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Sleep apnea is a manifestation of the metabolic syndrome.

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Obstructive sleep apnea (OSA) is a prevalent disorder particularly among middle-aged, obese men, although its existence in women as well as in lean individuals is increasingly recognized. Despite the early recognition of the strong association between OSA and obesity, and OSA and cardiovascular problems, sleep apnea has been treated as a 'local abnormality' of the respiratory track rather than as a 'systemic illness.' In 1997, we first reported that the pro-inflammatory cytokines interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNFalpha) were elevated in patients with disorders of excessive daytime sleepiness (EDS) and proposed that these cytokines were mediators of daytime sleepiness. Also, we reported a positive correlation between IL-6 or TNFalpha plasma levels and the body-mass-index (BMI). In subsequent studies, we showed that IL-6, TNFalpha, and insulin levels were elevated in sleep apnea independently of obesity and that visceral fat, was the primary parameter linked with sleep apnea. Furthermore, our findings that women with the polycystic ovary syndrome (PCOS) (a condition associated with hyperandrogenism and insulin resistance) were much more likely than controls to have sleep disordered breathing (SDB) and daytime sleepiness, suggests a pathogenetic role of insulin resistance in OSA. Other findings that support the view that sleep apnea and sleepiness in obese patients may be manifestations of the Metabolic Syndrome, include: obesity without sleep apnea is associated with daytime sleepiness; PCOS and diabetes type 2 are independently associated with EDS after controlling for SDB, obesity, and age; increased prevalence of sleep apnea in post-menopausal women, with hormonal replacement therapy associated with a significantly reduced risk for OSA; lack of effect of continuous positive airway pressure (CPAP) in obese patients with apnea on hypercytokinemia and insulin resistance indices; and that the prevalence of the metabolic syndrome in the US population from the Third National Health and Nutrition Examination Survey (1988-1994) parallels the prevalence of symptomatic sleep apnea in general random samples. Finally, the beneficial effect of a cytokine antagonist on EDS in obese, male apneics and that of exercise on SDB in a general random sample, supports the hypothesis that cytokines and insulin resistance are mediators of EDS and sleep apnea in humans. In conclusion, accumulating evidence provides support to our model of the bi-directional, feed forward, pernicious association between sleep apnea, sleepiness, inflammation, and insulin resistance, all promoting atherosclerosis and cardiovascular disease.

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