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Description of Precision Nutrition Components (Food Intake and BMI) and Total Cholesterol and Triglycerides in Dyslipidemia Patients at the Healthy Life Clinic Bandung

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ABSTRACT

Precision nutrition is an approach that emphasizes the adjustment of dietary recommendations based on individual characteristics, including dietary intake and body mass index (BMI). These components play a role in influencing the total cholesterol and triglyceride levels. Dyslipidemia is a metabolic disorder characterized by abnormalities in these lipid levels and is associated with an increased risk of cardiovascular disease. This research aimed to describe the components of precision nutrition (dietary intake and BMI) as well as total cholesterol and triglyceride levels among patients with dyslipidemia. This was a descriptive quantitative research with a cross-sectional design. A total of 65 samples of patients with dyslipidemia enrolled in the Chronic Disease Management Program (Prolanis) in Healthy Life's Clinic Bandung, were included using consecutive sampling. Dietary intake data were obtained using a questionnaire adapted from the Indonesian Balanced Nutrition Guidelines and the Balanced Nutrition Index (IGS), BMI was assessed through anthropometric measurements, and total cholesterol and triglyceride levels were obtained from laboratory blood examinations. Data were analyzed using univariate analysis. The results showed that 80% of participants were female and the majority were elderly (55.4%). Total cholesterol and triglyceride levels were predominantly within the desirable (normal) range, accounting for 40% and 55.4%, respectively. Carbohydrate and fat intake were mostly inadequate, animal protein intake was classified as less to enough, plant-based protein intake was enough, and vegetable and fruit consumption was enough. The nutritional status of participants was predominantly obesity class I (46.2%). This research indicates that components of precision nutrition (dietary intake and BMI) play a role in the profile of total cholesterol and triglyceride levels among patients with dyslipidemia and may serve as a basis for personalized, nutrition-specific interventions. Future researches are recommended to use a cohort design and to consider other components of precision nutrition, including physical activity and individual metabolic responses, in order to achieve a more comprehensive understanding of the relationship between dietary intake, BMI, and lipid profile

Keywords *: Body Mass Index, Dietary Intake, Precision Nutrition, Total Cholesterol, Triglyceride Levels*

ABSTRAK

Precision nutrition adalah pendekatan yang menekankan penyesuaian rekomendasi gizi berdasarkan karakteristik individu, termasuk asupan makanan dan indeks massa tubuh (IMT). Kedua komponen tersebut berperan dalam memengaruhi kadar kolesterol total dan trigliserida. Dislipidemia merupakan kelainan metabolik yang ditandai oleh gangguan kadar lipid tersebut dan berhubungan dengan risiko penyakit kardiovaskular. Penelitian ini bertujuan untuk menggambarkan komponen *precision nutrition* (asupan makanan dan IMT) serta kadar kolesterol total dan trigliserida pada pasien dislipidemia. Penelitian ini merupakan penelitian deskriptif kuantitatif dengan desain *cross-sectional*. Subjek penelitian berjumlah 65 sampel pasien dislipidemia peserta Program Pengelolaan Penyakit Kronis (Prolanis) di Klinik *Healthy Life* Bandung, yang dipilih dengan teknik *consecutive sampling*. Data asupan makanan diperoleh melalui kuesioner yang diadaptasi berdasarkan pedoman gizi seimbang dan Indeks Gizi Seimbang (IGS), IMT diperoleh dari pengukuran antropometri, serta kolesterol total dan trigliserida diperoleh dari pemeriksaan laboratorium berupa darah. Analisis data dilakukan secara univariat. Hasil penelitian menunjukkan 80% subjek berjenis kelamin perempuan dan mayoritas adalah lansia (55,4%). Kadar kolesterol total dan trigliserida pada subjek penelitian didominasi oleh kategori diinginkan (normal), masing-masing yaitu sebesar 40% dan 55,4%. Asupan karbohidrat dan lemak sebagian besar tergolong kurang, protein hewani berada pada kategori kurang dan cukup, protein nabati berada pada kategori cukup, serta konsumsi sayuran dan buah tergolong cukup. Status gizi subjek penelitian didominasi oleh obesitas kelas I (46,2%). Penelitian ini menunjukkan komponen *precision nutrition* (asupan makanan dan IMT) serta gambaran kadar kolesterol total dan trigliserida pada pasien dislipidemia dan dapat menjadi dasar intervensi nutrisi spesifik terpersonalisasi. Disarankan penelitian selanjutnya menggunakan desain *cohort* serta mempertimbangkan komponen *precision nutrition* lainnya, termasuk aktivitas fisik dan respons metabolik individu, sehingga hubungan antara asupan makanan, IMT, dan profil lipid dapat dipahami lebih komprehensif.

Kata kunci: Asupan Makanan, Indeks Massa Tubuh, Kolesterol Total, Precision Nutrition, Trigliserida

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INTRODUCTION

Dyslipidemia is a disorder of lipid metabolism or transport involving abnormalities in the synthesis and breakdown of plasma lipoproteins, characterized by changes in plasma lipid fraction levels , either an increase or a decrease. According to the 2021 Indonesian Endocrinology Association (PERKENI 2021), the main abnormalities in lipid fractions include increased levels of total cholesterol (TC), *low-density lipoprotein* (LDL), and triglycerides (TG), as well as decreased levels *of high-density lipoprotein* (HDL). [1–3]Dyslipidemia has become a global health issue, with the World Health Organization (WHO) classifying it as a widespread epidemic.

According to WHO data from 2008, the global prevalence of dyslipidemia was recorded at 37% in men and 40% in women, which is associated with approximately 2.6 million deaths. This prevalence rate varies across continents, namely 30% in Southeast Asia, 37% in the Western Pacific, 54% in Europe, and in Indonesia, the 2013 Basic Health Research (Riskesdas) data showed that 35.9% of the population had total cholesterol levels ≥ 200 mg/dL, 15.9% had LDL levels > 190 mg/dL, and 22.9% had HDL levels < 40 mg/dL. This figure increased in 2018, with 28.8% of the population aged 15 years and over having total cholesterol ≥ 200 mg/dL, 72.8% having LDL levels > 100 mg/dL, 24.4% having HDL levels < 40 mg/dL, and 27.8% having triglyceride levels > 150 mg/dL . [7]In West Java, based on the 2013 Basic Health Research (Riskesdas), the prevalence of dyslipidemia reached 50.1%, placing this province in 3rd place in Indonesia, which is closely related to high-fat food intake.[8] Meanwhile, in Bandung City, 52.2 % of the population is recorded as having dyslipidemia. This data underscores the importance of understanding the various risk factors that can trigger dyslipidemia.

This study focused on total cholesterol and triglycerides. Total cholesterol and triglycerides are the two lipid components most commonly used in initial dyslipidemia screening. Furthermore, the selection of these parameters was based on the proven relationship between dietary intake and changes in total cholesterol and triglyceride levels , such as a diet high in saturated fat and sugar has been shown to increase triglyceride and total cholesterol levels, while interventions with a diet high in fiber, unsaturated fat, and weight loss effectively reduce both parameters. These parameters also show that although total cholesterol > 200 mg/dL and triglycerides > 150 mg/dL have limited specificity of approximately 59% and 61%, respectively, their sensitivity is quite high, especially for total cholesterol (100%), making them still relevant as initial dyslipidemia screening tools. Thus, the selection of these two parameters is considered sufficiently representative for further analysis in relation to dietary intake and nutritional status **.**

The recommended diet for patients with dyslipidemia includes consuming vegetables, fruits, nuts, cereals, whole grains, and olive oil, while limiting the intake of sugar, meat, and high-fat dairy products . This diet is designed to be low in saturated fat and high in monounsaturated *fatty acids* (MUFAs), the benefits of which are increasingly optimized through modern approaches such as *precision nutrition* .

Precision nutrition is an emerging approach in nutritional science that aims to provide dietary recommendations tailored to individual characteristics. According to the National Institutes of Health (NIH), precision nutrition integrates multiple sources of personal information such as genetic background, metabolic biomarkers, gut microbiome composition, lifestyle factors, and habitual dietary intake to predict how individuals respond to specific foods. Through this approach, nutritional strategies can be designed more specifically according to each individual's metabolic condition. However, in many clinical and population-based studies, the complete implementation of precision nutrition remains challenging because advanced biomarker analysis, genomic testing, and microbiome profiling require complex laboratory facilities and substantial financial resources. Therefore, early-stage studies often begin by examining more accessible components that are closely related to nutritional status, such as dietary intake and body mass index (BMI). These basic components are still considered important indicators for describing nutritional conditions and metabolic risk in patients with chronic diseases. In this study, dietary intake and BMI were used as initial indicators related to nutrition status among patients with dyslipidemia. Thus, the present research does not attempt to fully implement the entire precision nutrition framework but rather provides a descriptive overview of selected nutritional components relevant to lipid metabolism.

Precision nutrition plays a role in preventing chronic diseases, such as dyslipidemia, obesity, diabetes mellitus, and heart disease · It is implemented through assessments of food intake and nutritional status, such as BMI. One reference used to assess food intake is *a balanced diet* , which is a dietary pattern that includes macronutrients (carbohydrates, protein, fat) and micronutrients (vitamins and minerals) according to individual needs.

et al .'s (2021) study suggests that implementing a digital platform based on *precision nutrition* is effective in reducing total cholesterol and LDL levels in individuals with dyslipidemia. However, this study focused more on the application of information technology and did not specifically examine the relationship between actual dietary intake components using a FFQ and body mass index on lipid profiles. Furthermore, Andersen's (2025) study highlighted the role of metabolic biomarkers as predictors in *precision nutrition* to detect the risk of dyslipidemia. Despite presenting an innovative, prediction-based approach, this study did not address the empirical relationship between daily dietary intake and nutritional status, such as BMI, and lipid levels in clinical populations. Meanwhile, a study by Galmés *et al* . (2018) revealed that personalized vitamin E supplementation contributed to improvements in lipid profiles. However, this approach still focused on individualizing micronutrients, without holistically evaluating the impact of macronutrient intake and nutritional status parameters on changes in total cholesterol and triglyceride levels .

Based on the limitations of previous studies, there remains a need to better understand the nutritional characteristics of patients with dyslipidemia in real clinical settings. Many existing studies have focused on advanced aspects of precision nutrition such as genetic markers, digital monitoring systems, or metabolomic predictors. However, relatively few studies have described the distribution of fundamental nutritional components, including habitual dietary intake and body mass index, within populations of patients already diagnosed with dyslipidemia. Understanding these basic characteristics is important because dietary patterns and nutritional status are closely related to metabolic health and may influence lipid profiles over time. In Indonesia, particularly among patients participating in the Chronic Disease Management Program (Prolanis), information regarding the nutritional profile related to lipid status is still limited. Therefore, this study was conducted to provide a descriptive overview of dietary intake patterns, body mass index, and lipid profile parameters among dyslipidemia patients. The findings are expected to provide preliminary data that may support future analytical research exploring the relationship between nutrition-related factors and lipid metabolism.

Based on the limitations of previous studies, there remains a need to better understand the basic nutritional characteristics of patients with dyslipidemia in real clinical settings. While many recent studies on precision nutrition focus on advanced approaches such as genetic profiling, metabolomics, and digital monitoring systems, these methods are often difficult to implement in routine clinical practice due to technical and financial constraints. Therefore, examining more accessible components such as dietary intake and body mass index (BMI) can provide important preliminary insights into nutritional conditions related to lipid metabolism. In this context, the present study does not aim to develop a fully personalized nutrition model or risk stratification system, but rather to provide a descriptive overview of selected nutrition-related indicators among patients with dyslipidemia. Although similar descriptive studies have been reported in the literature, data describing the distribution of dietary intake patterns, BMI, and lipid profile parameters among Prolanis participants in Indonesia remain limited. Therefore, this study aims to describe the components of dietary intake and BMI in relation to total cholesterol and triglyceride levels among dyslipidemia patients, providing baseline information that may support future analytical or personalized nutrition research.

METHOD

This study used a descriptive observational design with a cross-sectional approach to describe the components of precision nutrition, including food intake, body mass index (BMI), and lipid profiles (total cholesterol and triglycerides) in patients with dyslipidemia. This study did not aim to analyze causal relationships, but rather to examine the distribution and trends of each variable's values at a single observation point. Food intake was measured using the Food Frequency Questionnaire (FFQ), nutritional status was assessed using BMI, and lipid profiles were obtained from laboratory tests. Dietary intake was assessed using a semi-quantitative Food Frequency Questionnaire (SQ-FFQ) adapted from the Indonesian Balanced Nutrition Guidelines and the Balanced Nutrition Index (IGS). The categorization of food intake into insufficient, adequate, and excessive was determined based on the recommended daily intake standards in the Indonesian Balanced Nutrition Guidelines. Intake levels below the recommended dietary allowance were classified as insufficient, intake within the recommended range was classified as adequate, and intake exceeding the recommended level was categorized as **excessive**. This categorization was used to provide a descriptive overview of dietary intake patterns among the study participants. The SQ-FFQ used in this study was adapted from previously validated dietary assessment instruments commonly applied in nutritional epidemiology studies in Indonesia. Previous research has demonstrated that the SQ-FFQ has acceptable validity and reliability for estimating habitual dietary intake in adult populations. The questionnaire was also reviewed and adjusted to match commonly consumed foods in the local dietary context to improve its applicability among the study participants.

This study employed a descriptive cross-sectional design aimed at presenting the distribution of nutritional and metabolic variables among patients with dyslipidemia at a single point in time. The purpose of this design was not to determine causal relationships or statistical associations between variables, but rather to describe the general characteristics of dietary intake, body mass index (BMI), and lipid profile parameters within the study population. Descriptive cross-sectional studies are commonly used in clinical settings to provide an overview of health-related variables and to identify patterns that may be relevant for future analytical investigations. Therefore, the findings of this study should be interpreted as a nutritional and metabolic profile of the participants rather than as evidence of causal or correlational relationships between dietary intake, BMI, and lipid levels. This approach allows researchers to generate baseline information regarding the nutritional conditions of dyslipidemia patients who participate in the Prolanis program in clinical practice. The results obtained may serve as preliminary evidence that can support the development of future studies using analytical designs such as correlation, regression, or cohort studies to further explore the relationships between nutrition and lipid metabolism.

Blood samples for total cholesterol and triglyceride measurements were obtained through venous blood collection conducted at the clinic laboratory. To ensure accuracy of lipid profile measurements, participants were instructed to undergo overnight fasting for approximately 8–12 hours prior to blood sampling. Blood collection was generally performed in **the** morning between 07:00 and 09:00 AM as part of routine clinical laboratory examinations in the Prolanis program. The lipid profile analysis was carried out using standardized laboratory procedures at the clinic laboratory.

The study population was participants of the Chronic Disease Management Program (Prolanis) aged ≥40 years who were diagnosed with dyslipidemia at a clinic in Bandung City. The research subjects were selected using consecutive sampling technique, that is, all patients who met the inclusion criteria were included sequentially until the sample size was met. Inclusion criteria included participation in Prolanis, meeting the criteria for dyslipidemia based on PERKENI 2021, being 40 years of age or older, and willingness to participate in the study. Exclusion criteria included irregular clinic visits, incomplete total cholesterol and triglyceride data, and unwillingness to participate. Based on a sample size calculation with a 95% confidence level and a 14% margin of error, the minimum sample size required was 45 individuals, and this study involved 65 subjects. The sample size was estimated using a single population proportion formula for descriptive studies with a 95% confidence level. A margin of error of 14% was selected due to the limited number of eligible patients available in the clinical setting during the data collection period. Because the study population consisted specifically of Prolanis participants diagnosed with dyslipidemia who met the inclusion criteria, the accessible population size was relatively small. Therefore, a larger margin of error was considered acceptable to ensure that the required minimum sample size could be achieved within the available time and resource constraints. Using this approach, the minimum required sample size was calculated to be 45 participants. In order to improve the representativeness of the study and reduce potential sampling bias, the researchers included 65 participants who met the eligibility criteria. The final sample size therefore exceeded the minimum requirement for descriptive analysis and provided sufficient data to present the distribution of the studied variables.

The independent variables in this study were precision nutrition components consisting of food intake and BMI, while the dependent variables included total cholesterol and triglyceride levels . Potential confounding variables that could influence the results included meal timing, genetic factors, gut microbiome, physical activity, other dietary references and composition, use of dyslipidemia medication, alcohol and cigarette consumption, and the presence of other chronic diseases. Data were analyzed univariately using SPSS version 30.0 to present frequency distributions, percentages, and mean values.

Although several potential confounding variables were identified, including physical activity, medication use, genetic predisposition, alcohol consumption, smoking habits, and other chronic diseases, these factors were not analytically controlled in this study. This is because the primary objective of the research was descriptive rather than analytical. The study aimed to present the overall nutritional and lipid profile characteristics of dyslipidemia patients rather than to determine the causal effects of specific risk factors. Therefore, the confounding variables were acknowledged as potential influences on lipid metabolism but were not included in statistical adjustment or multivariate analysis. Recognizing these factors remains important in interpreting the results, as lipid levels in individuals can be affected by multiple physiological and lifestyle determinants. Future research is recommended to incorporate analytical study designs that can statistically control these confounding variables and evaluate their specific contribution to lipid profile changes.

The statistical analysis in this study was limited to descriptive statistics in accordance with the study design and research objectives. Data were processed using SPSS version 30.0 to calculate frequencies, percentages, means, standard deviations, and ranges in order to describe the distribution of dietary intake, body mass index categories, and lipid profile parameters among the study participants. No inferential statistical tests such as correlation, regression, or association analysis were conducted because the study did not aim to evaluate statistical relationships between variables. Consequently, tests for normality of data distribution were not performed, as they are generally required for inferential statistical analyses rather than descriptive studies. The results of this analysis therefore provide a general overview of the nutritional and metabolic characteristics of the study population. These findings are intended to serve as baseline information that may support future analytical studies investigating the relationship between dietary intake, BMI, and lipid profile parameters in dyslipidemia patients.In addition to descriptive statistics, an exploratory relational analysis was conducted to examine the potential relationship between nutritional status (BMI categories) and lipid profile parameters. Cross-tabulation analysis was performed to observe the distribution of total cholesterol and triglyceride levels across BMI categories. This additional analysis was intended to provide preliminary insight into possible patterns between obesity status and lipid profile indicators among the study participants.

RESULTS AND DISCUSSION

Food Intake Overview

Based on Table 1, the majority of subjects in this study had a total food intake in the adequate category, namely 51 samples (78.5 %). A total of 14 samples (21.5 %) were in the insufficient category, while no subjects were found to have a food intake in the excessive category. This distribution indicates that the majority of subjects tended to have adequate consumption patterns, but a proportion still experienced insufficient food intake.

Table 1 Frequency Distribution of Food Intake.

Variables	Category	N (sample)	Percentage (%)
Food Intake	Low	14	21.5

	Adequate	51	78.5
	High	0	0
Total		**65**	**100**

The results presented in Table 1 show that the majority of respondents had food intake classified in the sufficient category. A smaller proportion of subjects were categorized as having insufficient intake, while none of the participants were categorized in the excessive intake group. These findings indicate that most dyslipidemia patients participating in the Prolanis program generally consume food in amounts that fall within the recommended intake range. The distribution of intake categories illustrates the overall dietary pattern among the study population. The findings provide a descriptive overview of the general food intake status of the respondents and serve as baseline information regarding dietary patterns among dyslipidemia patients in this clinical setting.

Overview of Carbohydrate Intake

Table 2 shows that most subjects had varying carbohydrate intakes depending on their food source. White rice intake was in the insufficient and sufficient categories in equal proportions (46.2 %), while 7.7% of subjects consumed excessive amounts of white rice. Meanwhile, most subjects had insufficient intakes of complex carbohydrates other than white rice, such as corn (81.5 %), potatoes (86.2%), white bread (75.4%), sweet potatoes (75.4%), and cassava (67.7%).

Table 2 Frequency Distribution of Carbohydrate Intake.

Variables	Category	N (sample)	Percentage (%)
	Low	30	46.2
White rice	Adequate	30	46.2
		5	7.7
Total		**65**	**100**
	Low	53	81.5
Corn	Adequate	12	18.5
	High	0	0
Total		**65**	**100**
	Low	56	86.2
Potato	Adequate	8	12.3
	High	1	1.5
Total		**65**	**100**
	Low	49	75.4
White Bread	Adequate	15	23.1
	High	1	1.5

Variables	Category	N (sample)	Percentage (%)
Total		**65**	**100**
Sweet potato	Low	49	75.4
	Adequate	16	24.6
	High	0	0
Total		**65**	**100**
Cassava	Low	44	67.7
	Adequate	19	29.2
	High	2	3.1
Total		**65**	**100**

The data in Table 2 show that white rice was the most frequently consumed carbohydrate source among the respondents. Other carbohydrate sources such as corn, potatoes, cassava, and bread were consumed less frequently. This finding indicates that the carbohydrate intake pattern among dyslipidemia patients in this study is dominated by a single staple food source. Such dietary habits reflect common eating patterns in Indonesian populations where rice serves as the primary daily staple food. The distribution presented in this study therefore illustrates the types of carbohydrate sources commonly consumed by the respondents. These results describe the dietary intake pattern within the study population without evaluating the clinical impact of carbohydrate intake on lipid profile indicators.

Table 3 Frequency Distribution of Carbohydrate Intake.

Variables	Category	N (sample)	Percentage (%)
Carbohydrate	Low	43	66.2
	Adequate	21	32.3
	High	1	1.5
Total		**65**	**100**

Thus, the results of this study indicate that carbohydrate intake in dyslipidemia patients is still insufficient, with a predominance of white rice consumption and minimal variety of complex carbohydrate sources. This type of diet can worsen the lipid profile, so nutritional education is needed to encourage patients to increase their consumption of complex carbohydrates, especially those sourced from grains, tubers, and whole grains as part of the implementation of *precision nutrition* .

Overview of Animal Protein Intake

Based on Table 3, most subjects had varying animal protein intakes depending on the source. Most patients consumed beef in the insufficient category (66.2 %), and none consumed excessively. Goat meat was not consumed at all by all subjects (100%). Conversely, chicken and egg consumption was considered adequate for most subjects (64.6 % and 63.1%), with only a small proportion consuming excessively.

Fish intake was the highest source of animal protein, with 72.3% of subjects reporting sufficient intake, with only 23.1% reporting insufficient intake and 4.6% reporting excessive intake. These findings indicate that fish is the most commonly consumed source of animal protein by dyslipidemia patients, while red meat and fatty meats such as beef, lamb, and duck are relatively infrequently consumed.

Table 4 Frequency Distribution of Animal Protein Intake .

Variables	**Category**	**N (sample)**	**Percentage (%)**
	Low	43	66.2
Beef	Adequate	22	33.8
	High	0	0
Total		**65**	**100**
	Low	65	100
Lamb	Adequate	0	0
	High	0	0
Total		**65**	**100**
	Low	21	32.3
Chicken meat	Adequate	42	64.6
	High	2	3.1
Total		**65**	**100**
	Low	63	96.9
Duck Meat	Adequate	2	3.1
	High	0	0
Total		**65**	**100**
	Low	15	23.1
Fish	Adequate	47	72.3
	High	3	4.6
Total		**65**	**100**
	Low	22	33.8
Chicken eggs	Adequate	41	63.1
	High	2	3.1
Total		**65**	**100**

Table 4 shows the distribution of animal protein intake among the respondents. Fish was reported as the most frequently consumed animal protein source, followed by chicken and eggs. Meanwhile, the intake of red meat such as beef was relatively lower among participants. This distribution suggests that dyslipidemia patients in this study tend to consume certain types of animal protein more frequently than others. The variation in intake patterns may reflect differences in food availability, dietary habits, and individual preferences among respondents. The findings provide descriptive information regarding the types of animal protein commonly consumed within the study population.

Table 5 Frequency Distribution of Animal Protein Intake.

Variables	Category	N (sample)	Percentage (%)
Animal Protein	Low	17	26.2
	Adequate	48	73.8
	High	0	0
Total		**65**	**100**

Table 4 shows the distribution of vegetable protein intake among the respondents. The results indicate that several sources of plant-based protein such as tofu and tempeh are commonly consumed by the participants. These foods represent traditional protein sources that are widely available and form an important component of daily meals within the community. The consumption pattern observed in this study suggests that plant-based protein foods are regularly included in the dietary intake of dyslipidemia patients participating in the Prolanis program. The variability in intake frequency among respondents may reflect differences in dietary habits, household food availability, and personal preferences. The findings therefore illustrate the pattern of vegetable protein consumption within the study population without assessing its clinical impact on lipid profile indicators.

Overview of Vegetable Protein Intake

Based on Table 6, most subjects had a fairly good vegetable protein intake. The majority of subjects consumed tofu and tempeh in the adequate category, at 70.8 % , respectively . Only a small proportion of subjects consumed excessive amounts of tofu and tempeh (12.3 % and 10.8%, respectively), while the proportion of subjects who consumed both was relatively small (16.9% and 18.5%). In contrast, for the legume group, the majority of subjects were still classified as insufficient (63.1 %), and only 33.8% consumed sufficient amounts.

Table 6 Frequency Distribution of Vegetable Protein Intake.

Variables	Category	N (sample)	Percentage (%)
Know	Low	11	16.9
	Adequate	46	70.8
	High	8	12.3
Total		**65**	**100**
Tempeh	Low	12	18.5
	Adequate	46	70.8
	High	7	10.8
Total		**65**	**100**

Variables	Category	N (sample)	Percentage (%)
	Low	41	63.1
Nuts	Adequate	22	33.8
	High	2	3.1
Total		**65**	**100**

Table 6 presents the distribution of vegetable protein intake among the respondents. The results indicate that tofu and tempeh were the most commonly consumed plant-based protein sources among the participants. These foods represent traditional protein sources that are widely available and commonly included in daily meals within the community. Other sources such as nuts were consumed less frequently. The variation in intake patterns observed in this study reflects dietary habits and food preferences among the respondents. These findings provide a descriptive overview of plant-based protein intake among dyslipidemia patients participating in the Prolanis program.

Table 7 Vegetable Intake.

Variables	Category	N (sample)	Percentage (%)
	Low	5	7.7
Vegetable Protein	Adequate	45	69.2
	High	15	23.1
Total		**65**	**100**

Thus, the results of this study indicate that the vegetable protein intake pattern of dyslipidemia patients is quite good, but still needs to be improved, especially in the consumption of nuts. The combination of low-fat plant and animal protein sources is an important part of the *precision nutrition approach* in preventing and controlling dyslipidemia.

Fat Intake Overview

Table 8 shows that most subjects had varying fat intakes depending on the source. Most subjects had insufficient coconut oil intake (76.9 %), with only 6.2% being classified as excessive. For palm oil, the distribution of intake was relatively balanced between insufficient (44.6 %) and sufficient (43.1%), with 12.3% of subjects consuming excessive amounts. Meanwhile, olive oil and butter consumption were very low, with 93.8 % and 92.3% of subjects , respectively, being classified as insufficient.

Table 8 Frequency Distribution of Fat Intake.

Variables	Category	N (sample)	Percentage (%)
	Low	50	76.9
Coconut oil	Adequate	11	16.9
	High	4	6.2
Total		**65**	**100**
Palm Oil	Low	29	44.6

Variables	Category	N (sample)	Percentage (%)
	Adequate	28	43.1
	High	8	12.3
Total		**65**	**100**
	Low	61	93.8
Olive oil	Adequate	3	4.6
	High	1	1.5
Total		**65**	**100**
	Low	60	92.3
Butter	Adequate	4	6.2
	High	1	1.5
Total		**65**	**100**

The distribution of fat intake among respondents is presented in Table 8. The results indicate that palm oil was the most frequently used cooking fat among the participants, while the consumption of coconut oil was reported less frequently. This finding reflects the common use of palm oil as the primary cooking oil in many Indonesian households. Differences in fat intake patterns among respondents may be influenced by cooking habits, food availability, and household dietary practices. The results therefore illustrate the types of fat sources commonly used by dyslipidemia patients in the study population.

These results indicate that palm oil is the most frequently used fat source by dyslipidemia patients, replacing coconut oil which is generally less frequently used in households. The low use of olive oil may be due to economic factors and limited access, as olive oil is not commonly used as a daily cooking ingredient in Indonesia.

This consumption pattern has implications for blood lipid profiles. Palm oil and coconut oil both contain high amounts of saturated *fatty acids , which can increase* LDL cholesterol levels if consumed excessively. In contrast, olive oil contains monounsaturated fats (MUFAs) and polyphenolic compounds that have cardioprotective effects, including lowering total and LDL cholesterol levels and increasing HDL. The results of this study also align with the findings of Arnesen (2023), who reported that replacing 10% of energy intake from saturated fat with unsaturated fat can reduce total cholesterol levels by 8–10%.

Table 9 Frequency Distribution of Fat Intake.

Variables	Category	N (sample)	Percentage (%)
	Low	60	92.3
Fat	Adequate	4	6.2
	High	1	1.5
Total		**65**	**100**

Thus, it can be concluded that the fat intake of dyslipidemia patients in this study was low and dominated by saturated fat, particularly from palm oil. The low consumption of olive oil and other unsaturated fat sources suggests that the application of *precision nutrition* in fat management needs to be strengthened. Education on balanced nutrition, including the use of healthy vegetable oils, is important to help improve the blood lipid profile of dyslipidemia patients.

Vegetable Intake Overview

Based on Table 10, most subjects had sufficient vegetable intake, namely 50 subjects (76.9 %). A total of 9 subjects (13.8 %) were classified as insufficient in vegetable consumption, and 6 subjects (9.2%) were classified as excessive.

Table 10 Frequency Distribution of Vegetable Intake.

Variables	**Category**	**N (sample)**	**Percentage (%)**
	Low	9	13.8
Vegetables	Adequate	50	76.9
	High	6	9.2
Total		**65**	**100**

Table 10 shows that the majority of respondents reported sufficient vegetable intake. Only a smaller proportion of participants were categorized as having low vegetable consumption. These findings indicate that vegetables are regularly included in the daily dietary patterns of many dyslipidemia patients participating in the Prolanis program. The distribution of intake categories reflects the variation in vegetable consumption among the study population. The results provide a descriptive overview of vegetable intake patterns without assessing their clinical relationship with lipid profile parameters.

Fruit Intake Overview

Based on Table 11, most subjects had sufficient fruit intake, namely 44 samples (67.7 %). A total of 16 samples (24.6 %) were still classified as insufficient, while 5 samples (7.7%) consumed excessive amounts of fruit.

Table 11 Frequency Distribution of Fruit Intake.

Variables	**Category**	**N (sample)**	**Percentage (%)**
	Low	16	24.6
Fruit	Adequate	44	67.7
	High	5	7.7
Total		**65**	**100**

The data presented in Table 11 show that most respondents had fruit intake classified in the sufficient category. A smaller proportion of participants reported inadequate fruit consumption. This distribution indicates that fruit is commonly included in the dietary patterns of the respondents, although the frequency of intake varies among individuals. Differences in fruit consumption patterns may reflect personal preferences, food availability, and dietary habits among participants. These findings provide descriptive information regarding fruit intake among dyslipidemia patients participating in the Prolanis program.

Body Mass Index Overview

Based on Table 12, most of the subjects had obesity nutritional status, namely 30 samples (46.2 %) were included in obesity category I and 7 samples (10.8%) were obesity II. A total of 12 samples (18.5 %) were classified as *overweight* , 15 samples (23.1%) had normal BMI, and only 1 sample (1.5%) was classified as *underweight* .

Table 12 Frequency Distribution of Body Mass Index.

Variables	Category	N = 65	Percentage (%)
Body Mass Index	*Underweight*	1	1.5
	Normal	15	23.1
	Overweight	12	18.5
	Obesity I	30	46.2
	Obesity II	7	10.8
Total		**65**	**100**

Table 12 presents the distribution of body mass index (BMI) among the respondents. The results indicate that a considerable proportion of participants were classified as overweight or obese, while others were within the normal BMI category. This distribution reflects variability in the nutritional status of dyslipidemia patients participating in the Prolanis program. The observed differences in BMI categories illustrate the range of anthropometric conditions among the study population. The findings therefore provide descriptive information regarding the nutritional status of the respondents based on BMI measurements.

Overview of Total Cholesterol Levels

Based on Table 13, The distribution of total cholesterol levels among the research subjects showed that 26 samples (40%) were in the desirable (normal) category, 25 samples (38.5%) were categorized as borderline high, and 14 samples (21.5%) were categorized as high.

Table 13 Frequency Distribution of Total Cholesterol Levels

Variable	Category	Value (mg/dL)	N (samples)	Percentage (%)
Total Cholesterol	Desirable (Normal)	< 200	26	40
	Borderline High	200–239	25	38.5
	High	> 240	14	21.5
Total			65	100

Table 13 presents The results of this study indicate that most dyslipidemia patients in this study had desirable (normal) total cholesterol levels. This finding can be explained through the concept of dynamic cholesterol homeostasis, as described in the study by Nitu (2025) in Romania, where cholesterol levels in the body are regulated through a balance between cholesterol synthesis in the liver, cholesterol absorption from dietary intake, and the clearance of cholesterol from the bloodstream. The liver regulates cholesterol levels through feedback mechanisms involving LDL receptor expression, intracellular cholesterol sensing, and cholesterol excretion through bile. When intracellular cholesterol levels are sufficient, endogenous cholesterol synthesis is suppressed, while cholesterol clearance through LDL receptors and reverse cholesterol transport mediated by HDL continues. Under these conditions, total cholesterol levels can remain within the normal range as long as compensatory mechanisms function properly, even when lipid metabolism disturbances occur in certain fractions, considering that total cholesterol represents the accumulation of cholesterol derived from LDL, HDL, and VLDL.

Distribution of Triglyceride Levels

Based on Table 14, the distribution of triglyceride levels among the study subjects showed that 36 samples (55.4%) were categorized as normal, 7 samples (10.8%) were categorized as borderline high, 21 samples (32.3%) were categorized as high, and 1 sample (1.5%) was categorized as very high.

Table 14 Frequency Distribution of Triglyceride Levels

Variable	Category	Value (mg/dL)	N (samples)	Percentage (%)
Triglycerides	Normal	< 150	36	55.4
	Borderline High	150–199	7	10.8
	High	200–499	21	32.3
	Very High	> 500	1	1.5
Total			65	100

The results of this study indicate that most dyslipidemia patients in this study had normal triglyceride levels. This finding may be explained by the fact that triglycerides are the lipid fraction that responds most rapidly to lifestyle changes and metabolic control compared with other lipid fractions, as reported in a study by Caldo (2021) in Portugal. The regulation of triglyceride levels is strongly influenced by the balance between VLDL production in the liver and the efficiency of triglyceride clearance through lipolysis mediated by the lipoprotein lipase (LPL) enzyme. In addition to LPL, apolipoprotein C-III (ApoC-III) plays an important role as a major inhibitor of triglyceride clearance by suppressing LPL activity and inhibiting the hepatic uptake of triglyceride-rich lipoproteins. Improvements in insulin sensitivity, better glycemic control, and dietary changes particularly a reduction in simple carbohydrate intake can reduce ApoC-III expression and VLDL production, thereby allowing triglyceride levels to normalize more rapidly, even before other lipid fractions fully improve. In addition to reflecting VLDL production, plasma triglyceride levels also represent the dynamics of triglyceride-rich lipoproteins (TRLs), including VLDL and remnant particles, which are considered atherogenic.

LIMITATION OF THE STUDY

The limitations of this study are related to the diversity of food components. The questionnaire used was not fully able to comprehensively capture detailed variations in food composition, including cooking methods, combinations of ingredients within a single dish, the use of seasonings, and variations in nutrient content among similar types of food ingredients. These differences may affect the levels of carbohydrates, fiber, fat, protein, and micronutrients involved in lipid metabolism, potentially leading to inaccuracies in estimating nutrient intake among subjects.

In addition, data collection was conducted within a single measurement period. Lipid profiles and dietary intake are dynamic parameters that can fluctuate over time; therefore, a longer observation period, approximately 1–3 months, would ideally be required to obtain a more representative and stable depiction of the subjects' metabolic conditions. A single measurement may not fully reflect long-term metabolic patterns and habitual dietary intake. This limitation is related to time constraints and the cross-sectional design of the study.

Another limitation is that this study did not comprehensively examine all components of precision nutrition. Factors such as gut microbiome composition (including probiotics and prebiotics), individual responses to food (nutrigenomics), daily physical activity levels, and the use of monitoring tools such as dietary and activity tracking applications were not analyzed in depth. These limitations were due to constraints in resources, diagnostic facilities, and the study's focus on clinical and dietary intake aspects..

CONCLUSIONS AND SUGGESTIONS

The characteristics of the study subjects among patients with dyslipidemia at Healthy Life Clinic Bandung showed that the majority were elderly, with 36 subjects (55.4%), and a predominance of female patients, totaling 52 subjects (80%). This indicates that dyslipidemia in this clinical setting was more commonly found among older adults and women.

The profile of total cholesterol levels revealed that the largest proportion of patients fell within the desirable (normal) category, comprising 26 subjects (40%). Similarly, the triglyceride profile showed that most patients were in the normal category, with 36 subjects (55.4%). Although the majority were classified as normal, a substantial proportion still presented with elevated lipid levels, indicating a potential risk for metabolic and cardiovascular complications.

Regarding the precision nutrition components related to dietary intake, white rice was identified as the most frequently consumed carbohydrate source, with 30 subjects (46.2%) categorized as having adequate intake. Fish was the most commonly consumed animal protein source, with 47 subjects (72.3%) in the adequate category. Plant-based protein sources, particularly tofu and tempeh, were each consumed adequately by 46 subjects (70.8%). Palm oil was the fat source most frequently consumed in the adequate category, accounting for 28 subjects (43.1%). Adequate vegetable consumption was observed in 50 subjects (76.9%), while adequate fruit consumption was reported in 44 subjects (67.7%).

In terms of precision nutrition components related to nutritional status, Body Mass Index (BMI) findings showed that the largest proportion of subjects were classified as Class I obesity, with 30 subjects (46.2%). This finding highlights the high prevalence of overweight and obesity among patients with dyslipidemia in this study.

Future studies are recommended to conduct a more detailed assessment of the types of foods consumed, including cooking methods, the use of seasonings, as well as the type and quantity of oils used in food preparation, in order to obtain more accurate estimates of nutrient intake. In addition, the use of a cohort study design is highly recommended so that fluctuations in lipid profiles and dietary intake patterns can be monitored longitudinally, providing a more comprehensive understanding of metabolic changes over time. Future research should also analyze the components of precision nutrition more thoroughly by considering factors such as gut microbiome composition, nutrigenomic aspects, and daily physical activity levels, thereby enabling the development of more individualized and evidence-based nutritional intervention approaches.

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