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Impact Of Timor Moringa Extract (*Moringa Olifera Timori*) On Reducing Lipid Profiles Of Hypertensive Patients In Kupang City

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ABSTRACT

Background. Hypercholesterolaemia in the blood causes atherosclerosis. Damage to the endothelium of blood vessels is one of the triggers for coronary heart disease, hypertension, and stroke. Moringa leaves contain β-sitosterol, flavonoids, and vitamin C. Anthocyanins have evidence of preventing blood dyslipidaemia and lowering total cholesterol levels in patients with yslipidemia. Dyslipidaemia in plasma has an impact on changes in vasospasm and vasodilation of blood vessels. The purpose of this study was to see the effectiveness of giving moringa leaf capsules as a complementary therapy in lowering total cholesterol levels in patients with dyslipidemia. The study employed an experimental randomised controlled trial with a single-blind technique of administering Timor Moringa extract. **Results.** The number of patients with moringa leaf capsule therapy and placebo therapy was 40 participants. Each group was given 1000 mg of moringa leaf capsules and placebo capsules divided into 2 doses, each 500 mg/c capsule for 30 days. Measurement of total cholesterol levels was carried out before therapy, which was measured on day 0, followed by after therapy, which was measured on day 0. The average total cholesterol level in the control group was 2.9 mg/dl with a P-value <0.05, indicating no significant decrease., while the average total cholesterol level in the treatment group was 40.9 mg/dl. This is a significant decrease with a P-value <0.05 so that moringa leaf capsules can reduce total cholesterol levels. The independent T-test between the control and treatment groups revealed a significant difference in the effectiveness of moringa leaf capsule therapy, with a P-value < 0.05, demonstrating the ability of moringa leaf capsules to reduce total cholesterol levels. **Conclusion:** That the administration of moringa extract has a significant impact on lowering lipid profile levels in hypertensive patiens. **Suggestion:** In hypertensive patients with complications of dyslipidaemia, the author recommends consuming moringa olifera Timori extract.

Keywords: Hypertension, Lipid Profile, Dyslipidaemia, Timori Moringa Extract

Introduction

Dyslipidaemia is a condition of abnormal lipid levels in plasma and covers a wide spectrum. The main abnormalities in the lipid fraction are increased levels of total cholesterol, LDL, and triglycerides and decreased levels of HDL ([1,2,3]) Dyslipidaemia is a major contributor to heart disease; 17.5 million, or 30%, of deaths worldwide are caused by heart disease. Currently, heart disease is the number one cause of death in developed countries. The WHO (World Health Organisation) predicts that heart disease is the number one cause of death in the world. Cholesterol is a complex, non-hydrolysed fat compound that circulates in the blood and is the main sterol in human body tissue. Total cholesterol in the blood can increase if you often consume foods high in animal fat, such as red meat, beef brain, offal, egg yolks, cheese, seafood, or fast food (Darmawan et al., 2018). The abnormality of the lipid profile of the Indonesian population is still very high. According to data from the National Basic Health Research (Riskesdas) referring to NCEP-ATP III, this occurs mainly in Indonesian residents aged ≥15 years. It is feared that this can cause cardiovascular disease, which according to WHO data in 2012 caused 17.5 million people to die worldwide (Ministry of Health of the Republic of Indonesia, 2018). [4,5,6,] states that high blood fat can cause coronary heart disease. Anwar (2004) also states that blood vessels in the brain can become blocked and cause stroke due to high blood fat. Both of these diseases can cause death from cardiovascular disease, which is quite high, with coronary heart disease of 7.4 million and stroke of 6.7 million. In Indonesia itself, cardiovascular disorders are the number one cause of death every year for non-communicable diseases (PTM) (Ministry of Health of the Republic of Indonesia, 2014). Total cholesterol is a composition of many substances including triglycerides, LDL cholesterol, and HDL cholesterol. Two-thirds of all cholesterol in the body is produced by the liver, and one-third of all cholesterol in the body is absorbed by the digestive system from the food consumed. Excess cholesterol in the blood vessels will cause cholesterol buildup known as atherosclerosis, a major risk factor for coronary heart disease and stroke [7,8,9] The way moringa leaves work is the same as statins; the way statins work is by inhibiting the rate-limiting

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enzyme HMG CoA reductase, which converts HMG CoA to mevalonic acid and increases LDL receptors, which cause binding of circulating LDL and reduce LDL concentrations in plasma [1,5,9,10]. The results of the study entitled Therapeutic Benefits of Methanolic Extract of Moringa Oliefera Leaf Extract in Dyslipidaemia [1,2,3,45,6,7,8,9,10] Illustrates the cholesterol levels Before being given moringa leaves, the average cholesterol levels were high, but after being given additional therapy in the form of moringa leaves, there was a change in cholesterol levels and there was a decrease in total cholesterol levels in patients with dyslipidaemia. Based on the study, the decrease in total cholesterol levels before (pre) administration of moringa leaf capsules had an average total cholesterol level of 230.06 mgdldl, and after (post) administration of moringa leaf capsules, they decreased with an average total cholesterol level of 199.55 mgdldl with a value (P-value 0.001). From the study, the use of moringa leaf capsules can reduce total cholesterol levels in patients with dyslipidemia. The novelty of this study is the administration of moringa leaves with capsule preparations to each patient with dyslipidaemia, and a total cholesterol examination will be carried out again after 31 days of consuming moringa leaf capsules (Moringa oleifera L.). From this study, it is hoped that complementary therapy can be developed to reduce total cholesterol levels in patients with dyslipidaemia effectively and safely. One of the indicators to assess whether someone has the potential to develop hypertension is the examination of lipid profile levels . Dyslipidaemia is a condition in which a person's blood lipid profile levels have abnormal values. According to the research results of Chrysthien Venty Marumata (2019), according to the results of this study, drinking 220 ml of moringa leaf juice per day for 3 days can significantly reduce total cholesterol levels, namely from 236.30 mg/ddl to 234.30 mg/ddl ($p = 0.721$). According to the research results [12,13,14,15]the results obtained in this study show that giving tea in the form of a Moringa water infusion significantly ($P < 0.05$) can reduce cholesterol, reduce LDL, and increase HDL. According to the research results of [16,17,18] it was found that the treatment group given distilled water did not experience a decrease in cholesterol ($p > 0.05$), while the Moringa leaf extract dose of 20.8 mg/kgBW experienced a decrease in cholesterol by 15.83 mg/dl ($p<0.05$), the Moringa leaf extract dose of 41.6 mg/kgBW experienced a decrease in cholesterol levels by 17.83 mg/dl ($p<0.05$), and the positive control group given simvastatin suspension experienced a decrease in cholesterol levels by 19.67 mg/dl ($p<0.05$).

Method: This experimental research method uses a randomised controlled trial (RCT), which is a controlled experimental comparative study with a single blind technique where only the researcher knows which participants are in the control group or the treatment group. RCT is considered the most reliable evidence in the medical field because it eliminates false and ordinary causality. Patients diagnosed with dyslipidaemia were then divided into two groups. The control group was given placebo therapy containing amylum orizae (rice starch), which is a complex and odourless carbohydrate. This drug pharmacologically does not contain active substances but is able to treat certain diseases. The treatment group was given moringa leaf capsule therapy, 500 mg/ccapsule taken 2x2 per day. This study was conducted for 30 days, with total cholesterol levels measured on day 0 and re-examined on day 31. Moringa leaf capsules are given once a week and monitored patients through a WhatsApp group (if you do not have WhatsApp, you can use a companion, namely the patient's family at home). This is done to determine patient compliance in taking medication, monitor unexpected side effects, and provide advice on dealing with these symptoms.

The tools used for the study were a set of total cholesterol examination tools (total cholesterol tubes) to be given to the laboratory, research consent forms (informed consent), respondent data forms (CFR), participant data forms, and SPSS type 25. Materials The materials used for the study were moringa leaf capsules branded "H" with a dose of 500 mg, which had been standardised by BPOM, placebo capsules containing amylum orizae (rice starch), and placebo capsules made at the Kimia Farma pharmacy in a relaxed manner, total cholesterol, and blood of patients with dyslipidemia. Materials. The independent variable is a moringa leaf capsule (Moringa oleifera L.). The dependent variable is a variable that is influenced, or that is, the result, due to the presence of an independent variable. The dependent variable is the difference in total cholesterol levels in patients with dyslipidaemia before and after consuming moringa leaf capsules.

The population in this study were all participants with a diagnosis of dyslipidaemia at the Flodio Husada Tulungagung clinic. The number of dyslipidaemia sufferers at the clinic was 70 participants. The population in this study were all participants with a diagnosis of dyslipidaemia at the Health Centre Kupang City. The number of dyslipidaemia sufferers at the clinic was 80 participants. Based on the calculation of the sample size, the number of subjects needed is a minimum of 40 participants. If it is estimated that there is a dropout in the study of 10% (0.1),, then the sample size is so the total sample size for each group is at least 19 participants. The inclusion criteria for respondents are Participants with a diagnosis of good cholesterol with or without comorbidities. Participants were declared healthy by the doctor because their height and weight were appropriate, and their vital signs showed that overall they were normal, starting from blood pressure, pulse, respiration, and body temperature. Participants at Health Centre City Kupang, clinic aged ≥ 18 years, no allergies to moringa leaf capsules. Willing to follow the course of the study and sign the Informed Consent form. Exclusion criteria: participants who use drugs and have interactions with moringa leaf capsules such as statins, hypersensitivity to moringa leaf capsules, pregnant and lactating women, and patients with complications of serious diseases such as stroke, heart failure, kidney failure, and myocardial infarction dropped out of the study. Ethical clearance was carried out at the Poltekkes KemenKes Kupang.

Research methods: Patients diagnosed with dyslipidaemia were then divided into two groups. The control group was given placebo therapy, where this drug pharmacologically does not contain active substances but is able to treat certain diseases. The treatment group was given moringa leaf capsule therapy of 500 mg/capsule taken 2x2 per day. This study was conducted for 31 days, with total cholesterol levels measured on day 0 and re-examined on day 31. Moringa leaf capsules

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were given once a week, and monitoring was carried out via the WhatsApp group. This was done to determine patient compliance in taking medication, monitor unexpected side effects, and provide advice on dealing with these symptoms. The sample of this study was taken from a population that met the inclusion criteria, including cholesterol sufferers, over 18 years of age, no allergies, and agreed to participate in the study. Data collection was carried out on patients with consent given by signing the informed consent form, so that for patients who received the consent form, the patient could follow the research process from start to finish. The provision of therapy in the form of moringa leaf capsules is done once a week. This is done to determine patient compliance in taking medication and to record patient complaints related to side effects that appear after taking moringa leaf capsules. The sampling stage in this study was assisted by nurses at the nursing clinic. Data analysis used in this study was univariate and bivariate analysis. Data analysis and processing used the Statistical Product and Service Solution (SPSS) type 25 program. Univariate analysis was carried out on each variable from the research results [19,20,21]. Univariate analysis is used to describe sociodemographic characteristics consisting of age data , gender, medical history, and treatment history. Bivariate analysis was carried out by correlating the independent variables with the dependent variables used in the study [22,23] This study used bivariate analysis to see the total cholesterol levels before and after consuming moringa leaf capsules in dyslipidaemia patients at the Flodio clinic. Bivariate data processing analysis was carried out using the paired T-test and independent T-test, which are hypothesis testing methods where the data used are paired data (Nuryadi et al., 2017). Before the paired t-test was carried out, data testing was first carried out using the normality test and homogeneity test, which were requirements for data analysis before the paired t-test and independent test were carried out. The homogeneity test is a statistical test procedure intended to show that two or more groups of sample data come from populations that have the same variance . The paired t-test, or paired t-test, is a hypothesis testing method where the data used is not free (paired). H1 is accepted if the significant value is ≤0.05. H0 is rejected if the significant value is >0.05.

Results and discussion:

Table 1. Respondent characteristics:

Characteristics		Control group		Treatment group		Total
		N = 40	%	N= 40	%	N=80
Age	35-45	15	37.5	25	62.5	40
	46-55	23	57.5	7	17.5	30
	56-65	1	2.5	8	2	9
	66-75	1	2.5	0	0	1
Gender	Man	15	37.5	20	50	35
	Woman	25	62.5	20	50	45
Education	Elementary school	0	0	10	25	10
Education	Junior High School	5	12.5	12	30	17
	Senior High School	20	50	13	32.5	33
	college	15	37.5	5	12.5	20
Work	House wife	10	25	9	22.5	19
	Farmer	10	25	11	27.5	21
	Government employees	10	25	9	22.5	19
	Private	5	12.5	4	10	9
	Retired	5	12.5	7	17.5	13
Duration of hypercholesterolemia	>2 years	27	67.5	25	62.5	52
	< 2 years	13	32.5	15	37.5	28
History of chronic disease	There is	3	7.5	5	12.5	8
	There isn't any	37	92.5	35	87.5	72
Anti-cholesterol consumption	Yes	3	7.5	10	25	13
	No	37	92.5	30	75	67

Based on table 1 above, the age range of 46-55 years in the control group (57.5%) and in the treatment group aged 35-45 years (62.5%), the gender of the control group was more female (962.5%). and the treatment group, the gender of men and women was the same (50%). The length of time respondents experienced hypercholesterolaemia, both control and

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treatment, was > 2 years (67.5%, 62.5).). Both groups did not have a chronic history and did not consume antihypercholesterolemic drugs.

Table 2. Average value of total cholesterol level reduction before and after therapy in the treatment and control Groups in Dyslipidaemia patients

Group	Measurement	Mean (mg/dl) & Std. Deviation	Average Decrease	**P-value**
Control	before	234.2 ± 20.56		
	after	231.5 ± 21.40	2.7 mg/dl	0.331
intervention	Before	228.7 ± 20.73		
	after	190.8 ± 25.38	37.9 mg/d	0,000

*p < 0.05

Shows a significant difference in results between the control and treatment groups. The control group before consuming the placebo had an average total cholesterol level of 234.2 mg/dl, and after consuming 231.5 mg/dl, the average decrease was 2.7 mg/dl. The results of the statistical test of the control group obtained a P-value (0.331) > 0.05, which means that there was no significant decrease in total cholesterol levels before and after consumption. Clinically, the effectiveness of the decrease in the control group was very small because, when viewed from the sociodemographic data, the patient's long history of dyslipidaemia had been ill for more than 2 years, which means that the longer they suffer from dyslipidaemia, the higher the levels of atherosclerotic plaque fat and the function of their organs decreases, as well as a decrease in LDL receptor activity, so that fatty patches in the body increase and cause higher total cholesterol levels [22,23,24]. Placebo is used as a comparison to test the effectiveness of a drug in clinical trials; although pharmacologically it does not contain drugs, placebo capsules can cause a pseudoeffect that makes users feel better ([25,26,27]). Flavonoid compounds in Moringa extract can also reduce total cholesterol levels by inhibiting HMG-CoA reductase, leading to a decrease in cholesterol synthesis . Studies have shown that Moringa leaf extract intervention for at least 14 days to 30 days effectively reduces total cholesterol levels in hyperlipidemic patients [(Waode & Ari, 2022) The treatment group before consuming moringa leaf capsules had an average total cholesterol level of 228.7 mg/dl, and after consuming 190.88 mg/dl, the average decrease was 37.9 mg/dl. The results of the statistical test of the treatment group obtained a P-value (0.000) of decreased LDL receptor activity, so that fatty spots in the body increased and caused higher total cholesterol levels [26,27,28]. The second factor is age because as age increases, organ function decreases, and the body's ability to metabolise fat will also decrease due to changes in the secretion of the hormone adiponectin, a hormone that has important biological activity on glucose and fat metabolism [5,6,19,20,23,26]. Moringa leaves have an effect on lowering total cholesterol levels in the blood where there is a significant difference between cholesterol levels before and after treatment. This is in accordance with the theory that states that Moringa leaves have antioxidant content, including vitamin C, polyphenols, flavonoids, and carotene.[17,18,19,20,21], Where vitamin C is a natural antioxidant that has the highest antioxidant activity. Antioxidants function as inhibitors to inhibit oxidation by reacting with reactive free radicals to form relatively stable non-reactive free radicals. The content of beta-41 carotene in Moringa leaf extract also protects lipid membranes from peroxidation and at the same time stops the chain reaction of free radicals [23,26,27,29,30.] According to research from Mbikay (2012) entitled Therapeutic potential of Moringa oleifera leaves in chronic hyperglycemia and dyslipidaemia, flavonoids are biologically known for their antioxidant properties. Flavonoid quercetin is found at concentrations as high as 100 mg/100 g of dried moringa leaves, with the main content being quercetin-3-O-ÿ-d-glucoside, also known as isoquercitrin or isotrifoline. Quercetin is a potent antioxidant with various therapeutic properties; namely, it can reduce hyperlipidaemia and atherosclerosis in HCD or HFD rabbits. It has shown anti-dyslipidemic, hypertensive, and anti-diabetic effects in the metabolic syndrome model of obese Zucker rats. Chlorogenic acid can affect glucose metabolism beneficially. It has been shown to inhibit glucose-6-phosphate, which means a protein that helps move other molecules, usually across the cell membrane (translocase), in the liver of rats, which can reduce liver gluconeogenesis and glycogenolysis. According to research from [27,29,30] entitled Effectiveness of Moringa Leaf Extract (Moringa Oleifera) on Reducing Total Cholesterol Levels in White Rats (Rattus Novergicus), moringa leaves are known to contain 0.09% β-sitosterol. Sterols in plants are known to inhibit the absorption of cholesterol in the intestine. β-sitosterol is one of the sterols in plants that reduces serum cholesterol levels by reducing serum plasma LDL concentrations, inhibiting endogenous cholesterol reabsorption, and increasing cholesterol excretion in faeces in the form of neutral steroids. So it can be concluded that β-sitosterol is an active component in moringa leaves in lowering cholesterol.

Table 3. The effect of administering Moringa olifera timori extract on reducing cholesterol levels

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Group	Results	Average Decrease	P-value
Control	231.5 ± 21.40667 mg/dl	2.7 mg/dl	
			0,000
Treatment	190.8 ± 25.3813 mg/dl	37.9 mg/dl	

*p < 0.05

Based on Table 2 above, the control group was 231.5 mg/dl with an average decrease of 2.7 mg/dl, while the treatment group was 190.8 mg/dl with an average decrease of 37.9 mg/dl. This shows the results of statistical tests that there is a significant difference in total cholesterol levels between the control group and the treatment group with a P-value <0.05 after being given moringa leaf capsule therapy and placebo for 30 days, which means that there is an effect of consumption on reducing total cholesterol levels in dyslipidaemia patients. Moringa leaves contain beta-sitosterol, which lowers cholesterol levels by reducing LDL concentrations in plasma and inhibiting cholesterol reabsorption from endogenous sources. The flavonoid and polyphenol content can significantly increase SOD and catalase and reduce lipid peroxidase levels so that it can lower cholesterol levels.[28,29,30] Reduces total cholesterol levels in male Wistar rats Induced by streptozotocin shows the potential for reducing cholesterol levels along with increasing doses of moringa leaf extract. At doses of 250 mg/kgBW, 500 mg/kgBW, and 1000 mg/kgBW, the decrease that occurs can reach the normal range of total cholesterol levels (40-130 mg/dL). The decrease in total cholesterol levels in mice is caused by the antioxidant content, namely flavonoids in the form of quercetin and vitamin C. The flavonoid content in the form of quercetin in moringa leaf extract is 245.771 mg/L through the soxhletation method. The pathomechanism of both substances in reducing cholesterol levels is through two pathways, namely exogenous and endogenous pathways. Flavonoids and vitamin C in the exogenous pathway inhibit the catabolism of triglycerides and β-hydroxy βmethylglutaryl-CoA (HMG-CoA) by increasing the performance of the CYP7A1 enzyme so that low-density lipoprotein (LDL) is broken down into bile acids, while in the endogenous pathway flavonoids and vitamin C inhibit the regulation of phosphodiesterase (PDE) in the liver. Inhibited PDE increases cyclic adenosine monophosphate (cAMP) hydrolysis, which causes activation of protein kinase A (PKA) and CCAAT-enhancer-binding proteins α (C/EBPα). PKA stimulates TGH, which is involved in lihydrolysis, and C/EBPα is a transcription factor that regulates a series of genes involved in lipid metabolism ([1,3,6,9,21,22, 27, 31,32])

CONCLUSION In the study of the effectiveness of complementary therapy of moringa leaf capsules on total cholesterol levels in patients with dyslipidaemia, it can be concluded as follows: Total cholesterol levels before and after therapy in the control group decreased with an average decrease of 2.7 mg/ddl with a P-value > 0.05 mg/dl, and in the treatment group decreased with an average of 37.9 mg/dl with a P-value <0.05 mg/dl. This shows that moringa leaf capsules can provide a total cholesterol-lowering effect in patients with dyslipidemia. The independent t-test showed a difference in total cholesterol levels between the control and treatment groups after therapy with a P-value <0.05 . This proves that moringa leaf capsules can lower total cholesterol levels because there was a significant difference between the control and treatment groups after the moringa leaf capsule study for 30 day.

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