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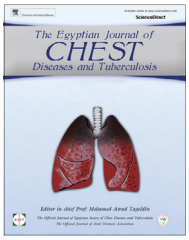

REVIEW

Insulin resistance in obstructive sleep apnea

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KEYWORDS

OSA;
Obesity;
Hypoxic stress;
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Abstract *Introduction:* OSA is a common condition that is characterized by intermittent and recurrent pauses in respiration results in multiple cycles of hypoxia/reoxygenation with an increased production of reactive oxygen species (ROS).

Aim of work: Is to assess serum insulin level and insulin resistance in obese patients with and without OSA.

Subjects and methods: Study was performed on 51 obese subjects who had been referred to the Chest Department of Kasr Alaini Hospital with clinical suspicion of OSA in order to perform polysomnography. They were classified into two groups; cases: consist of 33 obese patients who were diagnosed as obstructive sleep apnea (OSA) and controls: consist of 18 obese subjects, without OSA as a control group. The two groups were subjected to polysomnographic study, serum insulin by ELISA and assessment of insulin resistance by calculation of HOMA index.

Results: There was statistically highly significant increase in Epworth sleepiness scale (ESS) among cases compared to controls. As regards the polysomnographic data, there was statistically highly significant increase in AHI, desaturation index and duration of desaturation $<90\%$ among cases compared to control subjects. Regarding minimal O_2 sat% and average O_2 sat% were lower in cases than in the control subjects and this reduction was statistically significant. There was statistically highly significant increase in serum insulin, HOMA index among cases as compared to controls.

Conclusion: Insulin resistance in OSA is related to sleep associated hypoxemia and hypoxic stress.

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Contents

Introduction

The association of OSA and glucose intolerance/insulin resistance has been consistently shown in numerous studies involving different ethnicities and study design [1]. It was shown that sleep related hypoxemia was associated with glucose intolerance independently of age, sex, BMI and waist circumference. OSA severity was also associated with the degree of IR (insulin resistance) after adjustment for obesity [2].

Most studies have focused on the impact of SDB on insulin sensitivity/resistance, which reflect glucose utilization in peripheral tissue in response to insulin. Pancreatic β-cells, like any other tissues in the body, are also subject to the detrimental effects of sleep apnea and intermittent hypoxia. Other than a progressive reduction in insulin sensitivity with increasing severity of SDB, the disposition index, a measure of pancreatic b-cell function, was also reduced in those with moderate-to-severe OSA. The latter finding suggested that insulin secretion may be affected by OSA [3].

Subject and methods

The present study was performed on 51 obese subjects who had been referred to the Chest Department of Kasr Alaini Hospital for clinical assessment.

The included subjects were classified into two groups:

- Cases: consist of 33 obese patients who were diagnosed as obstructive sleep apnea (OSA) based on both clinical and polysomnographic criteria (AHI $\geqslant$ 5 events/h).
- Controls: consist of 18 obese subjects, without OSA as a control group. They were clinically free from any known diseases.

Inclusion criterion; subjects with BMI > 30 kg/m^2.
Exclusion criteria:

1- Known cases of D.M., hypertension.
2- History of cardiac troubles.
3- Presence of chest symptoms

Study design

The 2 groups were subjected to the following:

1- Full history taking with special emphasis on key symptoms of OSA.

2- Epworth sleepiness scale (ESS): The patients were asked, to evaluate sleepiness (how likely are you to doze off or fall asleep in the following situations):

1. Sitting and reading.
2. Watching television.
3. Sitting inactive in a public place (e.g. theater).
4. As a car passenger for an hour without break.
5. Lying down to rest in the afternoon.
6. Sitting and talking to someone.
7. Sitting quietly after lunch without alcohol.
8. In a car, while stopping for a few minutes in traffic.

The following scale was then used to choose the most appropriate number for each situation:

0 = would never doze.
1 = slight chance of dozing.
2 = moderate chance of dozing.
3 = high chance of dozing.

Interpretations of Epworth sleepiness scale [4]:

a. Supernormal (if ESS 0–5).
b. Normal (if ESS 5–10).
c. Sleepy (if ESS 10–15).
d. Very sleepy (if ESS 15–20).
e. Dangerously sleepy (if ESS > 20).

3- Full clinical examination.

4- Anthropometric measurements: All patients underwent comfort evaluation of anthropometric measures including: body weight, height, body mass index (BMI in kg/m), weight waist and hip circumferences, waist/hip ratio and neck circumference.

National Institutes of Health, 2000 [5] had classified obesity according to BMI into:

- Class I obesity (includes cases with BMI 30.0–34.9)–
  Class II obesity (includes cases with BMI 35.0–39.9)–
  Class III obesity (includes cases with BMI > 40.0).

5- Polysomnographic study: (8 h per night) with detailed analysis of the recorded data. Before the study, patients were advised to avoid tea and coffee intake or any other drugs that may have influence on the quality of sleep as sedatives, hypnotics and tranquilizers.

1. Patients presented to the Sleep Laboratory Unit in chest department of Cairo University Hospital 1 h before their usual bed time to get familiar and adapt with the