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DOI: [10.31965/infokes.Vol21Iss4.1407](https://doi.org/10.31965/infokes.Vol21Iss4.1407)Journal homepage: <http://jurnal.poltekkeskupang.ac.id/index.php/infokes>**RESEARCH****Open Access****Nutrition Counseling, Lipid Profile Improvement and Weight Loss in Obese Patients with Dyslipidemia****Salman^{1a}, Novian Swasono Hadi^{1b}, Lian A. Ntau^{1c}, Nancy Oliy^{2d}, Siti Choirul Dwi Astuti^{2e*}**¹ Department of Nutrition, Poltekkes Kemenkes Gorontalo, Gorontalo City, Gorontalo Province, Indonesia² Department of Midwifery, Poltekkes Kemenkes Gorontalo, Gorontalo City, Gorontalo Province, Indonesia^a Email address: slmnlukman@gmail.com^b Email address: nieno.poenya@gmail.com^c Email address: lianntau@gmail.com^d Email address: oliinancy7@gmail.com^e Email address: sitichoirul13@yahoo.co.id

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Abstract

Obesity with dyslipidemia is a serious problem because it risks various degenerative and metabolic diseases. The prevalence of obesity in Indonesia continues to increase every year, currently in the adult population reaching 21.8%. To prevent the onset of degenerative diseases and metabolic disorders, it is important to control obesity with dyslipidemia through weight loss and lipid profile improvement. This study aims to determine the effect of nutritional counseling in losing weight and improving lipid profiles in obese patients with dyslipidemia. This is a pseudo-experimental study with One group Pre and Post Test Design. The initial stage was the identification of obesity and lipid profile. In 100 respondents identified as obese, total cholesterol, LDL and triglycerides were examined. 40 obese respondents with dyslipidemia were determined as samples. The second stage was nutrition counseling intervention. The third stage of evaluation is the re-measurement of body weight and lipid profile. The research result is only 30 respondents participated in the evaluation. Average initial body weight was 75.11 kg and final body weight was 73.14 kg. Average weight loss was 1.97 kg. Average initial cholesterol 233.20 mg/dL and final cholesterol 224.70 mg/dL. Average cholesterol reduction of 8.5 mg/dL. Average initial LDL 152.37 mg/dL and final LDL 139.47 mg/dL. Average decrease in LDL 12.9 mg/dL. Average initial triglycerides 161.23 mg/dL and final triglycerides 143.97 mg/dL. The average decrease in triglycerides is 17.26 mg/dL. The statistical test results showed a p-value = 0.000. There is an effect of nutritional counseling on weight loss and improvement of lipid profiles of obese patients with dyslipidemia.

Keywords: Dyslipidemia, Lipid Profile, Nutrition Counseling, Obesity, Weight.***Corresponding Author:**

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1. INTRODUCTION

Global mortality data, there are more than 7.4 million people died from obesity which is the main cause of death and illness. This condition will continue to grow every year to 9.4 million deaths, and it is estimated that the number will increase to 23.3 million by 2030 (Almighal et al., 2023). One of the risk factors for obesity is excessive fat intake (Deora & Venkatraman, 2022). The level of lipids in the coronary arteries, the fatty layer, the protrusion of lesions and coronary stenosis and the independent risk factors that modify the complex and chronic vascular inflammatory process eventually manifest as causes i.e. a family history of obesity disease (Navya et al., 2023). If a person lacks physical activity but consumes very excess food, it can increase low density lipoprotein and decrease high density lipoprotein (Dou et al., 2023). The body moves a lot will cause fat not to accumulate in the body so that it can lower cholesterol levels. Physical exercise for 30 minutes a day can lower cholesterol levels (Fernández Granell et al., 2024). Excessive consumption of carbohydrates can trigger heart disease in a person (Islam et al., 2023). Excess carbohydrate intake can increase glucose levels in the blood and result in a higher risk of heart disease (Izoe et al., 2022). High consumption of carbohydrates tends to increase triglyceride levels and lower cholesterol levels (Kamrul-Hasan et al., 2023). Lifestyle such as physical activity that is not good has an impact and affects the quality of individual health, especially at the age of over 30 years. Likewise, an unhealthy diet has a significant effect on lipid levels in the blood such as cholesterol and triglycerides (Karunakar et al., 2023).

Indonesia is currently facing a double nutrition problem. Obesity is a health problem that occurs in many modern times and its incidence every year continues to increase (Katsuyama et al., 2022). Obesity with dyslipidemia can endanger health because it is a risk factor for various degenerative and metabolic diseases such as cardiovascular, diabetes mellitus, cancer, osteoarthritis (Kazemi et al., 2023). Obesity with dyslipidemia occurs due to an imbalance of incoming energy and outgoing energy. High energy intake is caused by the consumption of high energy and fat source foods. Low energy expenditure is due to lack of physical activity (Kim & Park, 2022).

The most important obesity control can be done with dyslipidemia for weight loss and improvement of lipid profiles (total cholesterol and triglycerides) (Kim et al., 2023). Weight loss and improvement of lipid profiles in obese people with dyslipidemia can reduce the risk of hypertension, coronary heart disease and type 2 diabetes mellitus. Conversely, obesity with dyslipidemia if not controlled is at risk of fatty liver which can result in hepatocellular carcinoma (Kirkpatrick et al., 2023).

To control obesity with dyslipidemia can be done with nutritional counseling to facilitate the process of interpersonal communication between counselors and clients in helping to overcome nutritional problems (Li et al., 2023). In conducting nutritional counseling requires counselors whose role is to help clients recognize and overcome nutritional problems (obesity with dyslipidemia) and encourage clients to find and choose ways to solve problems effectively and efficiently (Liang et al., 2023). Nutritional counseling is given to cliens with obesity and dyslipidemia conditions. The provision of nutritional counseling is expected that obese people with dyslipidemia can improve nutritional behavior, especially in applying the principles of balanced nutrition so that the nutritional status and health of clients become better, namely weight loss and lipid profile improvement in the form of decreased total cholesterol and triglycerides (Lobato Casado et al., 2024). Previous research has found that nutritional counseling with traffic light diet media, food exchange tables and food balance wheels is quite successful, with parents of obese children keeping a family food and drink diary and ensuring that their children live a well-dieted lifestyle (Mansfield et al., 2022). Other studies also found significant differences in average body weight and body mass index with results ($p < 0.01$) but

no differences in lipid profile and body composition ($p>0.05$) before and after the intervention (nutritional counseling). Nutritional counseling when combined with aerobic exercise also has a significant effect on improving cholesterol profiles and weight loss in obese adult women (Mishra et al., 2023).

Increasing socioeconomic levels have resulted in a change in diet from a traditional diet to a western diet such as fast food and high-calorie fats, resulting in a high prevalence of hypercholesterolemia in the community. One effort to reduce lipid profiles is through specific interventions to nutrition education through counseling is very good in improving one's behavior (Misra et al., 2022). Nutrition counseling is a two-way activity process that aims to improve patient behavior so that it can overcome health and nutrition problems, which generally in the implementation of counseling can be combined to be more effective (Muñoz et al., 2024). Therefore, this study aims to determine the effect of nutritional counseling he combination of exercise and nutritional counseling also had a significant effect on weight loss, body mass index, percent body fat (PBF) and visceral fat ($p<0.05$). Usually, nutritional counseling is only used to determine differences in knowledge and attitudes before and after counseling, but in this study also conducted an objective assessment of the results of changes in knowledge and attitudes after counseling in the form of lipid profiles and weight loss. For this reason, this study aims to determine the effect of nutritional counseling in losing weight and improving lipid profiles in obese patients with dyslipidemia.

2. RESEARCH METHOD

This type of research is a quasi-experimental study with a one group pre and post-test design. Sample of obese adults with dyslipidemia. The number of samples was 30 people. Sample criteria; obese with dyslipidemia, at least elementary school education, age 30-60 years, communication skills, cooperative, willing to be a respondent. Initial stage; purposive and tiered sampling. An obesity survey was conducted to 200 respondents in their homes. The survey was conducted by 5 enumerators, and 106 obese respondents were obtained. Next, dyslipidemia screening (examination of total cholesterol, LDL and triglycerides) by laboratory staff to 100 obese respondents in the meeting room of the Lurah office, obtained 52 obese respondents with dyslipidemia. Furthermore, 40 samples were determined purposively. The second stage; intervention was carried out in the form of providing nutritional counseling to 40 selected respondents. Nutrition counseling for each respondent was given 2 times with an interval of 2 weeks. Nutrition counseling was provided by 4 trained nutrition counselors. Counseling media were leaflets and videos. The third stage was evaluation, which involved measuring and rechecking body weight and lipid profile. Only 30 respondents (75%) participated in the evaluation stage. Data were statistically analyzed using t-student (paired sample test) at 95% confidence level. The measuring instruments used for obesity screening were Krisbow brand digital stepping scales with an accuracy of 0.1 kg and Gea brand microtois with an accuracy of 0.1 cm. For dyslipidemia screening using standard Prodia Laboratory equipment. The instruments used were interview forms and anthropometric measurement forms and dyslipidemia screening results. This research already has a permit by the Research Ethics Commission of the Health Polytechnic of the Ministry of Gorontalo, numbered LB.01.01/KEPK /177/2023.

3. RESULTS AND DISCUSSION

Table 1. Distribution of Lipid Profile of Obese Respondents.

Types of Lipid Profiles	N (83)	%
Total cholesterol		
Normal (< 200 mg/dL)	29	35
High (>200 mg/dL)	54	65
LDL		
Normal (<100 mg/dL)	7	8
High (>100 mg/dL)	76	92
Trigliserida		
Normal (<150 mg/dL)	53	64
High (>150 mg/dL)	30	36

Table show that from 83 obese respondents, lipid profile pictures were obtained; a) Most total cholesterol (65%) is high. b) LDL as large (92%) classified as high and c) triglycerides mostly (64%) classified as normal. The lipid profile assessment indicators are normal if that is less than 200mg/dL and high if more than 200mg/dL. Normal LDL is less than 100 mg/dL. The amount of LDL is said to be high if it is more than 100mg/dL The normal threshold of triglycerides in the body is less than 150mg/dL and if it exceeds that limit triglycerides can be said to be high.

Table 2. Characteristics Responden (n=30).

Characteristic	N (30)	%
Gender		
Man	3	10
Woman	27	90
Education		
Elementary School	4	13,3
Junior High School	7	23,3
High School	18	60,0
College	1	3,3
Occupation		
Housewife	24	80
Labourer	1	3,3
Farmer	1	3,3
Government Employees	1	3,3
Self employed	3	10

Table 2 show that the characteristics of respondents, most of which are female (90.0%), high school education level (60.0%), and unemployed (80.0%).

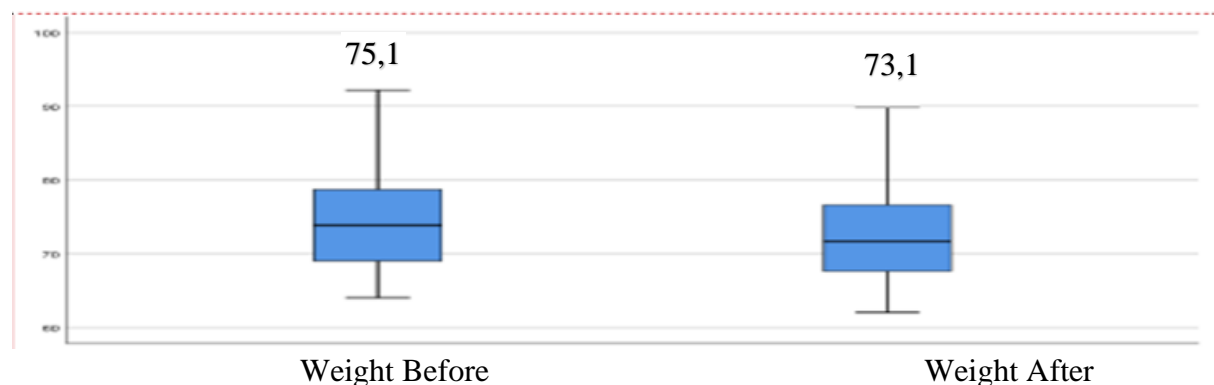


Figure 1. Progress of Weight.

Figure 1 show that the average body weight of respondents before nutrition counseling was 75.1 kg and after nutritional counseling was 73.1 kg. There was an average weight loss of 1.97 kg. Test statistics; $p=0.000$ ($p<0.05$). There was a difference in body weight after being given nutritional counseling.

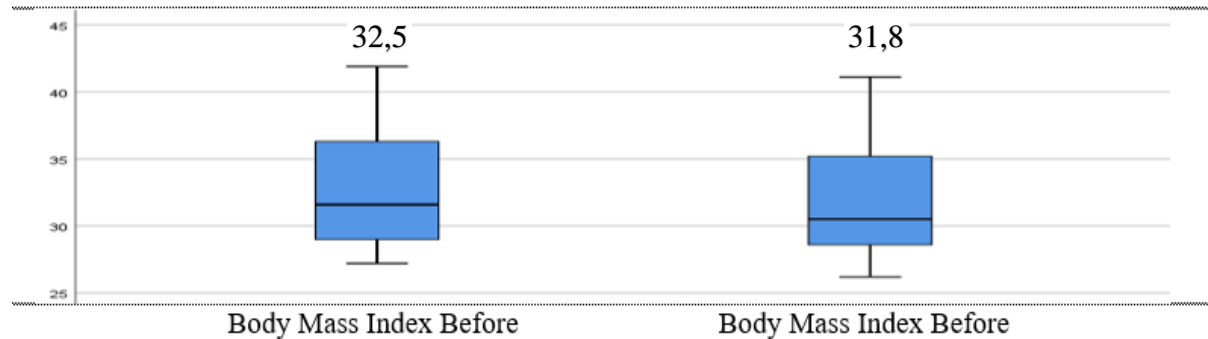


Figure 2. Progress of Body Mass Index

Figure 2 show that the average body mass index of respondents before nutrition counseling was 32.5 and after nutritional counseling 31.8. There was a decrease in the average BMI of 0.7. Test statistics; $P=0.000$ ($p<0.05$). There are differences in BMI after nutritional counseling.

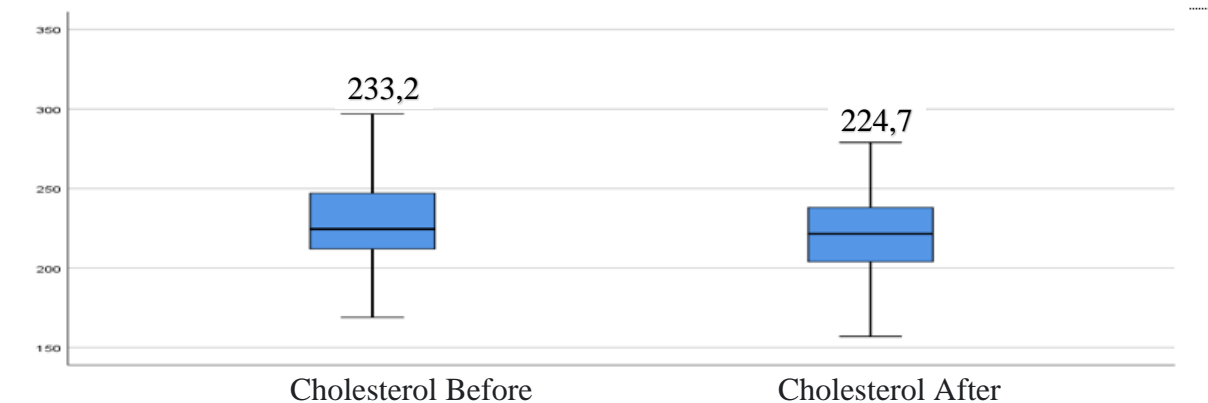


Figure 3. Progress of Lipid Profile Data

Figure 3 show that the average total cholesterol of respondents before nutritional counseling was 233.2 mg/dL and after nutritional counseling was 224.7 mg/dL. There was an average decrease in total cholesterol of 8.5 mg / dL. Test statistics; $P=0.036$ ($p<0.05$). There was a difference in total cholesterol after nutritional counseling.

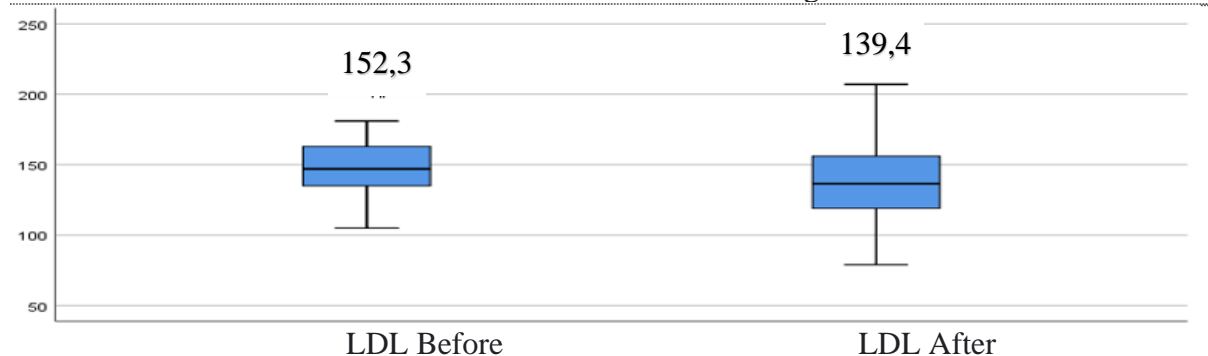


Figure 4. Progress of LDL

Figure 4 show that the average LDL of respondents before nutritional counseling was 152.3 mg / dL and after nutritional counseling 139.4 mg / dL. There was an average decrease in LDL of 12.9 mg/dL. Test statistics; P=0.003 (p<0.05). There is a difference in LDL after nutritional counseling.

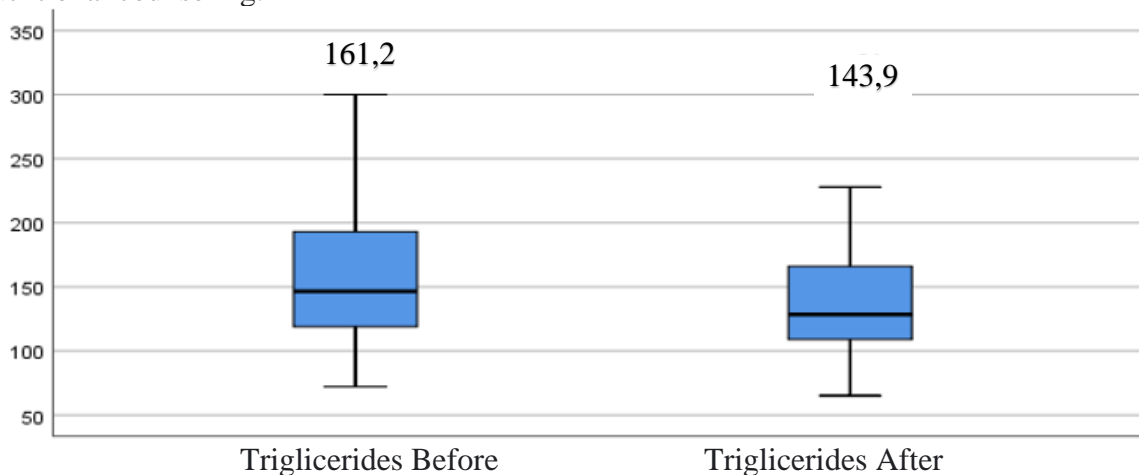


Figure 5. Progress of Triglycerides values

Figure 5 show the average triglyceride of respondents before nutritional counseling was 161.2 mg / dL and after nutritional counseling 143.9 mg / dL. There was an average triglyceride decrease of 17.3 mg / dL. Test statistics; P=0.034 (p<0.05). There are differences in triglycerides after nutritional counseling.

Table 3. Differences in Body Weight Lipid Profile Before and After Nutritional Counseling.

Parameter	Mean	T	p
Weight			
Early weight	75,1		
Final weight	73,1		
Decrease of Weight	1,97	5,96	0,0001
Body Massa Index			
Early Body Massa Index	32,5		
Final Body Massa Index	31,8		
Decrease of Body Massa Index	0,7	5,11	0,0001
Total Cholesterol			
Early Cholesterol	233,2		
Final Cholesterol	224,7		
Decrease of Cholesterol	8,5	2,20	0,036
LDL			
Early LDL	152,3		
Final LDL	139,4		
Decrease of LDL	12,9	3,20	0,003
Trigliserida			
Early Trigliserida	161,2		
Final Trigliserida	143,9		
Decrease of Trigliserida	17,3	2,22	0,034

The results of the study at the identification stage found that most obese respondents experienced problems with improving lipid profiles, namely high cholesterol. Elevated cholesterol in people with obesity due to obesity can increase the amount of cholesterol made by the liver (Nandasena et al., 2023). This condition can also reduce the clearance of cholesterol levels from the blood. For triglycerides, most of them are normal. The results found an increase in the group of obese patients compared to the non-obese group. A significant correlation between the increase in the blood of obese boys and girls. So the results of this study found the presence of 2 components of the lipid profile that increased in people with obesity, namely total cholesterol (Noh & Lee, 2023). This is not the case with triglycerides. There are differences in the findings of lipid profile components, namely triglyceride levels with may occur due to differences in respondent characteristics (Palikhey et al., 2023).

Effects of Nutritional Counseling on Weight Loss and Lipid Profile Improvement after being given nutritional counseling, respondents lost weight. The occurrence of weight loss is directly related to nutritional intake. Providing nutritional counseling can change respondents' consumption behavior, namely reducing energy intake consistently. This condition certainly affects weight loss (Pan et al., 2023). The results of statistical analysis showed a significant effect of nutritional counseling on weight loss. For the development of body mass index after nutritional counseling there was also a decrease in body mass index. The results of statistical analysis showed a significant effect of nutritional counseling on reducing body mass index. The occurrence of a decrease in body mass index is certainly directly related or as an effect of weight loss (Pinho et al., 2023). Where body weight is one of the parameters of body mass index. The results of this study found the significant effect of nutritional counseling on weight loss and body mass index of obese respondents (Raja et al., 2023). The effect of module-based nutrition education on adolescent weight change in the intervention group. The occurrence of differences in the results of this study may be due to the characteristics of different samples and nutritional counseling (Skudder-Hill et al., 2023).

For lipid profiles, after nutritional counseling there was a decrease in total cholesterol. The improvement of lipid profiles in respondents, both total cholesterol and triglycerides, is the impact of dietary changes, especially fat consumption patterns, both types and amounts (Thongtang et al., 2022). To lower total cholesterol and triglycerides, the type of fat that is restricted is saturated fat. Instead increase the consumption of unsaturated fats. The results of statistical analysis showed a significant effect of nutritional counseling on improving lipid profiles (total cholesterol and triglycerides) in dyslipidemia respondents (Williams et al., 2022). The significant decrease in total cholesterol after nutritional and lifestyle counseling has a significant influence on the reduction of total cholesterol and triglycerides (Yan et al., 2022).

Significant effect of nutritional counseling in lowering respondents' cholesterol levels. The characteristics of respondents in this study can have an effect on total cholesterol levels. As we get older, total cholesterol levels are relatively higher at a young age, this is due to reduced receptor activity (Yao et al., 2022). These receptor cells function as hemostasis regulators of cholesterol circulation in the blood and are widely found in the liver, gonadal glands and adrenal glands. The presence of interference with receptor cells will increase cholesterol levels in the blood. The results of the study are more women who suffer from dyslipidemia compared to men (Zhang et al., 2023). Some studies prove that women who have menopause tend to have higher cholesterol levels than adult men due to reduced activity of the hormone estrogen. Estrogen hormones play an important role in controlling cholesterol levels, and also function as antioxidants. The hormone estrogen can prevent the oxidation of LDL cholesterol so that it can reduce plaque in blood vessels (Zhang et al., 2023).

Nutritional counseling is usually used for the purpose of increasing knowledge that provides more specific information. The information conveyed is only in outline so that the

message to be conveyed cannot be too much (Zhao et al., 2023). Increased knowledge score after counseling on knowledge and attitudes found that counseling was very influential on increasing meaningful nutritional knowledge before and after nutrition education interventions 2 times a week (10-15 minutes) for 3 weeks (Zhao et al., 2023). This study shows there is a significant influence between nutritional counseling and knowledge. Improvement in addition to changing one's knowledge and attitudes, counseling is also able to change one's actions (obedience) for the better. This can be because one of the advantages of conveying information briefly so that respondents immediately understand the sentence compared to if it is too much and long (Abdu et al., 2023).

The provision of good nutritional counseling is very influential on reducing cholesterol levels to be able to reduce blood cholesterol levels (Alastalo et al., 2023). Nutritional counseling provides lifestyle changes in cholesterol patients, especially changes in nutritional intake (Chen et al., 2022). Providing nutritional counseling to reduce blood cholesterol levels Personal counseling is one of the roles of health services in creating lifestyle and dietary changes. These educative efforts need to be supported through counseling, clients are expected to have the knowledge and skills to make changes that are the solution to their problems (Garcia et al., 2023). Some other studies that support the results of this study are the effect of counseling there is a decrease in blood cholesterol levels with high total cholesterol while in patients with symptoms of obesity after receiving nutritional counseling. Research on patients with hypercholesterolemia does not use drugs for healing efforts but uses nutritional counseling. Respondents who received nutritional counseling 4 times in 4 months compared to patients who did not receive nutritional counseling (El-kholy et al., 2023). Patients who received counseling experienced a significant decrease in cholesterol while in the control group there was an insignificant decrease in cholesterol levels. The influence of nutritional counseling on reducing cholesterol levels in this study was made possible by three factors, namely patient education factors, counselor factors, and counseling frequency factors given to patients. This study means that counseling conducted during two meetings can generate interest and awareness of respondents. The interest or willingness of respondents and patients' families in the process of empowerment and independence is very necessary for the success of cholesterol sufferers so that the intake consumed is in accordance with the recommendations that have been described (Ermiyas et al., 2023). However, to achieve maximum results requires counselor knowledge about cholesterol and its management, counselor skills in counseling, and adequate meeting time to create effective counseling (Garling & Wong, 2023).

Effective counseling should take between 20 and 30 minutes per appointment. Counseling is given gradually by means of lectures, discussions, or sharing among high cholesterol sufferers who involve more respondents, and repeated and reviewed before continuing to the next discussion so that respondents more quickly and easily capture or understand the knowledge provided. There is an influence on the success of counseling delivery, so that nutritional counseling does not only take place face-to-face but can be done independently by respondents (Otsuka et al., 2023). In addition, the existence of materials / modules and media is very supportive of changes in knowledge and the success of a counseling activity. This opinion is supported by the success of a training or counseling activity is largely determined by the operations and processes of these activities such as the implementation process, the need for supporting facilities such as media development and the need for evaluation so that participants are more capable and faster in making better decisions, because their technical skills, human skills and managerial skills have increased (Paneque et al., 2023).

Education also contributes to the success of reducing blood cholesterol levels of patients needed to obtain information such as things that support health, so as to improve the quality of life. The higher one's level of education, the easier it is to receive information, so that the more

knowledge one has, while less education will hinder the development of one's attitude towards newly introduced values (Salhia et al., 2023). Education is closely related to the patient's knowledge in receiving information from counseling, which can increase the patient's knowledge. A person who is more educated has better knowledge than a less educated person. It is known that nutritional counseling interventions can lower cholesterol and triglyceride levels. It further proved that statistical test results on all lipid profiles (cholesterol levels, HDL and LDL levels, and triglyceride levels) between before and after nutritional counseling can change significantly (Almigbal et al., 2023). This shows that interventions in the form of nutritional counseling have significant benefits in lowering cholesterol, LDL and triglyceride levels. Intervention in the form of nutritional counseling benefits in lowering cholesterol values. Changes in lifestyle and changes in nutritional value intake in hypercholesterolemic patients are the results of providing nutritional counseling (Deora & Venkatraman, 2022).

Specific interventions with nutritional counseling can improve the understanding and activity patterns of patients who receive health promotion through various counseling for the better (Navya et al., 2023). Individually intervention through nutritional counseling can change lifestyle as well as dietary changes. This is important for health care providers such as hospitals (Dou et al., 2023). Educational efforts are very important which contain material such as diet / nutritional intake and physical activity. Material that is on target and has a good way of delivery, it is very effective in the success of nutrition counseling conducted by counselors. Diet such as carbohydrate and fat intake is very important to consider according to consumption rules such as portions and frequency of meals. Imbalance of lipid profiles in the blood from excessive food and beverages, excessive consumption of carbohydrates and fats is the cause of increasing acetyl-CoA obtained from the phosphorylation decarboxylation process, so that the increase forms cholesterol levels complexly (Fernández Granell et al., 2024). Excessive consumption of carbohydrates will increase blood sugar and increase insulin. The process of insulin action is to move blood sugar into cells and converted into glycogen and energy. Excess blood sugar will then become acetyl-CoA and converted into malonyl-CoA so that it will form free fatty acids that will be stored in the form of triglycerides (Karunakar et al., 2023). Furthermore, high plasma triglyceride concentrations can increase simultaneously will cause cholesterol esters to undergo a process of conversion into triglycerides, the reaction that occurs is mediated by CETP or Cholesterol Ester Transfer Protein (Izoe et al., 2022).

A high-carbohydrate diet in patients has an impact on reducing cholesterol and triglyceride levels through inhibition of the work process of the enzyme type Lecithin Cholesterol Acyltransferase or LCAT and can reduce the main protein component called Apolipoprotein A1. Therefore, the higher cholesterol will cause high protection against oxidation. Thus, increasing understanding related to carbohydrate intake and fat intake about consumption imbalances can reduce cholesterol, LDL, triglyceride levels and increase HDL levels (Katsuyama et al., 2022). The next material delivered by counselors in nutrition counseling is related to physical activity. Currently the high mortality rate is a result of diseases due to lifestyle changes and lack of physical activity as well as possible stress factors as risk factors (Kazemi et al., 2023). Therefore, physical activity material is important to be delivered in nutritional counseling related to the effect of physical activity on lipid profiles. In addition to food intake, physical activity factors can affect cholesterol in the blood. Good and regular exercise is very good in lowering blood lipid profiles. The absence of good physical activity or high sedentary factors, are considered risk factors for disease (Kim & Park, 2022). Regular exercise can improve body composition and reduce myocardial oxygen demand and is very beneficial and has an impact on low mortality. Lack of physical activity may be 7.8 times the risk of abnormal lipid profiles in the blood compared to those with good physical activity. Physical activity can lower cholesterol and this can lower risk factors for disease. In addition,

physical activity can lose weight due to excessive fat accumulation (not ideal) and this decrease will simultaneously reduce cholesterol levels. In this counseling, the physical activity recommended by the counselor is adjusted to the patient's condition. In general, forms of physical activity to control weight are directed at moderate activity. Regularity in doing aerobics at least 3 times per week with a duration of approximately 30 minutes, through moderate intensity it can improve the process of fat metabolism in the body (Kim et al., 2023). These exercises such as playing bicycles, running, jogging, walking and or brisk walking and allowing for swimming.

Based on the study's results, a p-value of 0.009 was obtained, which means that there is a relationship between the history of hypertension and the incidence of hypertension in pregnant women (Babys et al., 2021). Results 3,383 means that pregnant women with a history of hypertension are 3.3 times more likely to suffer from hypertension than pregnant women who do not have hypertension (Bijl et al., 2022). Women who develop hypertension in the first pregnancy will increase their hypertension in subsequent pregnancies (Chaemsaitong et al., 2022). The incidence of hypertension would grow in a second pregnancy if there is a pregnancy with too much distance from the child. With a history of hypertension, the probability of primigravida will increase four times (Chen et al., 2022). Most of the respondents who suffer from hypertension have a history of hypertension, namely 64.1% (Maher et al., 2022). Those with no history of hypertension are mostly not suffering from hypertension (Marasing et al., 2021). This shows that the history of hypertension in previous pregnancies plays an essential role in the incidence of hypertension during pregnancy (Miller et al., 2022).

The study's p-value of $0.010 < 0.05$ means a relationship between exposure to cigarette smoke and the incidence of hypertension in pregnant women (Sasmaya et al., 2022). Results mean that pregnant women exposed to cigarette smoke are 3.5 times more likely to suffer from hypertension than pregnant women who are not exposed to cigarette smoke (Sibai et al., 2021). Exposure to cigarette smoke during pregnancy determines fetal growth (Wu et al., 2021). The nicotine in cigarette smoke is a vasoconstrictor substance that will cause vasoconstriction of blood vessels and increase heart contractions, increasing blood pressure in pregnant women (Wu et al., 2021).

Most of the respondents who suffered from hypertension were respondents who were exposed to cigarette smoke, which was 57.4%, and respondents who were not exposed to cigarette smoke were mostly not suffering from hypertension (Aryal et al., 2020). This shows that cigarette smoke exposure can affect pregnant women's blood pressure (Bakouei et al., 2020). Researchers assume pregnant women exposed to cigarette smoke will have a greater risk of hypertension (Bhutani et al., 2022). This is because the nicotine in cigarette smoke is a vasoconstrictor substance that can increase the heart's work and blood pressure in pregnant women (Cameron et al., 2020).

Based on the study's results, a p-value of $0.000 < 0.05$ means a relationship between obesity and the incidence of hypertension in pregnant women. Results = 5.176 means that obese pregnant women are 5.1 times more likely to suffer from hypertension compared to pregnant women who are not obese (Society for Maternal-Fetal Medicine & Publications Committee, 2022). Obesity is the percentage of fat abnormalities expressed by the body mass index, which compares body weight and height squared in meters (de Haas et al., 2022). Being overweight and having hypertension often go hand in hand because adding kilograms makes the heart work harder (Fakhouri et al., 2020).

Most of the respondents who suffered from hypertension were obese, 65.7%. At the same time, people who are obese and do not suffer from hypertension are only 34.7%. Researchers assume obese people are at risk of suffering from hypertension at the time of pregnancy because, in obese people, there is increased work on the heart to pump blood. Excessive weight

leads to an increase in blood volume and area and expansion of the circulatory system. The greater the body mass, the more blood is needed to supply oxygen and nutrients to the body tissues. This results in the volume of blood circulating through the blood vessels will increase so that the pressure on the arterial walls becomes greater.

This study's results align with the research conducted on the effects of her research and obtained a p-value of 0.001 (Ferrari & Peyvandi, 2020). In line with the analysis, their research received a p-value of 0.001, indicating a relationship between obesity and hypertension (Fletcher et al., 2021). Based on the study's results, a the p-value of 0.125 was obtained, meaning there was no relationship between the physical activity of pregnant women and the incidence of hypertension in pregnant women (García-Romero et al., 2019). Exercise is a type of physical activity defined as an activity that is planned and given a structure in which the movement of a part of the body is repeated to obtain fitness, for example, walking, jogging, swimming and aerobics. Every adult should do at least 30 minutes of moderate-intensity physical activity daily (Goddard et al., 2020). Research results show no relationship between physical activity in pregnant women and the incidence of hypertension in pregnant women (Gonzalez Suarez et al., 2019). The results of this study contradict the research conducted. The effects of their study obtained a p-value of 0.000, meaning there is a relationship between physical activity and hypertension (Guimarães et al., 2019).

Researchers assume that even though there is no relationship between pregnant women and the incidence of hypertension in this study, the physical activity of pregnant women is still a risk factor for pregnancy hypertension (Issue et al., 2022). This is because if pregnant women do enough or do regular physical activity can play an essential role in maintaining a healthy body. Through sports activities, the heart can work more efficiently (Katsafanas & Bushnell, 2022). The frequency of the pulse is reduced, but the power of pumping the heart is getting stronger, the need for heart oxygen at a certain intensity, a reduction in fat and weight and lower blood pressure (Lane-Cordova et al., 2019).

Based on the study's results, a p-value of $0.481 > 0.05$ means no relationship exists between salt consumption and hypertension in pregnant women (López-Muñoz et al., 2019). In theory, the World Health Organization (WHO) recommends salt consumption patterns to reduce hypertension risk. The recommended sodium level is no more than 100 mmol (about 2.4 grams or 6 grams of salt) per day or the equivalent of 1 teaspoon daily (Magee, et al., 2022). Excessive sodium consumption causes sodium concentration in the extracellular fluid (Magee, et al., 2022). The intracellular fluid is drawn outwards to normalize, so the extracellular fluid volume rises (Marson et al., 2020). The increased importance of extracellular fluid causes an increase in blood volume, resulting in the onset of hypertension (McNeil et al., 2021).

The results of this study are contrary to the research on the effects of his study obtained a p-value of 0.0001 which means that there is a relationship between salt consumption and the incidence of hypertension (Partash et al., 2022). Research obtained a p-value of 0.001, indicating a relationship between salt consumption and hypertension (Prendes et al., 2020). Researchers assumed that although there was no relationship between salt consumption and the incidence of pregnancy hypertension in this study, excess salt consumption also remained an aggravating risk factor for pregnancy hypertension (Smith et al., 2022). People who consume extra salt every day can lead to hypertensive diseases. This is because excessive salt consumption can increase blood pressure. After all, salt retains water so that blood volume increases and can cause a narrowing of the diameter of arterial blood vessels. This circumstance forces the heart to pump more strongly, increasing blood pressure (Tan et al., 2021).

Based on the study's results, a p-value of 0.000 was obtained, which means that there is a relationship between pregnancy stress and the incidence of hypertension in pregnant women. Results 6.044 means that pregnant women who experience pregnancy stress are 6.0 times more

likely to suffer from hypertension than pregnant women who do not experience pregnancy stress (Tan et al., 2021). Stress can increase blood pressure times (Teirilä et al., 2019). The hormone adrenaline will increase when stressed, and it can cause the heart to pump blood faster so that blood pressure increases. If the stress level decreases, blood pressure will also decrease. According to the study results, most of the respondents who suffered from hypertension were respondents who experienced pregnancy stress, which was 64.5%. This proportion is more significant than the number of non-stressed respondents suffering from hypertension, 23.8% (Tsen & Gelman, 2022).

Researchers assume that stress can increase blood pressure for a while. Blood pressure usually increases when scared, nervous, and chasing time (Vanky & Løvvik, 2020). But in most cases, blood pressure returns to fall again as soon as it begins to relax. Stress can occur when a person is in a state of tension, feeling depressed, sad, frightened and guilty. This condition will stimulate the kidney child to produce the hormone adrenaline, which will spur the heart to pump blood faster and more robust, so blood pressure increases (Alves et al., 2021).

Based on the study's results, a p-value of 0.416 was obtained, meaning there was no relationship between age and hypertension in pregnant women (Cagnacci et al., 2022). The safest age for a woman to become pregnant and give birth is between 20-35 years since they are in a healthy reproductive period. Maternal mortality in expectant and parturient mothers at the age of < 20 years and the age of > 35 years will increase significantly as they are exposed to medical and obstetric complications that can endanger the mother's life (Chikowore et al., 2021). According to researchers, although there is no relationship between age and the incidence of hypertension in pregnant women, age is still a risk factor for hypertension in pregnant women; this is because hypertension is more often obtained in the early and late reproductive years, namely adolescents or over 35 years. Pregnant women < 20 years old easily experience an increase in blood pressure and cause seizures faster, while the age of more than 35 years is also a risk factor for hypertension (Dhawan & Sharma, 2020). So women who are at the beginning or end of reproductive age are more prone to suffer from hypertension during pregnancy (Anisa & Sofwan, 2021).

Based on the study's results, a p-value of 0.047 was obtained, meaning that there was a relationship between parity and hypertension in pregnant women (Aryal et al., 2020). Or result = 2, meaning that pregnant women with primigravida parity are 2.5 times more likely to suffer from hypertension than pregnant women with multigravida parity (Babys et al., 2021). The first pregnancy is mainly in mothers who are > 35 years old (Bakouei et al., 2020). The frequency in primigravida is riskier than in multigravida because immunological theory explains the relationship of parity with the incidence of hypertension (Bhutani et al., 2022). The theory states that blocking antibodies against placental antigens formed in the first pregnancy is the cause of hypertension. This study supported the conclusions of the relationship between parity and the incidence of hypertension in pregnant women and supported other studies that parity is a risk factor for hypertension in pregnant women (Bijl et al., 2022).

People with hypertension were 4.5% aged 20-35 years and 0.7% younger than 20 years old. Women less than 17 years of age or more than 30 years are significantly associated with hypertension (Wu et al., 2021). Women over the age of 35 are a risk factor for developing hypertension. Women under 20 years old have a higher risk of developing hypertension and are at 1.6 times higher risk of death; women over 35 years of age have a 1.2 times higher risk of developing hypertension. For ages, 20-35 years the risk of having risk of developing hypertension is 0.87 (Ahmed et al., 2021).

Inadequate maternal immunological response to inherited fetal antigens has been suggested as one of the mechanisms responsible for the development of hypertension (Albåge et al., 2020). Increased hypertension in primigravida women and reduced incidence in those

with previous abortions or late miscarriages are consistent with immunological causes of hypertension. However, data regarding previous miscarriages are not associated with the risk of hypertension (Arabloo et al., 2022).

Body mass index at the beginning of the second trimester is highly predicted to increase the risk of hypertension, with the highest incidence (12.6%) among women whose body mass index is >34 kg/m² (Bektas et al., 2020). These findings are consistent with other studies that report an increased incidence of hypertension in obese women (Bell et al., 2020). Obesity is the main risk factor for cardiovascular and cerebrovascular diseases. Indeed, obese women are at increased risk of hypertension, diabetes mellitus, hyperlipidemia, hyperuricemia, and poor heart function (Bichard et al., 2022).

In addition, obesity harms maternal hemodynamic changes during pregnancy (Chami et al., 2022). It is, therefore, possible that some pathophysiological alterations associated with obesity are also responsible for the incidence of wrinkled hypertension in obese women. The routine balance of pregnant women is an important part of all prenatal visits (Ciriello et al., 2022). The increase in weight gain at each visit is used both to assess status nutrition and to indicate the risk of hypertension. Again at least 2 pounds per week, especially during the third trimester associated with the risk of hypertension (Cui & Song, 2022). However, it should be emphasized that excessive weight gain (oedema) during pregnancy should not be considered diagnostic hypertension but should be noted as a risk factor for the potential development of hypertension (Diffenderfer et al., 2022).

Indeks body mass and systolic and diastolic blood pressure are very close to the risk of hypertension. This information should be useful for counseling mothers and understanding the pathophysiological characteristics of hypertension (Flügge et al., 2018). When using the reported characteristics of patients to predict recurrent hypertension in this group with a high recurrence rate (45.2%), the introduction of women at risk was insufficient. Identification of women at low risk for recurrent diseases, who may benefit from less intensive antenatal surveillance, is not yet possible and individual counselling on risks in subsequent pregnancies remains a challenge (Gooding et al., 2020).

Blood pressure and proteinuria are established as detailed diagnostic criteria for defining hypertension. In addition evaluating the risk factors for hypertension in a group of primigravida showed that systolic and diastolic systolic blood pressure in early pregnancy (before 22 weeks of pregnancy) was very predicted to be the risk of hypertension (Harrison et al., 2021). During pregnancy, normal major physiological changes occur throughout the cardiovascular system, especially the placental. These changes are due to the migratory and endovascular trophoblast action on the walls of the spiral arterioles, which help to transform of the placenta artery bed into low resistance, low pressure, high flow system. It is recommended that things in a bag start in the first trimester dan is usually completed at 20 weeks gestation. This coincides with a physiological decrease in the blood of the mother's systemic pressure during normotensive pregnancy. In contrast, pregnancies are not at risk of hypertension. The inadequate vascular response of the mother to the placenta is usually evident at 20 weeks gestation. Therefore the association of hypertension with an increase in maternal blood pressure reflects this abnormal physiological process (Heyden et al., 2020).

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artery bed into low resistance, low pressure, high flow system. It is recommended that things in a bag start in the first-trimester and is usually completed at 20 weeks gestation. This coincides with a physiological decrease in the blood of the mother's systemic pressure during normotensive pregnancy. Conversely, pregnancies that are not at risk of hypertension, the mother's inadequate vascular response to the placenta is usually proven at 20 weeks gestation (Babys et al., 2021). Therefore the association of hypertension with an increase in maternal blood pressure that we found in our study may reflect this abnormal physiological process.

In women who smoke during the menstruation period, hypertension is found. On the other hand, smoking when not menstruating is not found to risk hypertension. A similar analysis was performed to evaluate the contribution of hidden risk factors to the risk of severe hypertension (Bijl et al., 2022). No smoking during pregnancy in women who smoke during the menstruation period, an increase in hypertension is found. On the other hand, smoking when not menstruating is not found to risk hypertension. A similar analysis was performed to evaluate the hidden contribution of risk factors to the risk of severe hypertension (Bijl et al., 2022). No smoking during pregnancy can be used to protect against hypertension. However, the protective effect of smoking is a contra for women who continue to smoke, especially over 20 weeks of pregnancy. Having a husband who has a habit of smoking can also increase the risk of increased hypertension (Chaemsaitong et al., 2022). Mothers who smoke will increase the risk of hypertension. The prevalence of hypertension is least in women who quit smoking in early pregnancy. An increased risk of hypertension was found in pregnant women who were still smoking during pregnancy for more than 20 weeks. In addition to the time of cigarette consumption, the dose of cigarettes per day also affects hypertension.

Cigarettes of more than three pieces per day can increase hypertension in primigravida mothers. The production of thromboxane A₂ through inhibition of thromboxane synthase and placental acetylcholine by the way nicotine acts on nicotinic receptors in the placenta eventually stimulates the release of endothelium-derived relaxing factor and nitric oxide. This beneficial effect of smoking in hypertension can also be mediated by inhibiting cytokine production and the antioxidant activity of nicotine (Chen et al., 2022). Blood lead levels above 4.2 µg/dl may increase the risk of hypertension by 105%. For each increase in blood lead levels, 1 µg/dl. Blood lead levels in pregnancy are a risk factor for hypertension. Blood lead levels in patients with hypertension are higher than in normal pregnant women. Every 1 µg/dl increase in blood lead levels in pregnant women increases the risk of hypertension by 1.6%. The safe range of blood lead levels in pregnant women is 5 µg/dl. With a remarkable reduction in environmental lead sources, blood lead levels have declined over the past few decades. However, lead exposure remains a risk factor for women's health even at low Health. Lower blood lead levels (average = 2.3 µg/dl) were associated with systolic blood pressure. Low blood lead levels in pregnant women have been linked to pregnancy-induced hypertension. Low levels of lead exposure have a dosing effect, and hypertensive relationship at 4.2 µg/dl, The risk of hypertension is almost not significantly increased with an increase in blood lead levels when blood lead levels are lower than 4.2 µg/dl. However, when blood lead levels are higher than 4.2 µg/dl, the risk of hypertension increases by 105% for every 1 µg/dl increase in blood lead levels. Lead exposure can accumulate in pregnant women through the air, skin contact, or the food chain (Maher et al., 2022).

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Alcohol consumption may increase the risk of hypertension. A person who consumes alcohol can increase the severity of the disease if they experience hypertension. Blood vessels can become narrower if a person consumes alcohol to trigger damage to organs (Marasing et al., 2021). So far, alcohol consumption can be considered to improve heart health, but it is harmful if consumed within reasonable limits. Consumption of alcohol in small portions can dilate blood vessels, but if consumed in large quantities, it is the opposite (Miller et al., 2022).

Calcium in pregnant women is obtained from food consumed in the amount of 1200 milligrams per day for pregnant women over the age of 30 years, and pregnant women over 20 years old require calcium in the amount of 1300 milligrams per day. In pregnant women, calcium is needed more because it is a substitute for the reserve of tissue formation in the fetus. So that if pregnant women lack calcium can increase the risk of hypertension four times (Sasmaya et al., 2022).

Pregnant women who lack calcium can also trigger the occurrence of hypertension because there is an increase in concentration in the blood and muscle contractions in pregnancy hypertension is very important to pay attention to because calcium deficiency in the diet can trigger hypertension. Calcium maintains concentration in the blood on muscle contraction activity (Sibai et al., 2021).

4. CONCLUSION

In the study, matching was not carried out for the sample and there were no inclusion and inclusion criteria in determining the sample so that the results obtained were only differentiated based on the characteristics of respondents. The study still used heterogeneous samples and the examination was carried out in a fairly close time so that the results obtained did not show too significant differences. Based on the data obtained, it can be concluded that there is a significant

relationship between nutritional counseling, nutrition counseling, lipid profile improvement and weight loss in obese patients with dyslipidemia. The sample size used in subsequent studies is more homogeneous so that each sample must be the same. Checks to see a decrease should be carried out over a long enough period of time so that the results obtained are more valid. The study was conducted using a larger sample. The weakness of this study has not been matched on the sample, so the changes that occur only look at the differences before and after cannot distinguish changes between groups. But this study also has advantages because the assessment is objective so as to minimize the occurrence of bias. Suggestions for further research can be done by differentiating the effect of counseling on obese groups with those who are not obese so that the influence of counseling can be more visible.

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