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Obesity and Metabolic Health: Multifactorial Influences from DPP-IV and Circadian Disruption

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Description

A complicated, long-term metabolic disorder, obesity has significantly increased in prevalence around the world in recent decades. Numerous variables, including as biological processes, environmental effects and lifestyle changes, contribute to its occurrence. A comprehensive understanding of obesity's origins, which include a variety of pathways affecting metabolic health, is necessary to address the problem. This article examines the ways in which Dipeptidyl Peptidase IV (DPP-IV), exposure to heavy metals in the environment, greater availability of high-speed internet and disturbance of circadian rhythms all contribute to obesity. One enzyme that is known to be essential in controlling inflammatory pathways and metabolic activities is Dipeptidyl Peptidase IV (DPP-IV). Because of its increased expression in the visceral fat of obese people, it has recently attracted attention. DPP-IV is a key factor in disorders linked to obesity because it functions as an adipoke, a signaling molecule released by fat cells and is strongly implicated in the control of immunological responses and glucose metabolism. The main enzymatic function of DPP-IV is to cleave incretin hormones, such as Glucose-Dependent Insulinotropic Polypeptide (GIP) and Glucagon-Like Peptide-1 (GLP-1). Better glucose regulation is facilitated by these hormones, which increase insulin secretion in response to meals. Increased insulin sensitivity, better glycemic management and perhaps weight loss are all benefits of inhibiting DPP-IV, which prolongs the function of these hormones. As a result, DPP-IV inhibitors are now useful in the treatment of diseases like obesity and type 2 diabetes.

Effects on obesity

The growing obesity epidemic is caused by a combination of biological regulators such as DPP-IV and environmental variables, including exposure to heavy metals. Water, the air and food supplies are all contaminated with heavy metals like lead, mercury, cadmium and arsenic. According to new research, long-term exposure to certain metals may alter metabolic processes and raise the risk of obesity, especially in kids and teenagers. The relationship between metal exposure and childhood obesity in children aged 6 to 19 was investigated in a study that used data from the National Health and Nutrition Examination Survey (NHANES) conducted between 2007 and 2018. 21.04% of the 3,650 children in the study were obese and there were significant disparities in metal exposure between those who were fat and those who were not. Obesity was found to be positively correlated with exposure to barium and thallium, but negatively correlated with exposure to lead, cobalt and cadmium. By altering hormone control, raising oxidative stress and encouraging inflammation, heavy metals can impede metabolic functions. Cadmium exposure, for instance, has been connected to increased adiposity and changed fat metabolism. Lead and mercury are two metals that can disrupt insulin signaling, resulting in insulin resistance, which is a risk factor for type 2 diabetes and obesity. It is interesting to note that the study also found that the effects of heavy metal exposure on obesity varied by gender. For example, exposure to mercury was linked to a decreased incidence of obesity in women, demonstrating the intricate relationship between environmental pollutants and metabolic health. Reducing the prevalence of childhood obesity may require addressing heavy metal exposure through stronger environmental laws and public health initiatives, especially in regions where environmental pollution exposure is higher.

Circadian disruption

In addition to environmental and lifestyle factors, metabolic health and obesity are significantly impacted by disturbances of natural biological rhythms, especially circadian rhythms. Circadian rhythms, which have a roughly 24-h cycle, control a number of physiological functions, such as metabolism, hormone release and sleep. A disturbance of these cycles, brought on by things like nighttime exposure to artificial light, can result in weight gain, elevated inflammation and metabolic abnormalities. An investigation on the impact of continuous exposure to light on obesity was conducted using animal models. The metabolic health of mice exposed to continuous light was adversely affected by changes in circadian rhythms and elevated inflammatory markers. Obesity may worsen the consequences of circadian disturbance on metabolic outcomes, as these alterations were more noticeable in obese mice. Humans who experience circadian misalignment whether from shift work, erratic sleep schedules, or nighttime screen time are more likely to develop obesity, diabetes and cardiovascular disorders. The release of metabolic hormones like insulin and leptin, which are

essential for controlling hunger, fat storage and glucose metabolism, is impacted by circadian disturbance. Weight gain can be further encouraged by insulin resistance, decreased energy expenditure and an increased hunger for high-calorie foods caused by a misaligned circadian clock. A complex illness, obesity is impacted by biological, environmental and behavioral variables. A vital enzyme in the control of glucose, DPP-IV, has become a focus for the treatment of metabolic diseases linked to obesity. Environmental elements like exposure to heavy metals are also important, particularly for susceptible groups like kids and teenagers. The obesity epidemic is also exacerbated by lifestyle variables, such as increasing internet access that leads to sedentary behavior and artificial light exposure that disrupts circadian rhythms. A comprehensive strategy that takes into account the various factors on metabolic health is needed to address obesity. In order to prevent the global surge in obesity and improve general metabolic health, interventions that target these factors from controlling environmental contaminants to encouraging healthy digital habits and maintaining circadian alignment are essential.