Total Cholesterol Blood Level Based on Isoflavone and Vitamin E Intake in Hypercholesterolemia

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Total Cholesterol Blood Level Based on Isoflavone and Vitamin E Intake in Hypercholesterolemia

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Abstract

Hypercholesterolemia is a condition whereby the blood cholesterol level exceeds normal values. Cholesterol in food can increase blood cholesterol level; fat, cholesterol, and antioxidant intake are known to have major roles in the progress of coronary heart disease. This study seeks to determine the correlation of isoflavone and vitamin E intake from foodstuffs to total blood cholesterol level in hypercholesterolemia patients. The research uses descriptive analytic methods. Isoflavone and vitamin E intake is recorded for 24 respondents through food recall and food frequency questionnaires. Total blood cholesterol levels for these respondents are then obtained from the medical records of Roemani Muhammadiyah Hospital Semarang. This study uses the Rank-Spearman test. The results are that 66.7% of respondents are male, 37.5% are 45-50 years old, 70.8% have ≥ 80 mg intake of isoflavones, but all respondents have <15 mg intake of vitamin E. There is a significant correlation between isoflavone/vitamin E intake and total blood cholesterol level (p-value=0.000, p-value=0.008). Thus, isoflavones and vitamin E intake may affect total blood cholesterol levels.

Keywords: Hypercholesterolemia; Isoflavone; Total blood cholesterol

Introduction

Cholesterols are complex compounds utilized in the human body to cover various functions such as the production of sex hormones, adrenal cortex hormones, vitamin D, and pancreatic bile that aids fat absorption in the gut. As such, cholesterols are fats that play an important role in bodily functions [1] and cannot be dissolved in blood. Cholesterols are transported to various bodily tissues with the assistance of compounds formed out of fats and proteins, namely lipoproteins [2]. There are two main types of cholesterols produced in the human body: HDL (High Density Lipoprotein) and LDL (Low Density Lipoprotein) [3].

An excess of blood cholesterol is known as hypercholesterolemia [4]. Data from the American Heart Association (AHA) estimates that over 100 million US residents have a relatively high total cholesterol level over 200 mg/dl, while over 34 million adult US residents have total cholesterol levels of over 240 mg/dl, which is high enough to require therapeutic intervention [5]. A public health study in Indonesia in 2013 revealed that 35.9% of residents over 15 years old have higher-than-normal cholesterol levels. In 2009, the Public Health Service of the Central Java Province reported that the prevalence of hypercholesterolemia in their jurisdiction was 26.1% among men and 25.9% among women. Data from the Roemani Muhammadiyah Hospital in Semarang showed that hypercholesterolemia was the 10th most prevalent disease among their outpatients in 2015; their medical records for 2015 had 224 hypercholesterolemia patients with a prevalence of 1.02% [6-10]. In the absence of proper management, hypercholesterolemia can significantly increase the risk of stroke and coronary heart disease [7]. World Health Organization (WHO) data shows that 20% of strokes and over 50% of heart attacks stem from high cholesterol levels. The prevalence in Indonesia increases by 28 percent annually and affects people in the productive age bracket under 40 [11-13].

Hypercholesterolemia treatment to reduce the risk of cardiovascular diseases must involve pharmacological, non-pharmacological, and combined pharmacological/non-pharmacological approaches in order to achieve a more reasonable total cholesterol level below 200 mg/dl, an LDL cholesterol level under 100 mg/dl, and an HDL cholesterol level over 45 mg/dl of blood [12], (Indonesian Cardiovascular Specialists' Associaton, 2013). Non-pharmacological treatments to prevent dyslipidemia include weight control, low-cholesterol diets, regular exercise, and consumption of foodstuffs that contain antioxidants capable of reducing serum cholesterol levels [13]. Research on the best antioxidants against oxidative stress has shown that vitamin E has greater effect than vitamins A and C in reducing fat peroxidation [14]. One early prevention method that can reduce the risk of degenerative and cardiovascular diseases is increasing the intake of natural antioxidants that are relatively affordable, easily available, and non-toxic in addition to having a high anti-atherogenic potential, such as isoflavones and vitamin E. Isoflavones are antioxidants from the flavonoid group (1,2-diarylpropane) with a potential to reduce cholesterol levels. Isoflavones' cholesterol reduction mechanism takes place through the catabolism of fatty cells for energy generation, which increases LDL clearance from the bloodstream and reduces the blood's cholesterol content [15]. Isoflavones consist of genistein, daidzein, and glycitein – soy proteins capable of reducing the risk of cardiovascular diseases by binding blood lipids.

Vitamin E as a fat-soluble antioxidant can donate a hydrogen ion out of the hydroxyl group (OH) in its ring structure to the free radicals of fat peroxidation. The direct reaction between vitamin E and fat peroxidation free radicals forms a more stable and perfectly oxidized tocopheryl (quinine) that reduces the fat peroxidation free radical chain. This cuts off fat peroxidation so that lipid cells are not damaged and would be more easily recognized by the next receptors that would lead to their metabolization in the body's cells, especially in the liver and gut [16].

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