Type 2 Diabetes Mellitus and Obstructive Sleep Apnea: A Deadly Duo!

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ABSTRACT
Type 2 Diabetes Mellitus (T2 DM) is a chronic illness with increasing incidence worldwide. Its predisposing factors in majority include obesity, poor lifestyle habits, obstructive sleep apnea (OSA) etc. Despite lifestyle interventions and successful medical management, the economic and public health burden of T2 DM remains substantial. On contrary, OSA, a common chronic respiratory disorder which alters glucose metabolism, promotes insulin resistance due to chronic intermittent hypoxia and its other pathophysiological effects, either remains undiagnosed or untreated in majority of cases. Obesity is considered a key moderator to the effect of OSA on T2 DM. However, it is still unclear whether OSA may lead to the development of diabetes over time independent of obesity. This review article is intended to focus on the fact that OSA may represent as a novel, modifiable risk factor for the development of T2 DM and its in-time identification and management may improve glucose homeostasis.

Keywords: Sleep Apnea, Diabetes, Glucose, Obesity.

INTRODUCTION

Type 2 Diabetes Mellitus (T2 DM) is a chronic illness with increasing number of patients across the world. Factors contributing to its development include obesity, poor lifestyle habits, obstructive sleep apnea (OSA) and many more. Despite proven results of lifestyle interventions and medical management, the economic and public health burden of T2 DM remains substantial. On contrary, OSA, a common chronic respiratory disorder characterized by sleep-induced recurrent upper airway collapse, either remains undiagnosed or untreated in majority of cases. Although it is proven that OSA alters glucose metabolism, promotes insulin resistance, and is associated with development of T2 DM. Obesity is considered a key moderator to the effect of OSA on T2 DM. However, numerous studies have concluded and accepted the fact that OSA is associated with T2 DM, independent of obesity as well. 83% of patients with T2 DM suffer from undiagnosed OSA and increasing severity of OSA is associated with worsening of glycemic control. It is still unclear whether OSA solely may lead to the development of diabetes and in time identification and management of OSA improves glucose homeostasis.

Large-scale randomized-controlled trials are required to ascertain that OSA represents a novel, modifiable risk factor for the development of T2 DM.

RELATIONSHIP BETWEEN T2 DM AND OSA

T2 DM is proven to be having higher incidence of being associated with sleep disorders, which may be due to disease itself or because of secondary complications or co-morbidities associated with T2 DM. On the other hand, shorter sleep duration and erratic sleep behavior itself have been linked with higher incidence of obesity, metabolic syndrome, and T2 DM. Sleep Assessment as a part of the medical evaluation shall be a routine practice taking into consideration the emerging evidence based studies suggesting a relationship between sleep quality and glycemic control in persons with T2 DM. Attempts
should be made to identify sleep disorders associated with T2 DM and understand their impacts on glycemic and other metabolic control. Preventive and therapeutic strategies need to be laid down to manage these problems well in time and ensure good success.

T2 DM and OSA have several clinical findings in common for example: obesity, hypertension, and impaired glucose tolerance. Glucose regulation is closely linked to tissue response to insulin and its secretion from pancreatic beta-cells of Langerhans. Insulin resistance is an initial marker of T2 DM, but frank diabetes only develops when compensatory insulin secretion is insufficient to maintain glucose homeostasis. It is postulated that OSA can cause or aggravate impaired glucose-insulin regulation through induction of neurohormonal activation, oxidative stress and inflammation, with variable degree of evidence supporting the role of such mediating mechanisms.4-6

T2 DM is a major cause of morbidity and mortality associated with vascular complications and is considered as a coronary artery disease risk equivalent for myocardial infarction.7 Other studies indicate that OSA is associated with atherosclerosis and initiation and progression of cardiovascular disease,6-10 and it is also linked with other risks factors for cardiovascular disease, including hypertension,11-13 obesity, dyslipidemia and may interact synergistically with these risk factors to increase morbidity and mortality related to cardiovascular accidents.10

Investigators14-18 also found an association between OSA, insulin resistance, and impaired glucose tolerance which persists even after controlling the other risk factors such as obesity. Further it is observed that insulin resistance decreases in individuals who underwent management of OSA either with continuous positive airway pressure (CPAP), oral/mandibular advancement devices (MAD) or surgical intervention.

The fact, that OSA is more prevalent in patients with diabetes than in the general population seems to be a logical outcome. Both the diseases commonly co-exist, but here two different queries needs to be answered, is there a causative relationship between the two conditions and, if so, which one comes first? Most of the studies are focused on examining the impact of OSA on the incidence of T2 DM. Several longitudinal studies and meta-analyses have shown that OSA is a risk factor for the development of T2D independent of obesity and other traditional risk factors.19-22 It is very much possible that OSA can lead to the development of T2 DM as OSA is associated with insulin resistance and β-cell dysfunction; this relationship is mediated by several neurohormonal and inflammatory mechanisms and increased oxidative stress.23-25 OSA has also been known to worsen glycemic values following the adjustment for a wide range of confounders in several cross-sectional studies. The impact of OSA on HbA1C ranged between 0.7% and 3.69%.25

CONCLUSION

Identification and management of risk factors for T2 DM such as obesity, hypertension, and dyslipidemia are important to reduce complications associated with the disease. OSA, via sympathetic activation, oxidative stress, inflammation, and neuroendocrine dysregulation, alters glucose homeostasis and thus is a proven co-morbidity found in T2 DM patients. It needs attention during the primary care of patients with T2 DM. In majority of cases OSA either remains undiagnosed or untreated due lack of understanding or patient compliance.

Clinicians must remain vigilant for signs and symptoms of OSA and check patient compliance with either CPAP, oral appliances or the combination of two along alternate treatments of OSA such as behavioral and weight loss therapy.

REFERENCES