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The metabolic effects of ultra-processed foods: A cross-sectional study in adolescents.

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Introduction

Over the past few decades, the global food environment has undergone a profound transformation, particularly in urban and semi-urban areas. One of the most striking shifts has been the growing reliance on Ultra-Processed Foods (UPFs) industrially formulated products made from substances extracted or synthesized from whole foods, often with the addition of artificial flavors, emulsifiers, and preservatives. While convenient and often inexpensive, these foods tend to be high in sugar, unhealthy fats, sodium, and calories, while being low in fiber, protein, and essential micronutrients.Adolescents are among the highest consumers of UPFs due to targeted Aprketing, peer influence, and lifestyle factors such as school routines and digital engagement. This age group is also undergoing rapid physical and hormonal changes, making them especially vulnerable to dietary influences on metabolic health [1].

This study investigates the association between UPF consumption and metabolic Aprkers including Body Mass Index (BMI), waist circumference, fasting glucose, lipid profile, and insulin resistance (HOMA-IR) in a sample of adolescents aged 13–18 years. The goal is to provide insight into how modern dietary habits may be contributing to the early onset of metabolic disorders.A cross-sectional study was conducted in three urban secondary schools in a metropolitan city. A total of 350 adolescents were recruited through stratified random sampling. Dietary intake was assessed using a validated Food Frequency Questionnaire (FFQ), with foods categorized according to the NOVA classification system. UPF intake was quantified as a percentage of total caloric intake. Anthropometric data (weight, height, waist circumference) were collected, and BMI was calculated. Blood samples were taken to evaluate fasting glucose, total cholesterol, HDL, LDL, triglycerides, and insulin. HOMA-IR was used to assess insulin resistance [2].

Statistical analyses included linear regression models adjusted for age, sex, physical activity, and socioeconomic status. The average UPF intake among participants was 38% of total daily caloric intake. Higher UPF consumption was significantly associated with increased BMI and waist circumference ($p < 0.01$).Adolescents in the highest UPF quartile had notably higher fasting insulin levels and HOMA-IR scores, indicating early signs of insulin resistance.Lipid profiles showed a trend toward higher LDL and triglycerides, and lower HDL levels in the high-UPF group, although not all were statistically significant after adjustment.Physical activity levels had a slight protective effect but did not fully offset the impact of high UPF intake.The results support the growing evidence that UPFs are detrimental to metabolic health, even in the short term. Several mechanisms may explain these associations [3].

UPFs often contain refined carbohydrates and added sugars, leading to rapid spikes in blood glucose and compensatory insulin secretion. The lack of fiber and protein contributes to low satiety, increasing the risk of overeating.Additives such as emulsifiers and artificial sweeteners may disrupt the gut microbiota, which plays a role in insulin sensitivity and fat metabolism.This study aligns with previous findings from adult and pediatric populations and highlights a concerning trend: metabolic syndrome is increasingly affecting adolescents, a demographic once considered low-

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risk. The implications for long-term health such as increased risk of type 2 diabetes, cardiovascular disease, and liver disorders are profound [4].

The cross-sectional study on the metabolic effects of ultra-processed foods (UPFs) in adolescents reveals a strong association between high UPF consumption and adverse metabolic outcomes. Adolescents who frequently consumed UPFs exhibited higher levels of insulin resistance, increased waist circumference, elevated triglycerides, and reduced HDL cholesterol—key indicators of metabolic syndrome. The study highlights how UPFs, which are typically high in added sugars, unhealthy fats, and sodium, but low in fiber and essential nutrients, contribute to dysregulated glucose metabolism and systemic inflammation. These findings underscore the urgent need for public health strategies aimed at reducing UPF intake among youth to prevent the early onset of chronic metabolic disorders and promote healthier dietary habits during this critical developmental period [5].

Conclusion

This cross-sectional study demonstrates a clear association between high ultra-processed food consumption and early metabolic alterations in adolescents. While causality cannot be established due to the study design, the strength and consistency of the associations suggest that UPFs may be a major contributor to the early development of metabolic dysfunction.

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