

**Mini Review**

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# Role of Noninvasive Ventilation in the Management of Obese Patients



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**Abbreviations:** WHO: World Health Organization; OHS: Obesity Hypoventilation; BMI: Body Mass Index; PAP: Positive Airway Pressure; CPAP: Continuous Positive Airway Pressure; HRQoL: Health-Related Quality of Life

## Mini Review

National Health and Nutrition Examination Survey data reports that in USA, the prevalence of obesity was 39.8% in adults and 18.5% in youth in 2015–2016. It was also observed that prevalence of obesity was high in middle-aged adults (42.8%) than in younger adults (35.7%). Obesity in adults is defined as a BMI of greater than or equal to 30 [1]. According to the worldwide reports of obesity by World Health Organization (WHO) in 2016, more than 1.9 billion adults, 18 years and older, were overweight [2]. Of these over 650 million were obese. 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese. 41 million children under the age of 5 were overweight or obese in 2016. Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016.

Obesity is a risk factor for many medical disorders. Obesity hypoventilation is a consequence of obesity. WHO has reported that obesity is preventable. Obesity Hypoventilation (OHS) is defined as daytime hypercapnia and hypoxemia ( $\text{PaCO}_2$  - 45 mm Hg and  $\text{PaO}_2$  - 70 mm Hg at sea level) in an obese patient (body mass index [BMI] of 30  $\text{kg/m}^2$ ) with sleep-disordered breathing in the absence of any other cause of hypoventilation [3].

## Treatment Options

In a Meta-analysis by Kaw et al the predictors of chronic hypercapnia in OHS were identified. They are severity of obesity (BMI); severity of OSA, (measured by AHI or hypoxia during sleep) and extent of restrictive chest physiology [4].

In the light of these factors the treatment options should aim at treatment of the sleep disordered breathing, weight reduction and pharmacotherapy.

Treatment of Sleep disordered breathing includes the use of Positive airway Pressure (PAP) therapy. Continuous Positive Airway Pressure (CPAP) is the initial treatment for OHS. There are several studies supporting the use of CPAP in patients with OHS. Howard ME et al conducted a multicentre, double-blind trial with participants randomized to nocturnal Bi-level PAP or CPAP for 3 months. Primary outcome was frequency of treatment failure. Secondary outcomes included health-related quality of life (HRQoL) and sleepiness. The study concluded that in patients who are diagnosed newly with severe OSA, Bi-level PAP and CPAP resulted in comparable improvements in ventilatory failure, HRQoL and adherence [5].

Corral J et al. [6] did research on the Echocardiographic changes with non-invasive ventilation and CPAP in obesity hypoventilation syndrome, where Conventional transthoracic two-dimensional and Doppler echocardiograms were obtained at baseline and after 2 months for patients randomized in to control group (n=70 - life style modification and Intervention group of NIV (n=71), CPAP (n=80) to determine the comparative efficacy of 2 months of NIV on structural and functional echocardiographic changes. It was reported that in patients with OHS, NIV was more efficient treatment than CPAP and life style modifications in improving the following parameters such as pulmonary hypertension, left ventricular hypertrophy and functional outcomes. Masa JF et al. [7] in their Pickwick Study found out that NIV and CPAP were more effective than lifestyle modification in improving clinical symptoms and polysomnographic parameters, although NIV yielded better respiratory functional improvements than CPAP.

A retrospective cohort study of 73 patients by G Gursel et al. [8] where the participants were grouped in to two 1. obese (BMI>35 kg/m<sup>2</sup> and 2. non-obese (BMI<35 kg/m<sup>2</sup>), the difference in these two groups in necessary pressure, volume, mode, ventilator and time to reduce PaCO<sub>2</sub> <50 mmHg were explored. Results of this study showed that ICU specialists should be aware that obese patients with acute hypercapnic respiratory failure are more likely to have OSAS / OHS and may need higher PEEP setting and a longer time to reduce their PaCO<sub>2</sub> levels than non-obese patients when other NIV setting parameters, such as pressure support levels, modes and tidal volumes, are similar.

Nicolini A et al. [9] in their review suggested that, these patients require higher NIV settings, a longer time to reduce PaCO<sub>2</sub> levels below 50 mmHg, and they show more often a late but positive response to NIV. OHS patients are often misdiagnosed as having COPD or heart failure in the course of hospital stay for Acute Respiratory Failure. Early determination of OHS can guarantee proper treatment and repeated admissions to ICU. Another study by Ojeda Castillejo E et al. [10] including 2 groups, group1(OHS) Patients with (AHI)≤5, and group 2, patients with AHI>5 found that use of Mechanical ventilation in patients with OHS and /or OSAH is effective and the survival rates are higher.

### Summary

Obesity is a preventable lifestyle disease. OHS is often misdiagnosed or underdiagnosed. OHS can complicate one's ICU course of stay. Early diagnosis and treatment can reduce frequent admissions and cost associated with it. CPAP and BiPAP play an equally important role in the treatment of OHS and large researches are needed to find the differences in the treatment modalities available currently.

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