

UNIVERSITI TEKNOLOGI MARA

**GENETIC AND PHENOTYPIC BIOMARKERS IN DIETARY
INTERVENTION FOR ADULTS WEIGHT MANAGEMENT: A
SYSTEMATIC REVIEW**

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ABSTRACT

Background: This systematic review investigates genetic and phenotypic biomarkers influencing individual responses to dietary interventions for weight management. Key research questions include identifying genetic biomarkers associated with responses, investigating variations in phenotypic biomarkers, and assessing the correlation between these biomarkers and intervention effectiveness, providing insights into personalized dietary interventions. **Aim:** To review and analyse existing literature on genetic and phenotypic biomarkers in personalized weight management for adults. **Method:** Three databases (PubMed, Scopus and Web of Science) were search with keywords on genetic biomarkers, phenotypic biomarkers, dietary intervention, and weight loss (PROSPERO: CRD42024499460). Articles in languages other than English, trials investigating special groups (e.g., pregnant women, people with severe diseases) were excluded. In total, 4,027 articles were identified, and, after removal of duplicates and further screenings, 16 studies were included. **Result:** Key genetic biomarkers, including ADCY3, ADIPOQ, APOA5, FTO, MTNR1B, NPY, and PCSK7, have been identified as regulators of weight loss and metabolic changes. Phenotypic variability, such as hormone levels and plasma amino acids, also impacts diet efficacy. **Conclusion:** The results indicated that some genetic and phenotypic markers have a substantial impact on how individuals respond to different diets. Significant interactions between genetic and phenotypic markers can optimize tailored dietary regimens, enhancing weight management outcomes.

Keywords: Personalized Nutrition, Genetic Biomarkers, Phenotypic Biomarkers, Dietary Interventions, Weight Management, Metabolic Health

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CHAPTER 1: INTRODUCTION

1.1 Research Background

Over the past three decades, the prevalence of obesity has increased in several nations globally by double or triple, most likely as a result of sedentary lifestyles, urbanisation, and rising consumption of processed foods high in calories (Boutari & Mantzoros, 2022). According to the World Health Organization (WHO), global obesity rates have nearly tripled since 1975, with over 650 million adults classified as obese in 2021. Additionally, a study by the CDC reported that the obesity rate among U.S. adults reached 42.4% in 2020, an increase from 30.5% in 2000. Moreover, in National Health Screening Initiative 2023, most Malaysians who were checked, specifically 53.5%, were found to be overweight or obese. This includes 31.3% who were overweight and 22.2% who were obese. These statistics highlight the urgent need to address this growing health crisis.

Obesity is known as a chronic multisystem disease linked to higher morbidity and mortality rates. Numerous chronic disorders, such as diabetes, cardiovascular disease (CVD), hypercholesterolemia, asthma, and cancer, are linked to obesity and abdominal obesity (Jin et al., 2023). As traditional approaches to weight management often yield limited success, there is a growing interest in personalized dietary interventions tailored to individual genetic and phenotypic profiles (Woldemariam et al., 2023). Understanding the interplay between genetic factors, phenotypic characteristics, and dietary responses holds promise for optimizing weight management strategies and improving overall health outcomes (Gkouskou et al., 2024).