

UNIVERSITI TEKNOLOGI MARA

**PRECISION NUTRITION APPROACHES FOR PERSONALIZED
OBESITY MANAGEMENT FOR DIET AND EXERCISE: A
SYSTEMATIC REVIEW**

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ABSTRACT

Background: Obesity is a significant public health issue driven by genetic and lifestyle factors. Despite numerous public health initiatives, obesity rates continue to increase, underscoring the need for personalized and effective interventions. Precision nutrition, which tailors dietary and exercise advice based on genetic and metabolic characteristics, is a promising approach. **Objective:** The aim of this study is to 1) investigate the association between specific dietary patterns, genetic factors, and changes in body composition with weight changes; 2) evaluate the effectiveness of structured exercise programs in preventing obesity and their genetic impact on participants' fitness and exercise response; and 3) determine the interaction between dietary modifications, exercise interventions, and genetic on metabolism in obese participants. **Methods:** Registered in PROSPERO (ID CRD42024517550), a comprehensive search was conducted using PubMed, Scopus, Google Scholar, and Web of Science, focusing on studies from 2018 to 2024. Inclusion criteria centered on adults with overweight and obesity (BMI > 24.9 kg/m²) examining diet and exercise interventions related to genetic factors. **Result:** Out of 6572 initially identified articles, 14 were selected after removing duplicates and screening. Conducted between 2018 and 2021 across multiple countries, these studies involved 5327 participants with BMI > 24.9 kg/m² and intervention periods from 4 weeks to 2 years. Interventions included various diets (low-calorie high-protein, reduced-carbohydrate, decreased-fat, meal replacements) and exercise routines (aerobic, HIIT), supervised via consultations, food logs, and surveys. Genetic markers like MC4R, ACSL5, ADCY3, PTPN1, PLIN1, and MTNR1B influenced weight loss and body composition, with personalized dietary plans yielding better results. **Conclusion:** Key findings indicate that personalized dietary plans led to better weight loss outcomes, and combining diet and exercise interventions improved effectiveness. Future research should continue to explore individualized methods to enhance obesity treatment.

Keywords: obesity, genetics, precision nutrition, personalized exercise, weight management, systematic review

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The prevalence of obesity has risen significantly, becoming a chronic illness influenced by genetic and lifestyle factors. Despite numerous public health initiatives, obesity rates continue to increase, indicating that current strategies are insufficient. This research focuses on the potential of personalized nutrition, which integrates diet, exercise, and behavioral therapy tailored to individual genetic and metabolic profiles, to address the multifaceted nature of obesity. Understanding gene-diet interactions can improve weight loss outcomes and create personalized interventions that cater to individual genetic predispositions (Locke et al., 2015; Yengo et al., 2018).

1.2 Research Background

Obesity is a complex disease influenced by a combination of physiological, metabolic, behavioral, social, and genetic factors. According to the World Health Organization (WHO), the prevalence of obesity has nearly tripled over the past 47 years, making it a critical public health issue (WHO, 2021). This rise in obesity has been linked to an increase in body weight, contributing to severe health conditions such as cancer, type 2 diabetes, cardiovascular diseases, and hypertension. Obesity also significantly impacts the quality of life and life expectancy. Public health authorities advocate for a healthy diet and active lifestyle as primary strategies for weight management, but these measures alone have proven inadequate for many individuals (Tchang et al., 2021).

Recent advancements in genetic research have identified numerous genes associated with obesity and body fat distribution. The term first-ever genome-wide association study (GWAS) started to be used. Besides hundreds of such genes under the BMI classification of obesity and body fat which were marked with markers for GWAS