Obstructive Sleep Apnea and Type 2 Diabetes in Older Adults

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KEYWORDS

• Obstructive sleep apnea • Central sleep apnea • Type 2 diabetes • Aging

KEY POINTS

- Obstructive sleep apnea (OSA) is associated with insulin resistance, glucose intolerance, and type 2 diabetes independent of confounding effects of age and obesity.
- Intermittent hypoxemia and sleep fragmentation in OSA trigger a wide repertoire of pathophysiological mechanisms that may be responsible for altering glucose homeostasis and increasing the risk for type 2 diabetes.
- Treatment of OSA is associated with improvements in daytime sleepiness and quality of life, and may also have a favorable impact on glycemic control and glucose metabolism.
- OSA and central sleep apnea are common in people with type 2 diabetes, particularly in the presence of autonomic neuropathy.
- Given the high prevalence of OSA and type 2 diabetes in older adults, presence of 1 condition should prompt the evaluation of the other.

INTRODUCTION

Given the global increase in prevalence of obesity, obstructive sleep apnea (OSA) is becoming an increasingly common and pervasive condition. It has been estimated that OSA affects 12 to 18 million people in the United States alone.[1] In addition to its well-established neurocognitive effects,[2] OSA has also been found to be an independent risk factor for hypertension,[3] cardiovascular disease,[4] and impaired glucose metabolism.[5] Cross-sectional studies of clinic and population-based samples suggest that up to 50% of patients with OSA have type 2 diabetes, and approximately 50% of patients with type 2 diabetes have moderate-to-severe OSA.[6,7] Although many of the

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putative links between OSA and metabolic dysfunction are not well elucidated, it is likely that intermittent hypoxemia and sleep fragmentation, the 2 pathophysiological concomitants of OSA, play a fundamental role in the development of insulin resistance, glucose intolerance, and type 2 diabetes. The central theme of this article is to provide a brief appraisal of the bidirectional nature of the association between OSA and type 2 diabetes given that both conditions are increasingly prevalent in older adults.

SLEEP APNEA: DISEASE DEFINITION AND RISK FACTORS

Sleep apnea is a group of chronic sleep-related breathing disorders that are characterized by the occurrence of disordered breathing events during sleep. These events are generally classified into 2 main types: obstructive and central. The classification of an event as obstructive or central depends whether, in the absence of airflow, there is ongoing respiratory effort. OSA, which is the most prevalent type of sleep apnea, is characterized by the predominance of recurrent obstructive events that result from partial or complete collapse of the upper airway during sleep. The ensuing cessation of airflow (apneas) or decrease in airflow (hypopneas) is associated with a decrease in oxyhemoglobin saturation and arousal from sleep. In OSA, apneas and hypopneas during sleep are associated with continued respiratory effort. In contrast, in central sleep apnea, the upper airway remains patent, and the apneas and hypopneas result during sleep from a decrease or lack of respiratory muscle effort. The apnea–hypopnea index (AHI), which is the number of apneas and hypopneas per hour of sleep, is used as the disease-defining metric for OSA and central sleep apnea. By convention, the following thresholds are used to classify the severity of obstructive or central sleep apnea: normal (AHI <5 events/h), mild (AHI: 5.0–14.9 events/h), moderate (AHI: 15.0–29.9 events/h), or severe (AHI ≥ 30 events/h). Although OSA is by far the more common type, OSA and central sleep apnea can coexist in older adults. Data from several large population-based cohort studies have estimated the prevalence of OSA to vary in the range of 5.0% to 15.0%.[8] Even more gripping is the large number of people with OSA who remain undiagnosed, estimated to be 70% to 90% of those with OSA.[9] Risk factors for OSA include advancing age, male sex, family history, excess body fat, central obesity, large neck circumference, and craniofacial and upper airway abnormalities.[8] Other risk factors include family history, smoking, being postmenopausal, and nighttime alcohol use.

AGE AS A RISK FACTOR FOR SLEEP APNEA

Even in the absence of an underlying sleep disorder, older age is associated with impairments in sleep quality that can be related to either chronic medical or psychiatric conditions and/or changes in social situation.[10] The presence of a sleep disorder such as OSA can further impair sleep quality. Studies investigating prevalence of OSA have generally shown that it is an age-related condition, with older adults having a higher prevalence compared with younger adults.[11–15] Points estimates of OSA prevalence, however, vary across studies, in part, because of the heterogeneity in study samples including recruitment source (clinic vs community-based), distribution of factors such as sex and body weight, and the methods used to identify OSA. Undoubtedly, the highest prevalence of OSA is in older men, with estimates in the range of 13% to 44% for those between 59 and 99 years old.[11–15] Cross-sectional data on OSA prevalence as a function of age suggest that prevalence increases in middle-aged adults, up to the sixth decade of life, with a subsequent plateau (**Fig. 1**).[16] Longitudinal data on older cohorts also indicate a plateau, or perhaps even a decline, in OSA prevalence in the elderly.[17,18] It is certainly possible that survivor bias could explain the lack of a