Apnea in Older Adults

Susmita Chowdhuri, MD, MS[a,b,*], Pragnesh Patel, MD[b],
M. Safwan Badr, MD[a,b]

KEYWORDS

• Aging • Sleep • Cardiovascular • Hypertension • Stroke • Cognitive • Quality of life • CPAP

KEY POINTS

- Epidemiologic studies indicate that sleep-disordered breathing (SDB), including central sleep apnea, has a higher prevalence in the older adult population compared with younger and middle-aged adults. The underlying pathophysiology for this increased prevalence remains unresolved.
- Evolving research reveals that SDB in older adults is linked to an increased risk for stroke, heart failure, atrial fibrillation, type 2 diabetes, excessive daytime sleepiness, and early cognitive decline.
- There is conflicting evidence regarding the risk for mortality and for developing incident hypertension and ischemic heart disease; moreover there is a paucity of evidence regarding SDB effects on driving accidents and quality of life in older adults.
- The impact of positive airway pressure therapy on clinical outcomes in older adults is not well studied.
- There are no systematic outcome data on the impact of alternative therapies, including oral appliances and bariatric surgery, in older adults with SDB.

INTRODUCTION

Sleep disordered breathing (SDB) is more prevalent in older adults than in young and middle-aged adults. By 2050, 1 in 5 people will be 60 years or older prompting the World Health Organization to adopt a global 5-year strategy and action plan for enhancing older adult health (2016–2020) to alleviate complications of chronic diseases.[1] Given the very high prevalence of a chronic diseases like SDB in the United States and Europe, it is imperative that health care agencies focus on SDB and alleviate its adverse consequences in older adults to ensure that older adults live longer and healthier lives. The following sections review the current evidence and highlight research gaps related to the diagnosis and management of SDB in older adults.

EPIDEMIOLOGY

Several large, community-based epidemiologic studies have demonstrated increased prevalence of SDB in people older than 60 years of age, ranging from 27% to 80%.[2–6] Ancoli-Israel and colleagues[3] estimated the prevalence of SDB was 27% in community-dwelling older adults and 42% in nursing home residents. A population-based study in healthy adults noted that 3%, 33%, and 39% of 60, 70, and 80 year olds, respectively,[4] had an apnea-hypopnea index (AHI) of 5 or greater, with predominantly central apneas. Additionally, the prevalence of obstructive sleep apnea (OSA) (AHI $\geq$5) in the age group older than 71 years was 80% and increased 2.2 fold for each 10 years of advancing age.[6] Men are twice as likely to have SDB as women.[4,6] The prevalence of central apnea

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[a] Sleep Medicine Section, John D. Dingell VA Medical Center, Detroit, MI 48201, USA; [b] Department of Medicine, Wayne State University, Detroit, MI 48201, USA
* Corresponding author. Medical Service, John D. Dingell VA Medical Center, 4646 John R (11M), Detroit, MI 48201.
E-mail address: schowdh@med.wayne.edu

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(defined as a central apnea index [CAI] of ≥2.5) increased from 1.7% in the middle-aged group to 12.1% in the older-age group (odds ratio [OR] = 8.3).[5] The age-specific prevalence of a CAI of 20 or greater for men older than 65 years was 5.2%. However, the prevalence of a CAI greater than 0 in women was only 0.3%.[7] In the Outcomes of Sleep Disorders in Older Men (MrOS) sleep study, a study of community-based sample of older men, the prevalence of moderate-severe SDB using an AHI cutoff of 15 was 21.4% to 26.4%,[8] that is, higher than in younger adults.[9] This prevalence was similar to the prevalence in older adults of the Sleep Heart Health Study (SHHS)[10] and in a subgroup of men aged 65 years and older from a Pennsylvania-based cohort.[5] The AHI increases over time with longitudinal follow-up; older heavier adults have the highest rate of increase in AHI over time.[11,12]

In summary, the available studies indicate a higher prevalence of SDB in older adults, particularly men, relative to middle-aged adults, with a noted increase in the prevalence of central apneas.

CLINICAL MANIFESTATIONS

The main symptoms of SDB in older adults are snoring and excessive daytime sleepiness (EDS).[13,14] In the community-based MrOS sleep study, older men had a 50% greater odds of sleepiness if they had SDB.[8] However, in a separate study, only 32% of older individuals had EDS with Epworth sleepiness scale (ESS) scores greater than 10[15]; however, ESS may underestimate EDS in older adults. Moreover, some older adults may underestimate daytime napping. In one study, 40% of individuals who fell asleep at least twice during a multiple sleep latency test (MSLT) did not perceive their naps and had lower Modified Mini-Mental State Examination (MMSE) scores than matched individuals who perceived their naps.[16]

Older patients with SDB may also present with insomnia. In a study of older veterans undergoing behavioral therapy for insomnia, nearly half had occult SDB, which was characterized by reported EDS but not snoring or witnessed breathing pauses.[17] Significant predictors for SDB in the MrOS sleep study were age, obesity, Asian versus Caucasian race, snoring, sleepiness, hypertension, cardiovascular (CV) disease, and heart failure.[8]

The association of SDB with body mass index (BMI) is weaker in older versus middle-aged individuals.[18] But in one study, BMI more accurately identified the presence of a mild form of OSA, whereas male sex and central fat distribution better defined the presence of severe cases in older adults.[19]

DIAGNOSTIC TESTING

Attended full nocturnal polysomnography (PSG) remains the gold standard for diagnosing SDB in older adults. Older patients receiving home care services who had multiple comorbid conditions and a high pretest probability on the Berlin questionnaire were more likely to have a diagnosis of OSA.[20] Limited channel study recording in the sleep laboratory was reliable when compared with in-laboratory PSG in older patients.[21] Moreover, in-home unattended home sleep apnea testing (HSAT) that recorded airflow combined with symptoms of sleep apnea, BMI, neck circumference, age, and sex, was the best-performing 2-stage model for the diagnosis of OSA in older adults with an area under the curve (AUC) of 0.85 and negative posttest probability of 0.5% to make a diagnosis of OSA defined as an AHI of 30 or greater.[22]

In summary, population- and clinic-based studies suggest that the prevalence of snoring and EDS is high in older individuals with SDB. The ESS and sleep questionnaires have not been validated in older adults. The home sleep testing pathway needs to be further delineated in older adults.

PATHOPHYSIOLOGY

Sleep state oscillations may precipitate central apnea and periodicity in older adults (**Fig. 1**).[23,24] Pack and colleagues noted a waxing and waning oscillatory breathing pattern during the lighter stages of sleep in older subjects suggesting that ventilatory control mechanisms were involved.[23,24] The authors' group has demonstrated that healthy (nonapneic) older adults have narrower carbon dioxide (CO_2) reserve than younger adults because of the high controller gain,[25] but this was not noted in older patients with OSA.[26] The effects of aging on chemo-responsiveness during *wakefulness* have also yielded conflicting results.[27,28] During sleep, there was no change in the magnitude of the hypercapnic ventilatory response.[29] In contrast, Chowdhuri and colleagues[30] demonstrated that during non–rapid eye movement (*NREM*) *sleep*, older adults had an increased isocapnic hypoxic ventilatory response and hyperoxic suppression of ventilation (Dejours' effect) despite the absence of ventilatory long-term facilitation (plasticity) following acute intermittent hypoxia. Additionally, cerebral blood flow (CBF) regulation and cerebrovascular responsiveness to CO_2 (CVR) are reduced in older adults that may also reduce the CO_2 reserve.[31,32] Thus, increased chemosensitivity, unconstrained by respiratory plasticity and reduced CVR, may explain