



HARVARD T.H. CHAN

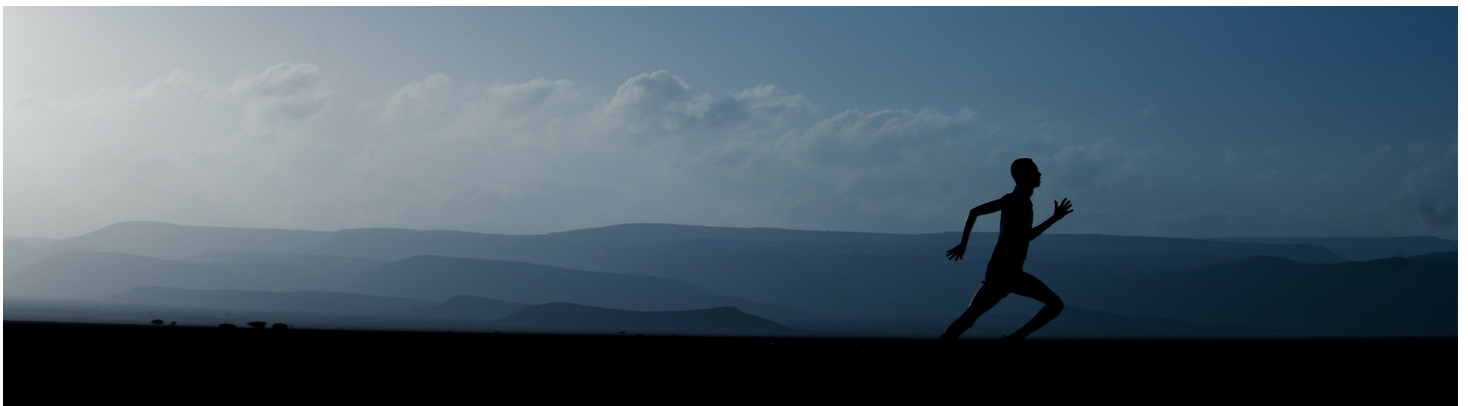
SCHOOL OF PUBLIC HEALTH

**NIEHS Center for Environmental Health
Community Engagement Core**

OBESITY AND ASTHMA

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Note from Author Traci Brown, PhD:

This document is intended to support health care providers as they serve their patients with obesity and asthma. It includes summaries of data showing the connections between obesity and asthma, the impact of the environment, and potential mechanistic theories connecting the two. It also highlights intervention studies that show how addressing co-morbidities and lifestyle factors can lead to improvements in asthma control and quality of life for this population.

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Disclaimer: This reference document summarizes relevant literature on asthma and obesity and is not intended to be used as medical advice. Health professionals should use their own discretion when incorporating these materials into their practice.



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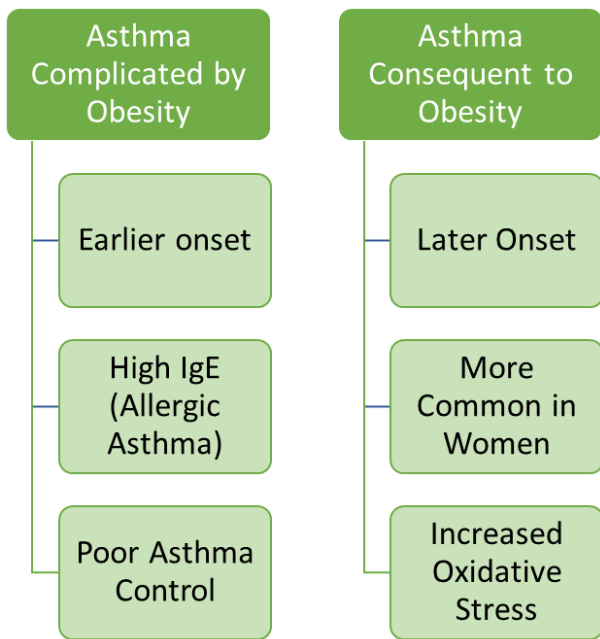
Relationship Between Asthma and Obesity

Nearly 20 years ago Harvard Chan researchers published a paper describing a connection between asthma and obesity using data from the Nurses' Health Study.¹ Since then we've learned a lot more about the relationship between asthma and obesity.

- ◊ **Obesity increases risk for asthma development and increases asthma severity.**
- ◊ **Obesity increases the prevalence of asthma** - People with obesity are 92% more likely than lean individuals to develop asthma, this is particularly true among women.^{2,3}
- ◊ **Obesity increases the incidence of asthma** - As Body Mass Index (BMI) increases so does the likelihood that someone will have asthma.⁵ One third of individuals with a BMI over 60 have asthma.⁴
- ◊ **Obesity is common in severe asthma** – Thirty-five percent (35%) of total adult population have obesity while 50% percent of adults with severe asthma have obesity, a much higher rate. Similarly, 20% of all children have obesity, while 30% of children with severe asthma have obesity. These data indicate a connection between severe asthma and obesity.⁵

Two Asthma Phenotypes are Currently Described in Relationship to Obesity.

Adapted from Dixon paper.⁶



Environmental Exposures Increase Risk for Asthma and Obesity.

Exposure to air pollution increases risk for the development of asthma and for the development of obesity. Children whose mothers smoked during pregnancy also have an increased risk for developing asthma and for developing obesity.^{7,8,9,10}



Obesity Reduces Effectiveness of Typical Asthma Medications.

Individuals with obesity and asthma do not respond as well to inhaled corticosteroids, the medication most commonly used to control asthma, compared to lean individuals with asthma. Individuals with obesity also do not respond as well to combination therapy of inhaled corticosteroids and long acting β -agonists, a bronchodilator also used to improve asthma control.^{11,12}



Mechanistic Theories

While no single mechanistic theory has entirely described how obesity influences asthma, a number of factors have been proposed with varying degrees of support, four of which are expanded upon below. It is likely a combination of factors play a role in the influence of obesity on asthma.

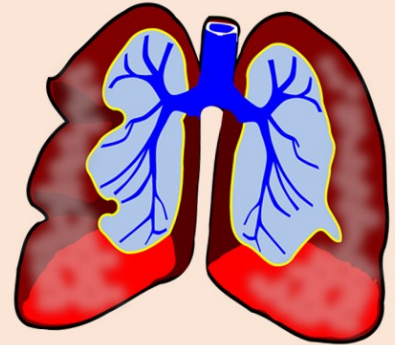
1. Altered Gut Microbiota

Obesity alters the gut bacteria and other microorganisms that make up the microbiome.¹³ Data from mice indicate the microbiome may play a role in the development of asthma.¹⁴

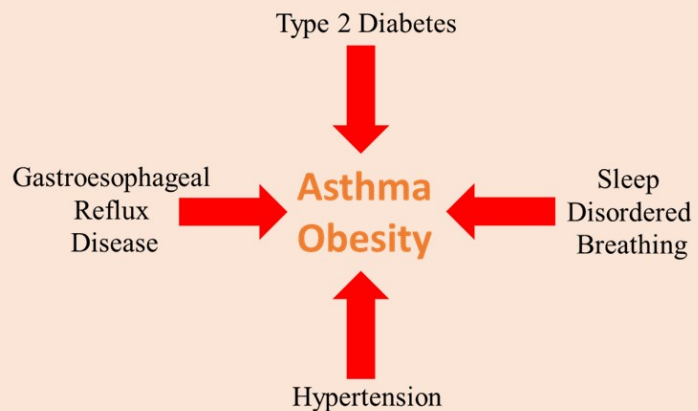


2. Effects of Obesity on Chest Wall

Excess fat tissue pushing on the chest wall leads to the narrowing of airways and makes breathing more difficult in people with obesity.¹⁵



3. Co-Morbidities associated with Obesity may Increase the Risk and/or Severity of Asthma¹⁶



4. Low Grade Systemic Inflammation

Obesity is associated with increased pro-inflammatory factors circulating in the blood and with alterations in energy-regulating hormones that also influence inflammatory activities. It is conceivable that as these substances circulate to the lungs, they act to promote asthma.¹⁷



A Case for Misdiagnosis?

Individuals with obesity can experience difficulty breathing not related to asthma because they carry excess weight around the chest and abdomen and spend more energy to move their body. Given that, it is possible that individuals with obesity are more frequently misdiagnosed with asthma than lean individuals, and this could account for some of the observed connection between asthma and obesity. However, one study comparing confirmation rates for asthma diagnosis in a group of randomly selected individuals who were lean or obese found that **individuals with obesity are *not* being misdiagnosed with asthma at a significantly higher rate than lean individuals.**¹⁸

Management of Illness Associated with Asthma and Obesity

It is important to assess whether or not a patient with asthma and obesity has any of the factors below and start treatment. Given that this patient population is less responsive to medication, any factors that could improve asthma control should be acted upon.



Obstructive Sleep Apnea (OSA)

OSA is associated with obesity and is also associated with worse asthma control. When treating someone with asthma and obesity, it is important to determine whether or not the patient also has OSA and, if so, to start treatment right away to reduce sleep apnea. This may improve asthma control.¹⁹



Increased Susceptibility to Infection

People with obesity have increased risk for developing viral respiratory infections which increase asthma exacerbations. Annual flu vaccinations should be encouraged for these patients. Of note, patients with obesity tend to respond less well to the vaccines; however, vaccination is an effective enough measure that it should be encouraged.²⁰



Depression

Depression and obesity are both associated with poor asthma control, and individuals with obesity are more likely to have depression.²¹ Studies with lean patients show that treating depression improves asthma control.²² Therefore, evaluation for and treatment of depression should be considered for patients with asthma and obesity.

Lifestyle Considerations: Diet

There is increasing recognition that treating patients with asthma using diet and exercise is an important approach for achieving asthma control and this treatment is particularly useful for individuals with obesity.

Studies show that poor dietary quality (independent of obesity) can increase inflammation, reduce lung function, exacerbate asthma, and reduce asthma control.²³⁻²⁶

Western Diet

Patients with a poorer diet have increased respiratory symptoms; for example, in one study, patients on a western diet reported more wheeze and cough than patients on a prudent diet, independent of body mass index (BMI).²³

Fat

Saturated fat was found to decrease response to rescue medication, such as albuterol. Saturated fat also increases the presence of neutrophils in the airway, an indicator of inflammation. This decreased response occurs after just one high fat meal.²⁴

◇ Examples of foods high in saturated fat:

- Beef, lamb, pork, poultry with skin
- Butter, cheese, whole or 2-percent milk
- Baked goods, fried food

◇ Examples of foods low in saturated fat:

- Poultry without skin, fish, nuts
- Low fat dairy products

Fruits and Vegetables

These foods have high amounts of fiber, non-digestible carbohydrates from plants, which may play a role in asthma. In animal models of allergic asthma, mice on a low fiber diet had increased inflammation compared to mice on a high fiber diet.¹⁴ In human studies, a diet high in soluble fiber (absorbs water) led to improved lung function compared to a diet low in soluble fiber.²⁵ Patients on a high fruit and veg diet had reduced asthma exacerbations compared to patients on a low fruit and veg diet.²⁶

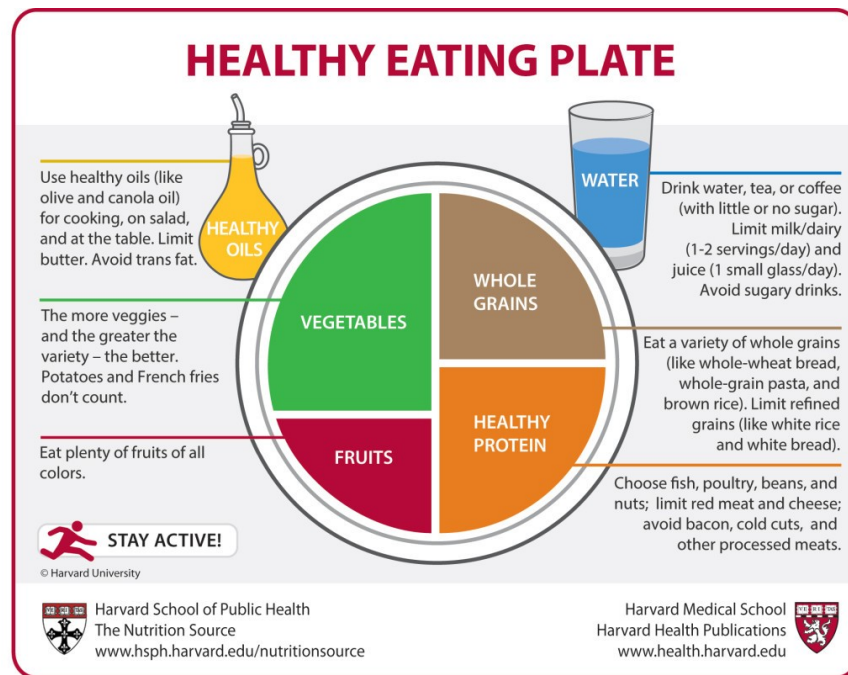
◇ Foods that are high in soluble fiber:

◇ Oats, Legumes, Fruits and Veggies (particularly oranges, apples and carrots).

◇ Fruits and veggies high in antioxidants such as β -carotenoids, vitamin A, and E, have potential to improve lung function and reduce asthma symptoms.²⁷ Below is a list of fruits and veggies with high levels of some of these antioxidants.

- ◇ Cantaloupe, Strawberries, Kiwifruit
- ◇ Tomatoes, Leafy Greens, Broccoli

Lifestyle Considerations: Diet



The Health Eating Plate, developed at Harvard T.H. Chan School of Public Health, emphasizes that:

Diet Quality is Just as Important as Diet Quantity.

For more information about the healthy eating plate and other nutrition information visit The Nutrition Source at:

www.hsph.harvard.edu/nutritionsource

Weight Loss

Improvements in asthma control were seen in patients who lost between 5-10% of their weight.²⁸ Given the difficulties in sustaining a substantial amount of weight loss over time, this is good news, because it means **patients don't have to lose all their excess weight to realize significant improvements in asthma control.** In a study of adolescents with obesity, when the participants were switched to a normal caloric diet from their typical diet, weight loss was observed as well as improvements in asthma control.²⁹



Asthma Control Improves with 5-10% Weight Loss.

Lifestyle Considerations: Exercise

Exercise can reduce asthma symptoms and improve quality of life in a generalized population.³⁰ Exercise likely contributes to better asthma control in people with obesity and asthma. When a dietary intervention alone was compared to dietary intervention plus exercise, patients who underwent dietary intervention plus exercise saw greater improvements in their asthma control than those who received the dietary intervention alone. One caveat of this study is that individuals who were in the exercise plus dietary intervention group lost more weight than the dietary intervention alone so it is difficult to discern whether weight loss or exercise was the factor that contributed to the increase in asthma control; however, the recognized benefits of exercise suggest exercise should be recommended.³¹



Exercise can Reduce Asthma Symptoms and Improve Quality of Life.

Hearing From Healthcare Providers

A recent study with adolescents highlights patients' desire to hear from their doctors about weight management practices for improving asthma control. In the study, teens responded favorably when their doctors initiated a weight loss conversation as part of the asthma management plan, and wanted parent participation in the discussion as well.³²

Another study found that physicians and medical students who had a normal BMI and met vigorous exercise guidelines were more likely to feel confident about counseling their patients about physical activity.³³ Healthcare providers should consider their own nutrition, physical activity, and lifestyle factors to set an example for their patients, feel more comfortable discussing these topics with their patients, and for their own health benefits.



Notes:

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