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Review Article

The Cortisol Connection: Weight Gain and Stress Hormones

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Abstract

Weight gain can be good or bad for health. Benefits include increased health for overweight people, disease or surgical recovery, and more. Health concerns, joint and musculoskeletal disorders, respiratory issues, metabolic abnormalities, cardiovascular health, psychological impact, reduced mobility, digestive troubles, hormonal changes, and cancer risk are negative impacts. Weight gain outcomes depend on heredity, weight distribution, and health. Maintaining a healthy weight needs a balanced diet, regular exercise, and stress management. A doctor or nutritionist can offer personalized weight management advice. Stress chemicals like cortisol trigger weight gain. ACTH stimulates adrenal glands to release cortisol, which increases hunger, fat storage, insulin resistance, and muscle loss. Understanding how stress hormones like cortisol affect weight gain is vital to reducing chronic stress's health risks. Stress reduction, a balanced diet, regular exercise, proper sleep, social support, and professional treatment can mitigate these outcomes. Ultimately, stress hormones like cortisol can cause weight gain, but a holistic strategy tackling physical and psychological stress can help people maintain a healthy weight.

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Introduction

Weight gain is a complex process influenced by genetic, physiological, lifestyle, and environmental factors. Understanding these factors can help humans make informed decisions about human diet, physical activity, and overall health [1]. Hormonal changes during menopause can lead to weight gain, particularly in the abdominal area. Genetic, physiological, lifestyle, and environmental factors influence the complex weight gain process. These factors can help humans make informed decisions about human diet, physical activity, and overall health [2,3]. Health concerns: Excessive weight gain, mainly when it develops into obesity, relates to various health concerns. These risks include coronary heart disease, type 2 diabetes, high blood pressure, and some types of cancer. Problems with the Joints and the Musculoskeletal System: Carrying extra weight places additional strain on the joints, contributing to problems such as osteoarthritis and joint discomfort. Problems with Breathing Obesity can be a contributing factor in breathing issues as well as sleep apnea, both of which can lead to a decrease in the quality of sleep and weariness. Changes in Metabolism Gaining weight, particularly when unhealthy dietary decisions accompany it, can result in metabolic disturbances such as insulin resistance and dyslipidemia, which raises the risk of metabolic syndrome and diabetes. Health of the Cardiovascular System Excess weight can burden the cardiovascular system, leading to an increased risk of cardiovascular diseases such as heart disease, stroke, and high blood pressure. Impact on Psychological Health an increase in weight can have a substantial effect on a person's mental health, leading to a decrease in self-esteem, concerns about body image, and the possibility of mental health conditions such as sadness and anxiety [3,4]. Heavier people are more likely to have problems with their mobility and physical fitness, which can affect their capacity to participate in day-to-day activities and exercise. Problems with Digestion Obesity is a risk factor for many digestive disorders, such as Gastroesophageal Reflux Disease (GERD), fatty liver disease, and gallstones. Gaining weight, particularly in the abdomen region, can throw off the body's hormone balance and put women at a greater risk of developing disorders such as Polycystic Ovarian Syndrome (PCOS). Cancer Risk Certain cancers, including breast, colon, and endometrial cancers, are more prevalent in people who are overweight or obese. This increases the likelihood that an individual may develop cancer [4-6].

Some common factors contributing to weight gain

Weight gain can be influenced by various factors, including diet, calorie intake, physical activity, metabolism, genetics,

emotional and psychological factors, sleep, medical conditions, environment, social and cultural factors, age, pregnancy, and menopause. Overeating, high-calorie foods, large portion sizes, sedentary lifestyles, insufficient exercise, and hormonal imbalances can contribute to weight gain [7]. Genetics, such as family history and predisposition to obesity, can also influence body weight and fat storage and burning. Emotional and psychological factors, such as stress, depression, and anxiety, can also lead to overeating and weight gain. Sleep deprivation and irregular sleep patterns can disrupt hormone regulation and appetite [8,9]. Medications, such as certain antidepressants and corticosteroids, can also cause weight gain. The food environment, including easy access to high-calorie, low-nutrient foods, and built environments lacking safe spaces for physical activity, can also influence dietary choices. Food marketing can also influence dietary choices [7-10]. Social and cultural factors, such as family and peer influence and cultural norms, can also impact weight. Age can slow down metabolism, making it easier to gain weight. Lifestyle changes, such as reduced physical activity, can contribute to weight gain. Pregnancy can be healthy, but excessive weight gain can be a concern. Menopause can also lead to hormonal changes, particularly in the abdominal area [8-10].

The cortisol hormone

In today's fast-paced world, stress has become an inevitable part of our lives. When stress becomes chronic, it can profoundly impact our physical and mental health. One of the lesser-known consequences of chronic stress is weight gain, often attributed to the cortisol hormone, which plays a vital role in the body's response to stress [9, 10]. This article will explore the relationship between cortisol and weight gain and discuss how to manage these effects. The adrenal glands produce cortisol, also known as the "stress hormone," which plays a crucial role in the body's response to stress. When humans encounter a stressful situation, their bodies release cortisol to prepare for a "fight or flight" response. This hormone increases energy levels by removing glucose from the bloodstream and altering various physiological processes, including metabolism and immune function [10].

Important aspects of cortisol:

A. Stress response: One of cortisol's primary functions is to help the body respond to stress. When humans encounter a stressful situation, their brain's hypothalamus and pituitary gland signal the adrenal glands to release cortisol. This is part of the body's "fight or flight" response, where cortisol increases energy levels and prepares the body to deal with a perceived threat [10,11].

B. Metabolism: Cortisol affects metabolism in several ways. It increases glucose (sugar) levels in the bloodstream, providing the body with a quick source of energy. It also mobilizes fat stores, making them available for energy use. However, chronic high cortisol levels can lead to insulin resistance and potentially contribute to weight gain [11,12].

C. Immune function: Cortisol has anti-inflammatory properties and regulates the body's immune response. In cases of acute stress, this can help reduce inflammation and minimize the risk of infection. However, chronic stress can suppress the immune system, making individuals more susceptible to illness [11].

D. Circadian rhythm: Cortisol levels typically follow a diurnal (daily) pattern, with the highest levels in the morning helping humans wake up and move. It gradually decreases throughout the day and reaches its lowest point at night, promoting restful sleep [12].

E. Blood pressure regulation: Cortisol influences blood pressure regulation by helping to maintain vascular tone and fluid balance. It can increase blood pressure, especially in the stress response [11,12].

F. Emotion and memory: Cortisol affects certain brain functions related to emotion and memory. It modulates emotional responses to stress and can influence memory consolidation, particularly during stressful events [11,12].

G. Anti-inflammatory effects: Cortisol's anti-inflammatory properties make it an essential tool in the body's response to injury and illness. Synthetic forms of cortisol, such as corticosteroids, are commonly used as medications to reduce inflammation and suppress the immune system [11,12].

H. Negative effects of chronic stress: While cortisol is vital for short-term stress responses, prolonged or chronic stress can lead to consistently elevated cortisol levels. This regular exposure to high cortisol levels has been associated with a range of health issues, including weight gain, high blood pressure, insulin resistance, weakened immune function, and mood disorders [11-13].

Several factors can increase cortisol levels in humans, including [10-15]:

A. Stress: Chronic stress is the most common cause of elevated cortisol levels. Various factors, such as work, relationships, finances, and health problems, can cause stress.

B. Lack of sleep: When humans don't get enough sleep, their bodies release more cortisol to keep them awake.

C. Poor diet: Eating a diet high in processed foods, sugary drinks, and unhealthy fats can also increase cortisol levels.

D. Caffeine and alcohol can increase cortisol levels. Certain medications. Some medications, such as corticosteroids and beta-blockers, can also increase cortisol levels.

E. Medical conditions: Certain medical conditions, such as Cushing's syndrome and Addison's disease, can also cause elevated cortisol levels.

Cortisol and weight gain

While cortisol is essential for survival in acute stress situations, prolonged or chronic stress can lead to consistently elevated cortisol levels in the body. This chronic elevation can have a significant impact on human metabolism and contribute to weight gain in several ways:

A. Increased appetite: Cortisol can stimulate appetite, particularly for high-calorie comfort foods. When stressed, people often reach for sugary or fatty foods, leading to overeating and weight gain [9].

B. Fat storage: Cortisol influences where the body stores fat. It tends to promote fat storage in the abdominal area, which is associated with an increased risk of various health problems, including obesity [12].

C. Insulin resistance: Elevated cortisol levels can lead to insulin resistance, making it more challenging for the body to regulate blood sugar. This can increase fat storage and weight gain over time [14,16].

D. Muscle loss: Chronic cortisol exposure can lead to muscle breakdown. As muscle tissue is more metabolically active than fat, reducing muscle mass can slow metabolism and make gaining weight easier [16].

Managing cortisol-induced weight gain

Addressing the physical and psychological aspects of stress is crucial to managing weight gain due to elevated cortisol levels.

A. Stress reduction techniques: Engage in stress-reduction practices such as mindfulness meditation, yoga, deep breathing exercises, and progressive muscle relaxation. These techniques can help lower cortisol levels and alleviate the effects of chronic stress [14].

B. Balanced diet: Focus on a balanced diet with plenty of fruits, vegetables, lean proteins, and whole grains. Avoid excessive consumption of high-sugar and high-fat foods [14,17].

C. Regular exercise: Physical activity can help reduce stress and minimize the impact of cortisol on the human body. Aim for a mix of aerobic and strength-training exercises to maintain muscle mass and support a healthy metabolism. Exercise regularly. Exercise is a better way to reduce stress and improve human overall health. Aim for at least 30 minutes of moderate-intensity exercise most days of the week [14,17].

D. Sleep: Get enough sleep. Most adults need 7 hours - 8 hours of sleep per night. Ensure humans get adequate and quality sleep. Lack of sleep can further increase stress levels and hinder weight management efforts [14,17,18].

E. Social support: Connect with friends and family to build a support system to help humans cope with stress [14,17,18].

F. Eat a healthy diet: A healthy diet can help reduce inflammation and balance blood sugar levels. This can help reduce stress and cortisol levels [17,18].

Cortisol-reducing dietary supplements

Pharmaceutical market cortisol-reducing dietary supplements as products that can help regulate and lower cortisol levels. These supplements typically contain a mix of vitamins, minerals, herbs, and other compounds that are believed to influence the body's stress response and cortisol production. However, it's essential to approach these supplements cautiously, as their efficacy and safety may vary, and their claims should be taken with a grain of skepticism [19,20-23].

Here are some common ingredients found in cortisol-reducing dietary supplements and a brief overview of their purported effects [24-27]:

A. Ashwagandha: This herb is believed to have adaptogenic properties, which may help the body adapt to stress. Research suggests that ashwagandha may potentially lower cortisol levels.

B. Rhodiola rosea: It is believed that Rhodiola rosea, another adaptogenic herb, supports the body's stress response and lowers cortisol production.

C. Phosphatidylserine: This phospholipid is involved in cell membrane structure and is believed to have a role in cortisol regulation. Some studies suggest it may help reduce cortisol levels in certain situations [25].

D. L-theanine: Found in tea leaves, L-theanine is thought to promote relaxation and reduce stress and cortisol levels [26].

E. Magnesium: Adequate magnesium intake is essential for overall health and may help support the body's response to stress [26,27].

F. Vitamin C: An essential vitamin, vitamin C is sometimes included in cortisol-reducing supplements due to its antioxidant properties, which may help combat the effects of stress on the body [27].

G. B-Vitamins: B vitamins, such as B6 and B12, are involved in various metabolic processes and may affect stress management [27,28].

Chronic stress can lead to elevated cortisol levels, which can contribute to weight gain through several mechanisms. This table summarizes the key points (Table 1).

Table 1: Cortisol's Role in Weight Gain.

Mechanism	Description	References
Increased Appetite	Cortisol triggers the "fight-or-flight" response, stimulating cravings for sugary and fatty foods for quick energy.	[20]
Reduced Metabolism	Cortisol can slow down metabolism, causing the body to burn fewer calories at rest.	[21]
Muscle Breakdown	Cortisol can break down muscle tissue, further reducing the body's calorie-burning capacity.	[22]
Altered Fat Storage	Cortisol promotes the storage of belly fat, which is associated with increased health risks like heart disease and type 2 diabetes.	[23]

Conclusion

The cortisol hormone, the body's primary stress hormone, is linked to weight gain due to its ability to trigger metabolic changes that promote fat storage and hinder weight loss. These changes include increased appetite, reduced metabolism, muscle breakdown, and altered fat storage. Future research could explore individual variability, mind-body interventions, nutritional strategies, and the gut microbiome. To combat the negative effects of cortisol on weight management, individuals can focus on a holistic approach that addresses both physical and psychological aspects of stress. This includes stress management techniques, a healthy diet, regular exercise, and quality sleep. Researching the gut microbiome and its interaction with stress hormones could lead to novel interventions. A balanced diet rich in fruits, vegetables, whole grains, and lean protein can provide sustained energy and reduce dependence on stress-induced food choices. Regular exercise can help lower cortisol levels and promote overall well-being. Seeking professional guidance can also be beneficial in managing stress-induced weight gain. By understanding the cortisol connection and adopting a comprehensive approach, individuals can break the cycle of stress-related weight gain and promote long-term health.

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