



## REVISIÓN

# Obstructive sleep apnea syndrome: An important piece in the puzzle of cardiovascular risk factors



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### KEYWORDS

Obstructive sleep apnea syndrome;  
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**Abstract** The obstructive sleep apnea syndrome (OSA) is a clinical entity characterized by recurring episodes of apnea and/or hypopnea during sleep, due to a total or partial collapse, respectively, of the upper airway. This collapse originates a set of pathophysiological changes that determine the appearance of several cardiovascular complications. OSA contributes for the development of hypertension, heart failure, arrhythmias and coronary heart disease. Nowadays it is recognized to be an important public health problem, taking into account not just its repercussions but also its prevalence, since the main risk factor for the disease is obesity, a growing problem worldwide, both in developed and developing countries. The present review summarizes the current knowledge about OSA, as regards its definition, pathophysiology, clinical manifestations, diagnosis, cardiovascular effects and treatment.

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### PALABRAS CLAVE

Síndrome de apnea obstructiva del sueño;  
riesgo cardiovascular;  
obesidad

**Síndrome de apnea obstructiva del sueño: una pieza importante en el rompecabezas del riesgo cardiovascular**

**Resumen** El síndrome de apnea-hipopnea del sueño (SAHS) es una entidad clínica caracterizada por episodios de apnea y/o hipopnea recurrentes durante el sueño, debido a un colapso total o parcial, respectivamente, de la vía aérea superior. Este colapso origina un conjunto de cambios fisiopatológicos que determinan la aparición de diversas complicaciones cardiovasculares, contribuyendo al desarrollo de hipertensión arterial, insuficiencia cardíaca, arritmias y enfermedad arterial coronaria. Hoy en día se reconoce como un importante problema de salud pública, teniendo en cuenta no sólo sus consecuencias, sino también su elevada

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prevalencia. Uno de los principales factores de riesgo del SAHS es la obesidad, un problema de gran relevancia en los países desarrollados y en vías de desarrollo. La presente revisión resume el conocimiento actual sobre la AOS, en cuanto a su definición, fisiopatología, manifestaciones clínicas, diagnóstico, efectos cardiovasculares y tratamiento.

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## Introduction

The obstructive sleep apnea syndrome (OSA) is a clinical entity characterized by recurring episodes of apnea and/or hypopnea during sleep, occurring by total or partial collapse, respectively, of the upper airway, in a frequency superior to five times per hour of sleep.<sup>1</sup>

This collapse originates a set of pathophysiological changes that determine the appearance of several cardiovascular complications. OSA can be an independent cause of systemic arterial and pulmonary hypertension; it can also contribute to the development of heart failure, arrhythmias and coronary artery disease.

Nowadays it is recognized to be an important public health problem, taking into account its prevalence, severity and socio-economic impact.<sup>2</sup> It is a problem that has been underestimated and it is believed that 80% of OSA patients are undiagnosed.<sup>1,2</sup> Therefore, the precocious recognition of this disease and institution of interventional measures are mandatory.

The present review summarizes the current knowledge about OSA, as regards its pathophysiology, clinical manifestations, diagnosis, cardiovascular repercussions and treatment.

## Epidemiology

OSA is an important public health problem, whose knowledge has grown over the last five decades.<sup>1</sup> It has been underestimated, and it is believed that 80% of OSA patients are undiagnosed.<sup>1,2</sup> Nowadays it is recognized to be a preponderant cardiovascular risk factor, since its main cause is obesity, a growing problem worldwide, both in developed and developing countries.<sup>1</sup>

It is estimated to affect approximately 9% of females and 24% of males, considering the adult population in general.<sup>3</sup> The disease is more common in middle aged men (from 40 to 65 years old).<sup>1</sup>

## Pathophysiology

OSA is characterized by recurring episodes of apnea and/or hypopnea during sleep, due to total or partial collapse, respectively, of the upper airway, in a frequency superior to five times per hour of sleep.<sup>1</sup> Apnea is defined as a reduction of at least 80% of the ventilatory flow; hypopnea corresponds to a reduction of at least 20% of the ventilator flow.<sup>4</sup> Both events have to last at least 10 s.<sup>4</sup>

OSA is based on the fact that during the night the airway dilator muscles are unable to counter, effectively, the negative pressure of the airway during inspiration, thus resulting in its collapse.<sup>1</sup> During the day, the patency of the airway is maintained at the expense of additional muscular effort, but during sleep the muscle tone decreases, so the airway collapses.

This collapse originates, from a pathophysiological point of view, a nocturnal desaturation followed by reoxygenation (intermittent hypoxemia) which leads to: (1) an activation of carotid chemoreceptors that triggers the secretion of catecholamines and systemic arteriolar vasoconstriction<sup>5</sup>; (2) an increased production of free radicals<sup>5</sup>; (3) an increase of inflammation markers, including C-reactive protein and inflammatory cytokines such as TNF-alpha and IL-6<sup>5,6</sup>; and (4) endothelial dysfunction.<sup>5</sup> However, there is still no reliable inflammation marker for the diagnosis of disease.<sup>6</sup>

## Etiology

One of the leading risk factors for OSA is obesity and overweight, which cause narrowing of pharynx,<sup>1</sup> a risk factor that is growing around the world, in developing and developed countries. Not just body mass index but also neck circumference seems to be an important risk factor for disease, both being highly correlated.<sup>7</sup> Thus, an elevated neck circumference is considered a new clinical parameter that seems to be an independent risk factor for severe OSA.<sup>7</sup>

Hypothyroidism and acromegaly also predispose to OSA by infiltration of the cervical soft tissues.<sup>1</sup> Other risk factors include micrognathia, myotonic dystrophy, Ehlers-Danlos syndrome and possibly smoking.<sup>1</sup>

Alcohol intake increases the frequency and duration of apneas due to its combined effect of reducing muscle respiratory tone and depression of respiratory center.<sup>4</sup>

The syndrome can also occur in children usually associated with tonsils hypertrophy.<sup>1</sup>

## Clinical manifestations

The most common neuropsychiatric manifestation is excessive daytime sleepiness, secondary to sleep fragmentation.<sup>8</sup> This drowsiness can cause inability to work effectively, and may affect interpersonal relationships.<sup>1</sup> Another consequence is the increased risk of accidents, including traffic and labor accidents. These patients may also present mood disorders, cognitive dysfunction, snoring and morning headache.<sup>1</sup>

Drowsiness may be assessed by subjective and objective tests.<sup>9</sup> Objective tests include Multiple Sleep Latency

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