

THE SLEEP DISORDERS CLINIC

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The Link between Sleep and Obesity

Sleep Timing:

- Circadian Rhythm disturbances such as shift work are positively associated with obesity through changes in hormones that suppress appetite (Leptin) and those that increase hunger (Ghrelin).
- When we don't sleep adequately at night we alter the gastro-intestinal and body's hormonal structures promoting poor eating patterns (eating at irregular hours and increasing cravings) and desynchronization of the metabolic processes (eating, excretion, voiding of urine, etc.)
- Increasing stress hormones (cortisol and epinephrine) due to fatigue from lack of sleep, promote insulin resistance which elevates blood sugars (pre-diabetic state). As insulin is a growth hormone, the body's response is to make higher levels of insulin which promote weight gain.

Sleep Deprivation:

- One third of the population works shifts. Most of these people will sleep deprive, sometimes by as many as twenty hours per week.
- We should ideally have eight and a quarter hours of sleep.
- Some people need more (idiopathic long sleepers) and some need less than six hours (short sleepers).
- Daytime sleep is not respected (phones are not turned off, temperature increases, daytime noise etc.)
- Sleep deprivation causes inflammatory changes which again interfere with the hormones that suppress appetite and increase hunger and other points noted above.
- In a state of sleepiness, people often look at nutrition as a way to promote wakefulness. This leads to increase calorie intake both from food and liquid sources, often pop.
- Sleep deprivation will decrease a person's overall energy levels reducing inclination to exercise.
- Caloric expenditure is mediated through muscle metabolism and activity. When sitting we can burn around 60 calories per hour, with vigorous exercise we can burn up to 16 times more (up to 1000 calories per hour).
- Studies in obese children have linked later bedtimes with increased obesity (obese children slept 71 minutes less than normally weighted children. (Gozal, David, 2006, Journal Sleep) and the same has been found with adults (White, David, 2006, Sleep).

Obesity and Sleep Disorders:

- Obstructive Sleep Apnea (OSA) is highly correlated with obesity. 30% of people with BMI over 30 have sleep apnea and it worsens with further weight gain. (BMI = weight in kilograms divided by height in metres squared)
- 2/3 are of North American adults are overweight with 1/3 being obese (BMI > 30).
- Obesity, especially abdominal obesity, is associated with narrowing of the airway (fatty deposition in the airway, enlargement of the tongue) and is metabolically active which may accelerate atherosclerosis.
- OSA causes sleep disruption (arousals) leading to issues discussed above.
- Even people who are obese without sleep apnea have inflammatory markers that are elevated.
- Obesity is strongly correlated with diabetes and hypertension (metabolic syndrome) which is also highly

correlated with OSA.

- With OSA there is intermittent suffocation which causes massive increase in stress hormone release.
- OSA is independently associated with insulin resistance regardless of obesity.
- Treating OSA with CPAP (Continuous positive airways pressure): benefits include control of apnea, reduction in cardiac work, increase in oxygen levels due to increase in lung volume, improved quality of sleep and in most patients a resolution of daytime sleepiness.
- Obesity related apnea most often will resolve with weight loss (by bringing oneself back to a normal weight, BMI between 20 and 25).
- In children sleep apnea occurs in two peaks: 2-6 year olds due to tonsils and adenoid enlargement, and second peak in adolescents due to obesity.

Decreasing caloric intake and increase caloric expenditure through increasing activity cures obesity. Weight loss surgery (bariatric surgery) is effective in the majority of cases as a cure for massive obesity.

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