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Association between diet quality and nutritional status in heart failure patients: A cross-sectional study

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ABSTRAK

Latar Belakang: *Gagal jantung merupakan penyakit dengan angka kejadian dan kematian yang tinggi, yang menyerang 64,34 juta orang di seluruh dunia. Di Indonesia, lebih dari 1,5% penduduk, atau sekitar 1.017.290 orang, telah didiagnosis menderita gagal jantung. Kondisi ini memiliki angka kematian yang signifikan, dengan 9,91 juta kematian di seluruh dunia. Faktor gaya hidup, seperti pola makan, memegang peranan penting dalam perkembangannya.*
Tujuan: *Mengetahui apakah terdapat hubungan antara kualitas diet dengan status gizi pada pasien dengan gagal jantung.*
Metode: *Penelitian ini menggunakan desain cross-sectional. Penelitian dilaksanakan di RSU Siaga Medika Purbalingga dengan jumlah responden sebanyak 110 orang menggunakan metode consecutive sampling dengan kriteria inklusi pasien gagal jantung kongestif dengan rentan usia 17 - <65 tahun baik wanita maupun pria. Data asupan makan dikumpulkan menggunakan kuesioner Recall 24 Hours dan formulir Diet Quality Index International (DQI-I) Data asupan makanan akan diolah menjadi beberapa jenis asupan makanan yang nantinya akan dihitung menggunakan perangkat lunak berupa nutrisurvey. Analisis statistic yang digunakan pada penelitian ini adalah uji fisher dan juga uji mann- whitney.*
Hasil: *analisis menunjukkan bahwa tidak ada hubungan yang signifikan antara kualitas diet dengan status gizi pada pasien dengan gagal jantung, dengan p-value sebesar 0.883. P-value lebih besar dari nilai signifikansi yang biasanya digunakan menunjukkan bahwa tidak terdapat hubungan antara kualitas diet dengan status gizi.*
Kesimpulan: *Hubungan antara kualitas diet dengan status gizi pada pasien dengan gagal jantung didapatkan hasil yang tidak signifikan. Subjek/ responden penelitian ini tidak terlalu banyak, pada penelitian selanjutnya dapat dilakukan dengan subjek/ responden lebih banyak sehingga mendapatkan hasil yang mungkin bisa dijandikan acuan lainnya untuk pengemabangan pada penelitian selanjutnya dengan variable atau penyakit berbeda.*

KATA KUNCI*: Diet Quality Index-International (DQI-I); diet recall 24 hours; gagal jantung; kualitas diet; status gizi*

ABSTRACT

Background: *Heart failure is a disease with a high incidence and mortality rate, affecting 64.34 million people worldwide. In Indonesia, over 1.5% of the population, or approximately 1,017,290 individuals, have been diagnosed with heart failure. This condition has a significant mortality rate, with 9.91 million deaths attributed to it globally. Lifestyle factors, such as diet, play a crucial role in its development.*

Objectives: *to determine whether there is a relationship between diet quality and nutritional status in patients with heart failure.*

Methods: *The research was carried out at RSU Siaga Medika Purbalingga with a total of 110 respondents using the consecutive method with the inclusion criteria of heart failure patients aged 17 - <65 years, both women and men. The method used is a cross-sectional study in the form of analytical observational data collection techniques using a questionnaire in the form of a 24 Hour Diet Recall and Diet Quality Index International (DQI-I) form and interviews are conducted by signing an informed consent. The data obtained from the interviews in the form of food intake data will be processed and divided into several types of food intake which will later be calculated using software in the form of nutrisurvey. The statistical analysis used in this study is the Fisher test and the Mann-Whitney test.*

Results: *The analysis showed that there was no significant relationship between diet quality and nutritional status in patients with heart failure, with a p-value of 0.883. This p-value is greater than the significance value usually used, indicating that there is no relationship between diet quality and nutritional status.*

Conclusions: *The relationship between diet quality and nutritional status in patients with heart failure obtained insignificant results. The subjects/respondents of this study were not too many, in further research it can be done with more subjects/respondents so that the results can be used as other references for development in further research with different variables or diseases.*

KEYWORDS*:* *Diet Recall 24 Hours; Diet Quality Index-International (DQI-I); Heart failure, Nutritional status; Diet quality*

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INTRODUCTION

Heart failure is a clinical syndrome characterized by symptoms such as dyspnea, swelling in the extremities (ankles), and fatigue accompanied by signs such as increased jugular venous pressure, pulmonary sounds and peripheral edema (1). Heart failure is a clinical syndrome with signs and symptoms that are caused by abnormalities in cardiac structure and/or function and followed by presence of increased natriuretic peptide levels and/or objective evidence of pulmonary or systemic congestion (2). Globally, heart disease has been the leading cause of death worldwide for the past 20 years. The number of heart failure cases reached 64.34 million cases with a death rate of 9.91 million (3). In Indonesia, heart failure was reported as the second leading cause of mortality in 2018, with a prevalence of 1.5% (1.017.290 cases) according to the Ministry of Health (4). Meanwhile 2019 cases of heart failure in Central Java were estimated at 132.565 (1.6%) cases, both those who had received treatment and those who had just been diagnosed (5). Nutritional status is a physical sign caused by the balance in all aspects, both food intake and activities carried out, the data for which can be collected in several ways, such as anthropometry, biochemistry, clinical, and also food intake (6). Diet quality is the consumption of food by a person including macro and micro nutrients. Diet quality is the intake of any food consumed by a person that will affect the quality of both development and growth (7). In heart failure patients, poor diet quality may contribute to disease progression and impaired

nutritional status. A study conducted a year earlier examined the relationship between nutritional status and high-saturated-fat diet consumption in patients with coronary heart disease. This study was conducted at Harapan Kita Regional General Hospital (RSJPD) in Jakarta, with 97 respondents aged 50-64 years (elderly) (8). Based on these findings, this study aims to investigate the relationship between diet quality and nutritional status in patients with other types of heart disease, such as heart failure, and to examine not only the elderly but also a more general age group. The results are expected to contribute to identifying potential risk factors and help determine appropriate dietary recommendations for individuals with heart failure.

MATERIALS AND METHODS

This study used a cross-sectional study in the form of an analytical observational study using a consecutive method with inclusion criteria. Based on the G-power calculation and adding 10% drop outs, a sample of 110 people was obtained. Sampling used a consecutive method with the inclusion criteria: 1) Aged 17 -<65 years 2) diagnosed with heart failure 3) Cooperative and willing to participate by signing an informed consent letter. Subjects will be excluded from participation if they meet the exclusion criteria, namely being unwilling or uncooperative in filling out the consent form and questionnaire sheet. Of the 110 selected respondents, 62 male patients and 48 female patients met the criteria and were willing to become research subjects. The research was conducted at RSU Siaga Medika Purbalingga from the end of September to October 2024.

Variables of this research consist of diet quality as the independent variable and nutritional status as the dependent variable. Diet quality with its components is an assessment of how good the subject's food consumption or intake is which is then collected through interviews and filling out a questionnaire in the form of a 24 Hour Food Recall with additional question items in the form of age, gender, education level, marital status, employment status, ethnicity, history of taking medication, smoking and exercise history which are analyzed using computer software in the form of Nutrisurvey 2007. Patients are asked to be available to fill out the consent form and questionnaire provided and the data obtained is then processed using nutrisurvey. The data collected is in the form of food and drink intake consumed by the subject within 24 hours (one day) as well as information regarding the subject's age, weight, body height, smoking history, level of education, drug consumption, employment status, marital status and exercise. Data is collected for one month and reviewed to obtain valid results or data.

The results of the diet quality index were analyzed using the Diet Quality Index International (DQI-I). DQI-I is a diet quality assessment used by various countries which will later be adapted to the research conducted. The dietary assessment used in this study is the RDA or balanced nutritional intake according to the DQI-I standard with 4 sub-assessments or special categories (variety, adequacy, moderation and overall balance of components). Variation is assessed by the total amount and variety of protein sources, adequacy is assessed by the number or value of fulfilling nutrients based on daily values, moderation is assessed by calculating the amount of total fat, saturated fat, cholesterol, sodium and non-calorie foods. The overall component assessment is taken from the distribution of macronutrients and fatty acids. With initiation, the DQI-I score ranges from 0-100, with scores for variation 0-20, adequacy scores 0-40, moderation scores 0-30, and overall balance scores 0-10, if the total score is <60% indicating the highest score (good high), if the score >60% percent indicates poor diet quality (9).

The statistical analysis used in this study is the Fisher test and the Mann-Whitney test. The results of the BMI calculation or body weight and height will be entered into a categorization based on Asia Pacific criteria (<18.5: Underweight), (18.5-22.9: Normal body weight), (23-24.9: Overweight), (25-29.9: Obesity I), (>30: Obesity II) (10). Ethical approval was obtained from the Medical and Health Research Ethics Commission (KEPKK) of the Faculty of Medicine, Muhammadiyah University with Number: No. KEEKKPK/FK/038/X/2024.

RESULTS AND DISCUSSIONS

Among the 110 subjects, 62 were male and 48 female, aged 17 - <65 years, with the majority

of sufferers being old adults and elderly, with the highest level of education being elementary school, the majority were from Javanese ethnicity, the majority of subjects did not take additional medication other than that prescribed by a heart specialist and most subjects did not smoke or had stopped smoking and 50% of subjects exercised every day. Regarding BMI classification, 3 subjects were underweight 43 were normal BMI, 33 subjects were overweight, 29 subjects were obese class I, and 3 were obese BMI II. The percentage of diet quality obtained the majority of 95 subjects with a score of <60, while15 subjects had a moderate score or 60-80. None of the subjects had a high diet quality (>80).

Table 1. Subject characteristics

Characteristics		**N (%)**
Gender	Man	62 (56)
	Woman	48 (44)
Age	Young (20-30)	1 (1)
	Adult (30-40)	11 (8)
	Old (40-65)	65 (63)
	Elderly (<65)	33 (28)
Educational Level	Elementary	86 (81)
	JHS	1 (1)
	SHS	4 (4)
	D3	3 (3)
	S1	1 (1)
	No School	12 (10)
Diet Quality (Food Variation)	Less (<60)	95 (87)
	Medium (60-80)	15 (13)
	High (>80)	0 (0)
Nutritional Status (IMT)	Underweight (<18.5)	3 (3)
	Normal (18.5-22.9)	43 (39)
	Overweight (23-24.9)	33 (30)
	Obesity 1(25-29.9)	29 (26)
	Obesity 2(>30)	3 (2)
Regional Origin	Java	110 (100)
	Outside Java	0 (0)
Smoke	Yes	0 (0)
	No	110 (100)
Consumption Of Medicine	Yes	30 (27)
	No	80 (73)
Sport (30-45 minutes)	Yes	55 (50)
	No	55 (50)
Heart Failure (Ef)	HFRef(Heart Failure with Reduced Ejection Fraction)	35 (32)
	HFmrEF (Heart Failure with Reduced Ejection Fraction)	11 (10)
	HFpEF (Heart Failure with Preserved Ejection Fraction)	64 (58)

Based on the results of research conducted on heart failure patients at RSU Siaga Medika Purbalingga, the majority of heart failure patients (64 people) were in the HFpEF category or heart failure with preserved ejection fraction were seen from LVEF on echocardiography examination of >50% followed by evidence of structural and/or functional abnormalities of the heart that are consistent with increased diastolic dysfunction including increased LV filling pressure including increased natriuretic peptides, in the other part as many as 35 subjects were in the HFrEF category or heart failure with reduced ejection

fraction where LVEF on echocardiography examination was between <40% with signs and symptoms, and as many as 11 people with the HFmrEF category which means heart failure with slightly reduced ejection fraction or LVEF of 41% -49% followed by signs and symptoms. The symptoms in question are shortness of breath, the presence or occurrence of swelling in the ankles or extremities and also excessive fatigue, while signs of heart failure itself can be in the form of increased pressure in the jugular vein, a crackling sound in the beak and also the occurrence of peripheral edema (11).

Table 2. Subject diet quality category overview

Component	Category	N (%)
Adequacy		
Vegetable group	good (≥ 3-5 servings/day)	23 (20.1)
	enough (< 3-1.5 servings/day)	53 (48.6)
	less (< 1.5 servings/day)	34 (31.1)
Fruit group	good (≥ 2-3 servings/day)	32 (29.3)
	enough (< 2-1 serving/day)	20 (17.4)
	less (< 1 serving/day)	58 (53.2)
Staple food groups	good (≥ 3-5 servings/day)	64 (58.1)
	enough (< 3-1.5 servings/day)	35 (31.8)
	less (< 1.5 servings/day)	11 (1.9)
Fiber	good (≥ 20-30 g/day)	23 (21.1)
	sufficient (< 20-10 g/day)	42 (47.6)
	less (< 10 gr/day)	45(41.2)
Protein	good (≥ 15% energy/day)	35 (32.1)
	sufficient (<15%-7.5% energy/day)	0 (0)
	lack (< 7.5% energy/day)	75 (67.9)
Iron	good (≥ 100% RDA mg/day)	41 (38.8)
	sufficient (< 100-50% akg mg/day)	17 (10.2)
	less (< 50%akg mg/day)	52 (51)
Calcium	good (≥ 100% RDAmg/day)	4 (0.3)
	sufficient (< 100-50% akg mg/day)	23 (20.9)
	less (< 50% rda mg/day)	83 (76.1)
Vitamin c	good (≥ 100% RDA mg/day)	0 (0)
	sufficient (< 100-50% akg mg/day)	0 (0)
	less (<50%akgmg/day)	110 (100)
Moderation		
Total fat	good (≤ 30% total energy/day)	93 (85.3)
	more (> 30% total energy/day)	17 (14.6)
Saturated fat/sfa	good (≤ 10% total energy/day)	22 (19.2)
	more (> 10% total energy/day)	88 (80.7)
Cholesterol	good (≤ 300 mg/day)	77(70.6)
	more (> 300 mg/day)	33(29.3)
Sodium	good (≤ 2400 mg/day)	107(98.1)
	more (> 2400 mg/day)	3(0,1)
Zero calorie foods	good (≤ 10% total energy/day)	3(0,1)

Component	Category	N (%)
	more (>10%total energy/day)	107(98.1)
Variation		
All group food	5 food groups/day	33(29.3)
	4 food groups/day	22(20)
	3 food groups/day	30(28.2)
	2 food groups/day	25(22.5)
Protein group	good (≥ 3 different sources/day)	78(70.5)
	enough (2 different sources/day)	30(28.7)
	less (≤1 source/day)	2(0.1)
Balance		
Macronutrient ratio	good (55-65: 20-15: 15-25)	10(9)
	enough (52-68:9-16:13-27) / (50-70:8-17:12-30)	100(91.0)
	less (other)	0(0)
Fatty acid ratio	good (p/s = 1-1.5 and ms = 11.5)	55(50)
	sufficient (p/s = 0.8-1.7 and ms = 0.8-1.7)	55(50)

The results of the analysis are categories of diet quality based on the intake consumed by the subject. Research results on consumption of vegetables, fruit, staple foods, fiber, protein, iron, calcium and vitamin C. With an average result of 12.6. In the vegetable consumption group, 53 subjects (48.6%) consumed vegetables as much as (<3-1.5 servings/day) and could be classified as sufficient consumption, as many as 23 subjects (20.1%) consumed as much (>3-5 servings/day) which was classified as good, and 34 subjects (31.1%) were classified as inadequate with the amount consumed (<1-1.5 servings/day). In the fruit consumption group, 32 subjects (29.3) were classified as good with the amount of daily fruit consumption (>2-3 servings/day), 20 subjects (17.4%) were classified as adequate with the amount of daily fruit consumption (<2-1 servings/day), and 58 subjects (53.2%) were classified as poor with the amount of fruit consumption (<1 serving of fruit/day). Staple food consumption was found by 64 subjects (58.1%) who were classified as good with the amount of consumption (>3-5 servings/day), 35 subjects (31.8%) were classified as sufficient with consumption (<3-1.5 servings/day), and 11 subjects (1.9%) were classified as poor with the amount of consumption (<1.5 servings/day). Fiber consumption in 23 subjects (21.1%) was categorized as good with a consumption amount of (>20-30 g/day), 42 subjects (47.6%) was categorized as sufficient with a consumption amount of (<20-10 g/day), and 45 subjects (41.2%) were categorized as poor with a consumption amount of (<10 g/day).

Protein consumption in 35 subjects (32.1%) was categorized as good with the amount of consumption (>15% energy/day) and 75 subjects (67.9%) was categorized as poor with the amount consumed (<15%-7.5% energy/day). Iron consumption in 41 subjects (38.8%) was categorized as good with the amount consumed as much as (>100% RDA mg/day), 17 subjects (10.2%) categorized as adequate with the amount consumed as (<100%-50% RDA mg/day), and 52 subjects (51%) categorized as poor with the amount consumed as (<50% RDA mg/day). The calcium consumption of 4 subjects (0.3) was categorized as good with the amount of consumption of (>100% RDA mg/day), 23 subjects (20.9%) were categorized as adequate with the amount of daily consumption of (<100%-50% RDA mg/day), and 83 subjects (76.1%) were categorized as poor with the amount of consumption of (<50% RDA mg/day). In terms of vitamin C consumption, a total of 110 subjects (100%) received the deficient category with a consumption rate of (<50% RDA mg/day).

Table 3. Minimum, maximum, average and standard values for diet quality

Variables	Minimum	Maximum	SD Average
Diet Quality (Total Score)	34	62	60.5
Variation (Score)	10	17	16.2
All Food Groups (Food Groups/Day)	3	4	3.5
Protein Sources (Type/Day)	1	5	2.7
Adequacy (Score)	11	28	12.6
Vegetable Groups (Servings/Day)	1	5	2.9
Fruit Groups (Servings/Day)	0	3	2.9
Staple Food Groups (Portions/Day)	1	5	3.9
Fiber (g/day)	3.7	76.2	13.9
Protein (g/day)	7	150.3	135
Iron (mg/day)	1.2	31	27.7
Calcium (mg/day)	51.8	913.8	372.4
Vitamin C (mg/day)	4.2	158.8	69.5
Moderation (Score)	12	24	16
Total Fat (g/day)	5.6	176.4	47
Saturated Fat/SFA (g/day)	6.4	50.3	28.1
Cholesterol (g/day)	4.9	217.4	129.8
Sodium (mg/day)	49.9	2085.6	218.6
Low Nutrient Foods (% Total Energy)	4	72	68.6
Overall Balance (Score)	0	6	3.3
Macronutrients	0	6	0.8
Fatty Acid	0	2	1.4
PUFA (g/day)	1.7	49	33.6
MUFA (g/day)	3.9	32.4	29.5

The results of the research on consumption of fatty acids, total fat, saturated fat, cholesterol, sodium and non-calorie foods showed that the average was 16. In the total fat group, 93 subjects (85.3%) were categorized as good with an average consumption rate of (<30% total energy/day) and 17 subjects (14.6%) were categorized as more with a consumption rate of (>30% total energy/day).

In the saturated fat/SFA group, 22 subjects (19.2%) were categorized as good with an average consumption of (<10% total energy/day) and 88 subjects (80.7%) were categorized as better with an average consumption of (>10% total energy/day).

In the cholesterol group, 77 subjects (70.6%) were categorized as good with an average consumption of more (<300 mg/day) and 33 subjects (29.3%) were categorized as more with an average consumption of (>300 mg/day). In the sodium group, 107 subjects (98.3%) were categorized as good with an average consumption of (>2400 mg/day) while 3 subjects (0.1%) were categorized as better with an average consumption of (2400 mg/day). In the non-calorie food group, 3 subjects (0.1%) were categorized as good with an average consumption of (<10% total energy/day) and 107 subjects (98.3%) were categorized as excessive, categorized as good with an average consumption of (>10% total energy/day).

The research results for all food and protein groups consumed showed an average of 16.2. A total of 33 subjects consumed 5 food groups/day, 22 other subjects consumed 4 food groups/day, 30 subjects consumed 3 food groups and 25 other subjects consumed 2 food groups. In the protein group, 78 subjects (70.5%) were categorized as good with an average consumption of (>3 different sources/day), 30 subjects (28.7%) were categorized as sufficient with an average consumption of (2 different sources/day), and 2 subjects (0.1%) were categorized as poor with an average consumption of (<1 different source/day).

Research results on consumption figures for macronutrients, fatty acids, PUFA and MUFA. With an average of 3.3. The macronutrient ratio group of 10 subjects (9%) was categorized as good and 100 subjects (91.0%) were categorized as sufficient. In the fatty acid ratio group, 55 subjects (50%) were categorized as good and the other 55 subjects (50%) were categorized as sufficient.

The average result of adequacy in consumption covering fatty acids, total fat, saturated fat, cholesterol, sodium and non-calorie foods was obtained 16 which means very good, with total consumption of fat, cholesterol, and sodium good, but the consumption of saturated fat/SFA and non-calorie foods tends to be higher, namely 88 people with daily SFA/saturated fat consumption below the recommended daily consumption of <10%. The recommendation to limit SFA consumption itself is limited to <10% of total daily calorie consumption where the implementation of this restriction is carried out to prevent vascular disorders or the emergence of diseases related to cardiovascular. The impact of SFA or saturated fat consumption itself has been widely proven in studies both in Indonesia and globally, where many of them say that saturated fat or SFA itself has an effect on the incidence of cardiovascular disease which causes congestive heart failure. Contributors to foods containing SFA can be obtained from milk, red meat, vegetable oil, yogurt, and cheese (12).

The average result of adequate consumption in the overall balance group aims to see the consumption figures for macronutrients, fatty acids, PUFA, and MUFA obtained at 10.8 which means very good with the fulfillment of sufficient macronutrient ratios and the fulfillment of fatty acids that tend to be balanced.

Table 4. Relationship between diet quality and characteristic subject

Characteristic	Diet Qualitiy		P-Value
	Not Enough	Currently	
Nutritional Status			*0.883
Underweight	3		
Normal	38	5	
Overweight	32		
Obesity I	22	7	
Obesity II	3		
Age			*0.454
Young (20-30)	1		
Adult (30-40)	9	2	
Old (40-65)	59	6	
Elderly (<65)	30	3	
Exercise			**0.584
Yes	47	7	
No	49	7	
Smoking			**1.000
Yes	11	1	
No	85	13	
Gender			**1.000
Men	58	10	
Women	38	4	
Education Level			*0.159
No School	11	3	
Elementry	76	10	
Junior High School	1		
Senior High School	3	2	
D3	3		
S1	1		

Note:*result: non-statistical using Mann-Whitney statistical analysis

**result: non-statistical using fisher statistical analysis

Implementation of several diet methods can be done from limiting sodium consumption, controlling saturated fat consumption to changing lifestyle by controlling weight but in heart failure there are two recommended diet patterns, namely the Mediterranean diet and the DASH diet, the Mediterranean diet is a diet that can be done by prioritizing plant foods that are considered safe for most people generally in the Mediterranean area itself, what is consumed is olives, beets, rosemary, oregano and others, in Asia generally consume buckwheat, rice, turnips, spinach, cabbage, beans, onions, broccoli and others, in Africa generally consume sorghum, artichoke, watermelon and melon, while in America they consume tomatoes, pears, avocados, flower seeds, zucchini, potatoes, and beans. The Mediterranean diet is not only used as a cardiovascular diet but also as a diet for liver and metabolic diseases (13)

The DASH diet is a diet that emphasizes the consumption of whole grains, vegetables, fruits, dairy, lean meats, fish, poultry, nuts, legumes and the use of rare oils. The basis of the DASH diet itself is a diet high in antioxidants, micronutrients, fiber, nitrates while low in saturated fat and trans fat. Many studies have proven the effectiveness of the DASH diet for people with cardiovascular disease. DASH diet interventions have been shown to have a positive impact on people with heart failure. The DASH diet has been supported in the USDA dietary guidelines for Americans and is recommended by the American Heart Association/American College of Cardiology (AHA/ACC) as a diet pattern that can help adults lower cholesterol and blood pressure (14).

Statistical tests were carried out using the Mann-Whitney test with non-normal data distribution to state the results of the relationship between diet quality and nutritional status. The results were not significant with a p value of 0.883, which means there is no relationship between diet quality and nutritional status Miskiyah et al (15) Apart from that, in other research conducted by Mardiana et al, it was stated that diet quality was only related to energy and nutritional adequacy but not related to nutritional status (16). In this study, there were obstacles in the form of many patients only remembering their menus, not with exact measurements of diet or food eaten, but this was overcome by measuring using the tools used when taking food such as spoons or rice ladles, obstacles in this study also tended to be few subjects.

The Mann-Whitney test was performed to assess the relationship between diet quality and age. Based on statistical tests, the results were not significant with a p value of 0.454 or there was no relationship between diet quality and age. There has been no research that specifically discusses and proves the relationship between diet quality and age, both in terms of influence and the relationship between the two. In the existing research, there is only research that discusses the relationship between diet quality and longevity, which has been done by Goshen et al by saying that there is an influence on diet quality or food choices on longevity. Their research also proves that healthy food choice patterns can have a lot of influence on good cognitive and mental function in the elderly group (17) The comparison in this study tends to be a little bit only directed at older adults and the elderly while young adults and adolescents are only a little so that the possibility of the results that arise is not significant supported by the relatively small number of subjects.

The relationship between diet quality and exercise was statistically tested using the Fisher test with non-normal data distribution. The results were not significant with a p value of 0.584. In previous research, there were insignificant results between the quality of diet and exercise carried out by teenagers during the Covid-19 period (15). Another study stated that there were no significant results on the quality of diet and physical activity in patients with cardiovascular disease and mortality (18). From the equation above, it is possible to conclude that there is no relationship or indeed there is no relationship between diet quality and exercise, or perhaps in the next study it could be carried out with a larger number of samples to compare the existing results in the future.

A statistical test in the form of the Fisher test was carried out to assess the relationship between diet quality and smoking habits. The results were not significant with a p value of 1.000, means there is no relationship between diet quality and smoking habits. Similar results were also found in previous research conducted on early adult

smokers and on student smokers at the UNESA engineering faculty (19). However, other research shows that there is an influence of smoking on food consumption where active smokers tend to eat food with worse nutritional content than people who do not smoke or have quit smoking (20). This study was conducted on average at the elderly and also old adults where most of them have quit smoking or most of them do not smoke so that the results obtained are likely not significant because the balance of the number of subjects does not meet expectations and also the number of subjects studied tends to be small.

The relationship between diet quality and gender was tested using Fisher's test, and the results were not significant with a p value of 1.000, which means there is no relationship between diet quality and gender. There has been no research that mentions the relationship between diet quality and gender. However, according to Gal et al, it is stated that the tendency for women to have a higher quality diet than men, this is possibly due to perceptions regarding body image, where there is a tendency for many women to try to create or maintain a body shape compared to men (21, 22).

In this study, the majority of the subjects were elderly and old adults, causing the comparison group to be different. Usually, those who tend to maintain their diet will tend to be the majority of young women for aesthetic reasons and also self-confidence factors, but in old adulthood and the elderly, the differences in metabolism and aesthetic influences will automatically change and tend to decrease, so that if there is another study in the future, perhaps young adult and adolescent subjects between men and women can be the next subjects to find the differences and their influences.

Statistical tests in the form of the Mann-Whitney test were carried out to assess the relationship between diet quality and education level. The results were not significant with a p value of 0.159, which means there is no relationship between diet quality and education level. There is no research that specifically discusses the relationship between the two so it would be better if this was reviewed in the future with a larger number of respondents using other measurement methods so that the relationship can be compared and proven.

CONCLUSION AND RECOMMENDATION

The results of the study prove that there is no relationship between diet quality and nutritional status in patients with heart failure. In this study, the subjects taken were relatively small, it is expected that in future studies, more subjects can be used with different instruments in order to see and make comparisons and prove the results obtained, so that it is hoped that it can be proven and can become a concrete reference both in the medical world and in the world of education.

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