Chapter 1

Introduction

1.1 Background

Cardiovascular diseases (CVDs) continue to be the foremost cause of illness and death globally (Gaziano et al., 2020). The World Health Organization (WHO, 2025) reports that in 2022, CVDs were responsible for an estimated 19.8 million deaths, representing roughly 32% of all deaths worldwide. One of the major modifiable risk factors contributing to CVD is hyperlipidemia, a condition characterized by imbalances in blood lipid levels, particularly elevated triglycerides and low-density lipoprotein (LDL), which are influenced by both lifestyle and genetic factors (Abbasi et al., 2024; Taher et al., 2024). Lifestyle modifications, including weight loss, exercise, and diet, are increasingly prioritized to manage and prevent lipid abnormalities, especially for the population at risk of cardiovascular disease (Taher et al., 2024). The potential of dietary strategies that focus on bioactive compounds obtained from plants to enhance lipid profiles and promote metabolic health has drawn attention. Among them, the lipid-modulating properties of foods and drinks high in polyphenols, such as green tea, have been extensively studied (Radeva-Ilieva et al., 2025).

Green tea (*Camellia sinensis*) is a minimally oxidized and non-fermented tea, distinguished by its characteristic taste and aroma. It is among the most popular beverages in Asia, valued both for its health benefits and cultural importance. (Zhao et al., 2016; Ahmed & Stepp, 2025). Green tea contains various bioactive compounds, such as catechins, that are suggested to play a role in regulating lipid metabolism and supporting overall metabolic health (Zhou et al., 2022). These effects are thought to be mediated by green tea catechins, which may increase total plasma antioxidant capacity, inhibit LDL oxidation, and contribute to improvements in cholesterol metabolism (Dinh et al., 2019). Available evidence indicates that green tea may disrupt lipid emulsification, enhance thermogenesis, suppress adipocyte differentiation, and reduce food intake (Dinh et al., 2019; Patanè

et al., 2023). Furthermore, findings from randomized controlled research showed that drinking green tea for four weeks significantly lowered total blood cholesterol (Tadayon et al., 2018). Beyond lipid metabolism, studies have shown that green tea influences insulin sensitivity and glucose regulation. In addition, green tea consumption has been associated with a significant reduction in body weight and body mass index (BMI), effects that have been attributed to its catechin content (Ohishi et al., 2021).

Although numerous studies indicate that green tea consumption may improve lipid profiles in hyperlipidemic individuals, the magnitude and consistency of their effects across different lipid parameters remain inconclusive. Participant characteristics, dosage, and adherence measurement may contribute to these inconsistent findings (Xu et al., 2020; Gholami et al., 2024; Pormlikul et al., 2025). Additionally, strong animal evidence exists, yet human clinical data, especially in Taiwanese populations, remain limited (Lee et al., 2025). Therefore, additional research is required to fully comprehend how green affects lipid characteristics.

1.2 Objective

The primary objective of this study is to analyze the effect of green tea consumption on triglyceride and cholesterol levels in adults with hyperlipidemia. The secondary objective is to explore the effects of green tea consumption on selected metabolic and nutritional parameters, including macronutrient intake records and anthropometric and body composition indicators such as body mass index (BMI), visceral fat level, and body fat percentage.

1.3 Hypothesis

$H0_1$ (Null Hypothesis): Green tea supplementation does not produce a statistically significant change in triglyceride and total cholesterol (including high-density lipoprotein cholesterol (HDL-C) and LDL-C) levels compared to baseline or control conditions.

$H1_1$ (Alternative Hypothesis): Green tea supplementation significantly reduces total cholesterol (including LDL-C and HDL-C) and triglyceride levels compared to baseline or control conditions.

$H0_2$ (Null Hypothesis): Green tea supplementation does not significantly affect metabolic and nutritional parameters, including macronutrient intake, BMI, visceral fat level, and body fat percentage.

$H1_2$ (Alternative Hypothesis): Green tea supplementation significantly improves metabolic parameters, including and is associated with favorable changes in anthropometric and body composition indicators such as BMI, visceral fat level, and body fat percentage