Abdominal Obesity and Smoking

What We Know

- Smoking and obesity are both serious public health concerns that are associated with cardiovascular diseases (CVD), cancer, metabolic abnormalities, and premature mortality. The combination of smoking and obesity further increases the risk of mortality, particularly from CVD. The life expectancy of an obese smoker is estimated to be 13 years fewer than that of a normal-weight smoker.\(^2,3,4,6,7,11\)

- Smoking initiation—especially among adolescents and women—is commonly related to weight concerns in individuals who view smoking as an effective means of weight control, and fear of gaining weight can be an impediment to smoking cessation; nevertheless, the relationship between smoking and obesity is complex and incompletely understood.\(^2,3,4,6,8\)

- Smokers tend to have lower body mass index (BMI)—likely due at least in part to a combination of nicotine-induced acute increase in metabolism and reduction in appetite—and smoking cessation often leads to weight gain, but heavy smoking is associated with increased risk of obesity.\(^2,3,6,8\)

- In addition, accumulating evidence suggests that smoking is associated with abdominal obesity, which reflects visceral fat deposition and is associated with increase in risk of CVD, diabetes mellitus, type 2 (DM2), hypertension, dyslipidemia, hyperglycemia, insulin resistance, and mortality compared to overall obesity. Indeed, even among individuals with BMI in the normal range, higher waist circumference or waist-to-hip ratio is associated with increased risk for obesity-related complications and diseases.\(^1,2,3,4,6,7,8,11\)

- The correlation between smoking and abdominal obesity has been demonstrated in a number of populations, and there appears to be a dose-response relationship between the number of cigarettes smoked and risk for abdominal obesity.\(^3,6,8,11\)

- In a study of 283 adults in South Korea, investigators observed a significant dose-dependent association of smoking pack-years with waist circumference and visceral fat area, even after controlling for age, alcohol consumption, and physical activity.\(^6\)

- Another group of researchers in South Korea who categorized 2,197 patients with DM2 as never-smokers, ex-smokers, or current smokers found that mean values of waist circumference and visceral fat thickness were lowest in never-smokers and highest in current smokers.\(^11\)

- In a study of 6,123 White adults in Switzerland, researchers observed that, compared to light smoking (1–9 cigarettes per day), heavy smoking (≥ 20 cigarettes per day) was associated with a 1.94-fold increased risk for abdominal obesity in men and a 2.15-fold increased risk in women. In addition, heavy smoking was associated with a 2.11-fold increased risk for excess body fat in women.\(^2\)

- The underlying mechanism or mechanisms linking smoking and abdominal obesity have yet to be proven, but several possible mechanisms—including the direct effects of nicotine and the effects of smoking on sex hormone levels—have been identified.\(^2,3,8,11\)

- Nicotine may lead to fat accumulation through a variety of mechanisms, including induction of insulin resistance and increased levels of stress hormones, including cortisol, which is associated with abdominal obesity and insulin resistance.\(^2,3,8,11\)
Researchers in a study of 954 male smokers in China found that the relationship between smoking intensity and abdominal obesity was moderated by variations in the CYP1A6 gene, which encodes an enzyme involved in the metabolism of 70–80% of inhaled nicotine\(^5\).

- Sex hormones might also be involved, with smoking causing an imbalance in androgenic and estrogenic activity\(^1,2\).
- Smoking may decrease testosterone levels in men, which increases visceral fat deposition\(^2\).
- Although absolute estrogen concentrations are similar in smoking and nonsmoking women, female smokers have higher androgen concentrations and lower bioavailability of estrogens, which can lead to visceral adiposity\(^2\).
- Abdominal obesity in smokers may also be related in part to the likelihood that smokers have a less healthy lifestyle than nonsmokers (e.g., physical inactivity, increased alcohol consumption, unhealthy diet)\(^1,3\).
- Finally, smokers may gain weight during failed attempts at quitting\(^3\).

Consequences of abdominal obesity in smokers include increased risk of DM2 and metabolic syndrome (MetS; i.e., a constellation of metabolic abnormalities—including abdominal obesity, hypertriglyceridemia, low levels of high-density lipoprotein [HDL] cholesterol, hypertension, and hyperinsulinemia—that increase a person’s likelihood of developing CVD and DM2)\(^2,9,10\).

- In a recent population-based study including 3,598 participants in Jiangsu, China, researchers found that the combination of current smoking and abdominal obesity was associated with a 2.8-fold increased risk of developing DM2\(^2\).
- In a study of 2,675 Japanese males with DM2, there was a positive correlation between heavy smoking and MetS—due mainly to higher risk of abdominal obesity and dyslipidemia—among nondrinkers\(^10\).
- Researchers who analyzed data from 11,559 participants in the Korean National Health and Nutrition Examination Surveys 2008–2010 found that MetSwas significantly more common in smokers than in nonsmokers. Components of MetS that occurred more frequently in smokers than in nonsmokers included low HDL cholesterol and high triglycerides in men and abdominal obesity and high triglycerides in women\(^2\).

- Although persons who quit smoking are likely to gain weight, and fear of gaining weight is a possible impediment to smoking cessation, a long period of smoking cessation may reduce abdominal obesity to a level similar to that of persons who never smoked\(^1,2,4,6\).
- Investigators in a population-based study of 21,828 adults in the United Kingdom found an inverse relationship between time since quitting and waist-to-hip ratio. Duration of smoking was positively associated with the time necessary to achieve normalization of waist-to-hip ratio\(^1\).

**What We Can Do**

- Learn about the link between abdominal obesity and smoking so you can accurately assess your patients’ personal characteristics and health education needs; share this information with your colleagues
- Identify patients who smoke, educate them about the hazards of smoking (including abdominal obesity) and the benefits of quitting smoking, and assist them with smoking cessation (e.g., by providing support, educating about nicotine replacement therapy, by requesting a referral to individual counseling or group therapy)
- Inform your patients that smoking is not an effective method of weight control and that, in the long term, smoking is associated with a higher risk for abdominal obesity and related health conditions (e.g., MetS, DM2, CVD)
**Coding Matrix**

References are rated using the following codes, listed in order of strength:

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<th>Code</th>
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<td>Published meta-analysis</td>
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<td>SR</td>
<td>Published systematic or integrative literature review</td>
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<td>RCT</td>
<td>Published research (randomized controlled trial)</td>
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<td>R</td>
<td>Published research (not randomized controlled trial)</td>
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<td>C</td>
<td>Case histories, case studies</td>
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**References**


