 3).

Results

The BMI is a weight: height ratio. It is calculated by dividing the weight (in kilograms) by the height square (in meters). The body mass index based obesity definition as per world health organization (WHO) is depicted in the Table 1.

Table 1. Body mass index based obesity definition as per WHO

Definition	BMI range (kg/m^2)
Underweight	Under 18.5
Normal	18.5 to < 25
Overweight	25 to < 30
Obese class I	30 to < 35
Obese class II (Morbid obesity)	35 to < 40
Obese class III (Super morbid obesity)	40 and over

The BMI of the enrolled patient is represented in the Table 2. The obese patients (46.1± 8.3 kg/m^2) showed significant (p≤0.01) increase in the BMI as compared to non-obese patients (26.4±3.1 kg/m^2).

Table 2: Body mass index (BMI) of enrolled patients

Parameters	Obese patients	Non-obese patients
BMI	46.1± 8.3** kg/m^2	26.4±3.1 kg/m^2

BMI = Wt (kg)/Ht (m^2)

In the obese patient, heart rate cardiac output was significantly increase as compared to non-obese patients. In the obese patients, heart rate, cardiac output, mean arterial pressure, was found to be increased as compared to non-obese patients. In the obese patients, stroke volume, systolic and diastolic were found to be decrease as compared to non-obese patients. Physiologic changes on the cardiovascular system in both the groups are depicted in the Table 3.

Table 3. Physiologic changes on the cardiovascular system

Parameters	Obese patients	Non-obese patients
Heart rate	97.6±2.05	70.2±6.20
Stroke volume (ml/beat)	65.0±3.30	96±4.0
Cardiac output (L/min)	9.0	6.8
Mean arterial pressure (mmHg)	117±3.84	95.2±3.65
Systolic (mmHg)	Decrease	unchanged
Diastolic (mmHg)	Decrease	unchanged

The physiologic changes to the respiratory system is depicted in the Table 4. The tidal volume, and respiratory rate was found to be increased in both the

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groups. Similarly, expiratory reserve volume was decreased in both the groups.

Table 4. Physiologic changes to the respiratory system

Parameters	Obese patients	Non-obese patients
Tidal volume	Increased	Increased
Respiratory rate	Increased	Increased
Expiratory reserve volume	Decreased	Decreased
Vital capacity	unchaged	Decreased

In the obese patients, PO2 and PCO2 leval was found to be > 65 mmHg and > 45 mmHg, respectively (Table 5).

Table 5. PO2 and PCO2 levels of obese and non-obese patinets.

Parameter	Obese patients	Non-obese patients
PO2	< 65 mmHg	> 65 mmHg
PCO2	> 45 mmHg	< 45 mmHg

DISCUSSION

Continuous positive airway pressure and positive end-expiratory pressure may be used in all morbidly obese patients during anaesthesia induction, especially when difficult airway management is expected or when extreme obesity is present (Gander et al, 2005).

Excess fatty tissue can be found outwardly on the breast, thoracic wall, neck, and abdomen, as well as internally in the mouth, pharynx, and abdomen in morbidly obese patients. This excessive tissue makes access (intubation, tracheostomy), as well as patency of the upper airway and lung function, more difficult than in lean patients. Proper planning and preparation for airway management is essential, which includes elevating the patient's upper body, head, and neck. Preoxygenation is required in morbidly obese patients, and it should be followed by measures to avoid the development of atelectasis. Before beginning airway manipulation, make sure have quit enough anaesthetic depth because insufficient anaesthesia depth can lead to aspiration if airway management becomes challenging (Kristensen, 2010).

Cardiac output is expected to increase by 0.01/min for every kilogram of adipose tissue (DeMaria et al., 2007). The number of overweight and obese patients has risen substantially over the world. As a result, anesthesiologists confront obese patients on a daily basis in their practise. For these patients, regional anaesthetic is becoming increasingly popular. A localised anaesthetic has advantages when used appropriately and should be considered in the anaesthetic treatment strategy for obese individuals (Ingrande et al, 2009).

Regional anaesthetic treatments for obese individuals are becoming more prominent. For some patients, regional anaesthesia has specific advantages over general anaesthetic. A localised anaesthetic allows for minimal airway manipulation, the avoidance of anaesthetic drugs that cause cardiopulmonary depletion, as well as reduced postoperative nausea and vomiting (PONV) and better postoperative pain control. Regional anaesthesia may help minimize the need for perioperative and postoperative analgesics, which is crucial in a patient population prone to pulmonary problems after surgery. However, the limitations of regional anaesthesia, as well as the technical challenges of using it in obese patients, must be carefully examined. When administered by an experienced anesthesiologist who is familiar with morbidly obese surgical patients, then obesity is not a serious complication to regional anaesthesia (Ingrande et al, 2009).

Obesity is a worldwide health issue. Obesity hypoventilation syndrome is one of the symptoms of morbid obesity (OHS). OHS is a significant disease entity that needs a complete understanding by the anesthesiologist (Edmond and Chau et al, 2013). Obesity in the mother before the baby is a substantial risk factor for adverse pregnancy outcomes. Obese patients have a higher chance of caesarean birth and the problems that come with it, such as anaesthesia, wound disruption, infection, and deep venous thrombophlebitis (Catalano, 2007). An anesthesiologist with experience in regional methods and awareness of the physiologic and pharmacologic characteristics that are unique to the obese patient is required for effective peripheral and neuraxial blockade in obese patients (Ingrande et al., 2009).

CONCLUSIONS

The present study can be concluded as the proper anesthesia management should be taken to treat obese patients during operations. Many anesthesiologists prefer to resuscitate the nerves at the operating table. A suitable high-end theater table should be used. There should be enough trained and experienced staff in the theater to assist with evacuating the patient quickly, if necessary during training. Normal monitoring should include a cuff for the right blood pressure cuff.

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