

Hubungan Frekuensi Makan dan Pola Makan dengan IMT pada Mahasiswa Tata Boga Universitas Negeri Jakarta

Relationship Of Eating Frequency And Dietary Patterns With BMI Among Culinary Students At Universitas Negeri Jakarta

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Abstract

Background: University students' eating frequency and dietary patterns remain varied and do not fully comply with balanced nutrition guidelines, potentially increasing the risk of nutritional problems. Objective: To analyze the relationship between eating frequency, dietary patterns, and Body Mass Index (BMI) among Culinary students at Universitas negeri Jakarta. Methods: This quantitative correlational study used a cross-sectional design involving 147 students selected through proportionate stratified random sampling. Eating frequency was assessed using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), while dietary patterns were measured using Food Recall. Data were analyzed using Spearman's rank correlation and ordinal logistic regression. Results: No significant relationship was found between the frequency of energy ($p=0.125$), protein ($p=0.140$), and fat intake ($p=0.516$) and BMI. However, carbohydrate intake frequency was significantly associated with BMI ($p=0.004$). Dietary patterns of energy ($p=0.001$), carbohydrate ($p=0.036$), protein ($p=0.001$), and fat intake ($p=0.026$) were significantly associated with BMI. Carbohydrate intake pattern was identified as the strongest determinant, increasing the likelihood of BMI variation by 2.94 times. Conclusion: Carbohydrate intake frequency and dietary patterns of energy, carbohydrate, protein, and fat were significantly associated with BMI. Recommendation: Nutrition education programs on healthy eating frequency and dietary patterns should be strengthened among university students.

Keywords: Eating Frequency, Consumption Patterns, Body Mass Index, Students

Abstrak

Latar Belakang: Frekuensi makan dan pola makan mahasiswa masih bervariasi dan belum sepenuhnya mematuhi pedoman gizi seimbang, sehingga berpotensi meningkatkan risiko masalah gizi. Tujuan: Menganalisis hubungan antara frekuensi makan, pola makan, dan Indeks Massa Tubuh (IMT) pada mahasiswa program studi Tata Boga di Universitas Negeri Jakarta. Metode: Penelitian kuantitatif korelasional ini menggunakan desain *cross-sectional* yang melibatkan 147 mahasiswa yang dipilih melalui teknik *proportionate stratified random sampling*. Frekuensi makan dinilai menggunakan *Semi-Quantitative Food Frequency Questionnaire* (SQ-FFQ), sedangkan pola makan diukur menggunakan metode *Food Recall*. Data dianalisis menggunakan korelasi *rank Spearman* dan regresi logistik ordinal. Hasil: Tidak ditemukan hubungan yang signifikan antara frekuensi asupan energi ($p=0,125$), protein ($p=0,140$), dan lemak ($p=0,516$) dengan IMT. Namun, frekuensi asupan karbohidrat berhubungan secara signifikan dengan IMT ($p=0,004$). Pola makan terkait asupan energi ($p=0,001$), karbohidrat ($p=0,036$), protein ($p=0,001$), dan lemak ($p=0,026$) berhubungan secara signifikan dengan IMT. Pola asupan karbohidrat teridentifikasi sebagai faktor penentu terkuat, yang meningkatkan kemungkinan variasi IMT sebesar 2,94 kali lipat. Kesimpulan: Frekuensi asupan karbohidrat serta pola makan terkait asupan energi, karbohidrat, protein, dan lemak berhubungan secara signifikan dengan IMT. Saran: Program edukasi gizi mengenai frekuensi makan dan pola makan sehat perlu diperkuat di kalangan mahasiswa.

Kata Kunci: Frekuensi Makan, Pola Konsumsi, Indeks Massa Tubuh, Mahasiswa

1. Introduction

Nutritional problems are still a global health issue that still requires special attention. In Indonesia, nutritional problems are categorized into two, namely undernutrition and overnutrition (Ramadany & Pasaribu, 2021). These nutritional

problems can be experienced by all age groups, especially the adolescent age group. These nutritional problems can be reflected in nutritional status, which can be identified through BMI calculation (Yusuf et al., 2025). Based on national data, measurement of nutritional status using BMI shows variations in body mass. In 2023, Indonesian people aged >18 years experienced overweight at 14.4% and obesity at 23.4% (RISKESDAS, 2018). Meanwhile, in 2023, 7.8% of Indonesian adolescents aged >18 years were classified as underweight.

Among university students, a busy lecture schedule and both external and internal factors make it difficult for students to maintain consumption patterns, both in terms of meal frequency and the quality and quantity of food consumed (Noventa, 2015). According to Septiana et al. (2018), cited in Nugroho et al. (2020), excessive or inappropriate meal frequency will increase the risk of BMI in the obesity category. Conversely, eating too little due to lack of appetite causes undernutrition (Hafiza et al., 2020). Meanwhile, based on the Ministry of Health of the Republic of Indonesia (2009), cited in Amaliyah (2021), the amount and variety of food in consumption patterns need to be regulated and include foods as providers of energy, tissue builders, and regulators of body functions so that health and nutritional status remain maintained, and disease can be avoided.

Based on pre-survey data of Culinary Education students, 51.1% of students had a meal frequency of only twice a day; 35.6% of students still often skipped breakfast; and 37.8% of students tended to combine meal times. In terms of consumption patterns, 46.7% of students had irregular consumption patterns and depended on conditions and food availability. The consumption of snack foods in the form of fried foods or snacks was also still quite high, namely 66.7%. In terms of BMI, Culinary Education students who were included in the underweight BMI category were 13.68% and those in the overweight BMI category were 23.08%. This shows that students still experience undernutrition and overnutrition problems, and that students' meal frequency and consumption patterns vary and are not fully in accordance with the principles of balanced nutrition, so they need to be studied further in research.

In previous studies, the relationship between meal frequency and eating patterns with BMI is still varied. The results of studies by Pakpahan et al. (2024), Sari (2024), Suyasmi et al. (2018), and Irianti et al. (2023) show that there is a relationship between eating patterns and BMI. Conversely, studies by Refaldi et al. (2025), Musthofa et al. (2025), Prisilia & Malinti (2023), and Octaviani Sagala (2021) revealed that eating patterns are not related to BMI. These studies measured meal frequency and eating patterns using only one type of measurement, which has the potential for recall bias and does not represent actual daily consumption. To fill this gap, this study uses meal frequency measurement with the SQ-FFQ and consumption pattern measurement with Food Recall, as well as adjustment of the consumption questionnaire according to food ingredients at the research location, so that the nutritional data obtained are more accurate. Meal frequency calculated using the SQ-FFQ has the advantage of analyzing how often a person consumes food intake (Alfitri et al., 2023), while consumption patterns measured through Food Recall are able to produce accurate consumption pattern data (Sholihah et al., 2024).

The study by Ilham Azhari (2025) stated that eating patterns are related to BMI. The sampling method using accidental sampling in that study was less representative because it did not consider the proportion or characteristics of the actual population. To fill this gap, the sampling method in this study uses proportionate stratified random

sampling so that the data collected are more representative. In addition, Culinary Education students from the 2022–2023 cohort as respondents in this study are a group of students who are in the middle to final stages of study and have taken various basic courses such as Nutrition Science and others. Relevant knowledge and experience regarding processing, serving, and management of food and beverage products make Culinary Education students a relevant group to be studied in this research.

Based on these foundations, this study is entitled “The Relationship between Meal Frequency and Consumption Patterns with BMI of Culinary Education Students at Universitas Negeri Jakarta.” This study aims to analyze the relationship between meal frequency and consumption patterns with BMI of culinary education students at Universitas Negeri Jakarta. This study is expected to provide information regarding students’ meal frequency and consumption patterns, as well as become a basis for consideration in efforts to improve and prevent nutritional problems among university students.

2. Method

Type of Research

This study uses a quantitative approach with a correlational type of research conducted through a survey method and cross-sectional design.

Location and Time of Research

The study was conducted at Universitas Negeri Jakarta, precisely at the Faculty of Engineering, Culinary Education study program, from March to May 2026.

Population and Sample

The population in this study was students of the Culinary Education Study Program, cohort 2022–2023, at Universitas Negeri Jakarta, totaling 234 students. The sample was determined using the Slovin formula (margin of error = 0.05) and based on the proportionate stratified random sampling method, resulting in a total of 147 samples. The samples in this study had to meet the inclusion criteria, namely students of the Culinary Education Study Program, cohort 2022–2023, Universitas Negeri Jakarta, aged 18–25 years, and willing to become research respondents and complete the SQ-FFQ and Food Recall. The exclusion criteria were not continuing participation in the study, being unable to participate in the research process when data collection was carried out, currently undergoing the use of or therapy with certain drugs, and experiencing health problems or having a history of chronic disease.

Data Collection

The stages of data collection began with the provision of an informed consent sheet to the respondents. After approval was obtained, BMI measurement was carried out on the respondents using a Body Fat Analyzer. Furthermore, respondents completed personal identity data, the SQ-FFQ questionnaire, and Food Recall.

The SQ-FFQ questionnaire containing 58 food item ingredients was first tested for validity and reliability. Based on the number of respondents ($n = 147$), the r table value obtained was 0.161. Based on the results of the validity test using Product Moment correlation and a significance level of 5%, all 58 food item ingredients were

declared valid (r calculated > 0.161). At this stage, the reliability test obtained a Cronbach's Alpha of 0.962.

The data obtained from the SQ-FFQ and Food Recall were in the form of energy, carbohydrate, protein, and fat intake, which were categorized into insufficient deficit ($\leq 89\%$ RDA), normal (90–119% RDA), and excess ($\geq 120\%$ RDA) (WNPG 2012, cited in Syifa Apriliana et al., 2023). Then, BMI based on the Ministry of Health Regulation (2014) was classified into severely underweight BMI (< 17.0); underweight ($17.0 < 18.5$); normal (18.5–25.0); overweight (> 25.0 –27.0); and obesity (> 27.0). Questionnaire completion was conducted through interviews with researcher assistance. Respondents received explanations for questions they did not understand and were asked to answer according to their actual condition.

Materials and Instruments

The completion of the SQ-FFQ and Food Recall questionnaires was supported by the use of food ingredient photos. Meanwhile, BMI measurement was carried out using a body fat analyzer.

Data Processing and Analysis

The data results from the SQ-FFQ and Food Recall questionnaires in the form of energy content and other nutrients were analyzed with the assistance of NutriSurvey. Furthermore, the data were processed and analyzed using SPSS software. The analysis carried out consisted of 3 stages. First, univariate analysis to describe the criteria of the research variables, namely meal frequency, consumption patterns, and BMI. Second, bivariate analysis using the Spearman Rank correlation test. Third, multivariate analysis using ordinal logistic regression.

3. Results And Discussion

Results

The sensory quality test was conducted with 45 semi-trained panelists, with 15 panelists assessing each treatment sample. The assessed attributes were color, peanut aroma, brittle texture, sweetness, peanut taste, and peanut aftertaste. The three treatments were peanut aquafaba prepared using peanut-to-water ratios of 1:2, 1:3, and 1:4.

Respondent Characteristics

Table 1. Respondent Characteristics

Characteristics	Frequency	Percentage (%)
Sex		
Male	117	79.6
Female	30	20.4
Age		
20 Years	23	15.6
21 Years	63	42.9
22 Years	52	35.4
23 Years	7	4.8

Characteristics	Frequency	Percentage (%)
24 Years	2	1.4
Total	147	100.0

The majority of respondents were female, totaling 117 students (79.6%). Meanwhile, the other 30 students were male (20.4%). The largest age group was 21 years, totaling 63 students (42.9%), followed by 22 years, totaling 52 students (35.4%).

Research Variable Distribution

Table 2. Research Variable Distribution

Variable	Frequency	Percentage (%)
Meal Frequency of Energy Intake		
Insufficient	89	60.5
Normal	27	18.4
Excess	31	21.1
Meal Frequency of Carbohydrate Intake		
Insufficient	134	91.2
Normal	9	6.1
Excess	4	2.7
Meal Frequency of Protein Intake		
Insufficient	58	39.5
Normal	31	21.1
Excess	58	39.5
Meal Frequency of Fat Intake		
Insufficient	30	20.4
Normal	24	16.3
Excess	93	63.3
Consumption Pattern of Energy Intake		
Insufficient	136	92.5
Normal	9	6.1
Excess	2	1.4
Consumption Pattern of Carbohydrate Intake		
Insufficient	137	93.2
Normal	4	2.7
Excess	6	4.1
Consumption Pattern of Protein Intake		
Insufficient	103	70.1
Normal	26	17.7
Excess	18	12.2
Consumption Pattern of Fat Intake		
Insufficient	97	66.0
Normal	31	21.1
Excess	19	12.9
Body Mass Index (BMI)		
Severely Underweight	8	5.4

Variable	Frequency	Percentage (%)
Underweight	11	7.5
Normal	86	58.5
Overweight	20	13.6
Obese	22	15.0
Total	147	100.0

In meal frequency, the majority of students were included in the insufficient category for energy intake, namely 89 students (60.5%). Almost all students had carbohydrate intake in the insufficient category, namely 134 students (91.2%). The insufficient and excess categories in protein intake had the same proportion, namely 58 students (39.5%) with insufficient protein intake and 58 students (39.5%) with excess protein intake. The majority of students had fat intake in the excess category, namely 93 students (63.3%).

In consumption patterns, almost all students had energy intake in the insufficient category, namely 136 students (92.5%). Almost all students had carbohydrate intake in the insufficient category, namely 137 students (93.2%). The insufficient category dominated students' protein intake with a total of 103 students (70.1%). The majority of students had fat intake in the insufficient category, namely 97 students (66%).

In BMI, the majority of students had normal BMI, totaling 86 students (58.5%). However, some other students still had severely underweight BMI (5.4%), underweight (7.5%), overweight (13.6%), and obese (15%).

Bivariate Analysis

Relationship between Meal Frequency and BMI

Table 3. Relationship between Meal Frequency and BMI

Meal Frequency	BMI										Total	
	Severely Underweight		Underweight		Normal		Overweight		Obese			
	N	%	N	%	N	%	N	%	N	%	N	%
Energy Intake												
Insufficient												
Normal	4	4.5	7	7.9	49	55.1	15	16.9	14	15.7	89	100.0
Excess	0	0.0	2	7.4	16	59.3	3	11.1	6	22.2	27	100.0
	4	12.9	2	6.5	21	67.7	2	6.5	2	6.5	31	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0
Spearman Rank Test Result p = 0,21 (r = -0,127)												
Carbohydrate Intake												
Insufficient	6	4.5	9	6.7	77	57.5	20	14.9	22	16.4	134	100.0
Normal	0	0.0	1	11.1	8	88.9	0	0.0	0	0.0	9	100.0
Excess	2	50.0	1	25.0	1	25.0	0	0.0	0	0.0	4	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0
Spearman Rank Test Result p = 0,004 (r = -0,235)												
Protein Intake												
Insufficient												
Normal	2	3.4	5	8.6	31	53.4	11	19.0	9	15.5	58	100.0
Excess	2	6.5	1	3.2	18	58.1	3	9.7	7	22.6	31	100.0
	4	6.9	5	8.6	37	63.8	6	10.3	6	10.3	58	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0
Spearman Rank Test Result p = 0,140 (r = -0,122)												
Fat Intake												
Insufficient	0	0.0	2	6.7	20	66.7	5	16.7	3	10.0	30	100.0

Meal Frequency	BMI										Total	
	Severely Underweight		Underweight		Normal		Overweight		Obese			
	N	%	N	%	N	%	N	%	N	%	N	%
Normal	2	8.3	1	4.2	12	50.0	5	20.8	4	16.7	24	100.0
Excess	6	6.5	8	8.6	54	58.1	10	10.8	15	16.1	93	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0

Spearman Rank Test Result $p = 0,516$ ($r = -0,054$)

The results of the Spearman Rank test showed that meal frequency of energy intake ($p = 0.125$; $r = -0.127$), protein ($p = 0.140$; $r = -0.122$), and fat ($p = 0.516$; $r = -0.054$) were not related to BMI. Meanwhile, meal frequency of carbohydrate intake was related to BMI ($p = 0.004$; $r = -0.235$). All correlation values showed a weak and negative relationship.

The majority of students had insufficient meal frequency of energy intake with normal BMI, totaling 49 students (55.1%), insufficient meal frequency of carbohydrate intake with normal BMI, totaling 77 students (57.5%), excess meal frequency of protein intake with normal BMI, totaling 37 students (63.8%), and excess meal frequency of fat intake with normal BMI, totaling 54 students (58.1%).

Relationship between Consumption Pattern and BMI

Table 4. Relationship between Consumption Pattern and BMI

Consumption Pattern	IMT										Total	
	Severely Underweight		Underweight		Normal		Overweight		Obese			
	N	%	N	%	N	%	N	%	N	%	N	%
Energy Intake												
Insufficient	5	3.7	9	6.6	80	58.8	20	14.7	22	16.2	136	100.0
Normal	2	22.2	2	22.2	5	55.6	0	0.0	0	0.0	9	100.0
Excess	1	50.0	0	0.0	1	50.0	0	0.0	0	0.0	2	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0
Spearman Rank Test Result p = 0,001 (r = -0,272)												
Carbohydrate Intake												
Insufficient	7	5.1	11	8.0	83	60.6	18	13.1	18	13.1	137	100.0
Normal	1	25.0	0	0.0	3	75.0	0	0.0	0	0.0	4	100.0
Excess	0	0.0	0	0.0	0	0.0	2	33.3	4	66.7	6	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0
Spearman Rank Test Result p = 0,036 (r = 0,173)												
Protein Intake												
Insufficient	3	2.9	5	4.9	59	57.3	17	16.5	19	18.4	103	100.0
Normal	2	7.7	4	15.4	16	61.5	1	3.8	3	11.5	26	100.0
Excess	3	16.7	2	11.1	11	61.1	2	11.1	0	0.0	18	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0
Spearman Rank Test Result p = 0,001 (r = -0,283)												
Fat Intake												
Insufficient	4	4.1	3	3.1	59	60.8	17	17.5	14	14.4	97	100.0
Normal	1	3.2	6	19.4	16	51.6	1	3.2	7	22.6	31	100.0
Excess	3	15.8	2	10.5	11	57.9	2	10.5	1	5.3	19	100.0
Total	8	5.4	11	7.5	86	58.5	20	13.6	22	15.0	147	100.0

Spearman Rank Test Result $p = 0,026$ ($r = -0,183$)

The results of the Spearman Rank test showed that consumption patterns of energy intake ($p = 0.001$; $r = -0.272$), carbohydrate ($p = 0.036$; $r = 0.173$), protein ($p = 0.001$; $r = -0.283$), and fat ($p = 0.026$; $r = -0.183$) were related to BMI. The correlation values for consumption patterns of energy, protein, and fat intake showed a weak and negative relationship. Meanwhile, the correlation value for consumption pattern of carbohydrate intake showed a weak and positive relationship.

The majority of students had insufficient consumption pattern of energy intake with normal BMI, totaling 80 students (58.8%), insufficient consumption pattern of carbohydrate intake with normal BMI, totaling 83 students (60.6%), insufficient

consumption pattern of protein intake with normal BMI, totaling 59 students (57.3%), and insufficient consumption pattern of fat intake with normal BMI, totaling 59 students (57.3%).

Multivariate Analysis

Table 5. Results of the Ordinal Logistic Regression Test

		Estimate	Std. Error
Threshold	Y = 1	-5.545	1.053
	Y = 2	-4.413	.958
	Y = 3	-1.092	.839
	Y = 4	-.158	.860
Location	X1.2	-1.226	.445
	X2.1	-1.152	.644
	X2.2	1.078	.394
	X2.3	-.591	.300
	X2.4	.072	.286

Previously, the data had been tested using the multicollinearity test to ensure that there were no symptoms between the independent variables Susanti & Saumi (2022). The tested data showed that the regression model did not experience multicollinearity problems. In the ordinal logistic regression test, the odds ratio results for BMI were obtained for meal frequency of carbohydrate intake (X1.2) at 0.29; consumption pattern of energy intake (X2.1) at 0.32; consumption pattern of carbohydrate intake (X2.2) at 2.94; consumption pattern of protein intake (X2.3) at 0.55; consumption pattern of fat intake (X2.4) at 1.07. Among all variables, consumption pattern of carbohydrate intake (X2.2) had the highest odds ratio (OR = 2.94), making it the most dominant factor related to BMI.

DISCUSSION

The results of the Spearman Rank test showed that meal frequency of energy intake ($p = 0.125$; $r = -0.127$) was not related to BMI. This study showed results similar to the study by Abihail et al. (2023), namely that no relationship was found between energy intake and the nutritional status of new students of FKM UNAIR. The frequency of students' energy intake was still mostly below average, so their energy intake had not met the needs of balanced nutrition and RDA. This statement is supported by Rizqi Fauziah & Indrawati (2023), who stated that the respondents' lack of energy intake was due to the mismatch between intake and daily energy needs among respondents, namely the lack of portion size, frequency, and variation in food selection.

The results of the Spearman Rank test showed that meal frequency of protein intake ($p = 0.140$; $r = -0.122$) was not related to BMI. This study showed results similar to the study by Bobby Yitran Udju Tade et al. (2025), which stated that protein intake had no relationship with students' BMI. Although students tended to have excess meal frequency of protein intake, the amount and quality of protein consumed did not necessarily meet daily needs according to the RDA. This statement is supported by Lulu Afifah et al. (2025), who stated that the amount and frequency of daily protein

consumption cannot yet be declared to meet protein intake needs because respondents may not consume protein intake in a day.

The results of the Spearman Rank test showed that meal frequency of fat intake ($p = 0.516$; $r = -0.054$) was not related to BMI. The results of this study are supported by the study by Yuliana et al. (2022), which showed that fat intake was not related to nutritional status ($p > 0.05$). Students tended to consume fried chicken, ayam geprek, fried foods, or other fast foods in the campus canteen. Although these foods contain fat, the frequency of fat intake consumption among respondents does not always reflect the amount of fat consumed.

The results of the Spearman Rank test showed that meal frequency of carbohydrate intake ($p = 0.004$; $r = -0.235$) was related to BMI. Based on the data from consumption frequency, students tended to have insufficient meal frequency in carbohydrate intake, but had a fairly frequent consumption frequency of fast foods containing energy, such as fried foods, sweetened beverages, and so on. Therefore, the respondents' BMI was in the normal category even though carbohydrate intake was still insufficient. This result is in line with the study by Bobby Yitran Udju Tade et al. (2025), which stated that there is a relationship between carbohydrate intake and BMI.

The results of the Spearman Rank test showed that consumption patterns of energy intake ($p = 0.001$; $r = -0.272$), carbohydrate ($p = 0.036$; $r = 0.173$), protein ($p = 0.001$; $r = -0.283$), and fat ($p = 0.026$; $r = -0.183$) were related to BMI. This study showed that most students had a low level of diversity in consumption patterns. A total of 145 students (98.64%) more often consumed fried dishes that had high fat content, thus potentially increasing total calories (Tim Promkes RSST, 2023). A total of 26 students (17.69%) had eating behavior late at night. The findings obtained also showed that the majority of students still liked to skip breakfast, namely 55 students (37.41%). This irregular consumption pattern triggers an imbalance in nutrient intake, thereby affecting nutritional status (Putri et al., 2024). The results of this study are relevant to the studies conducted by Azmy Nasution & Ayu (2022) and Lupiana et al. (2022), which stated that there is a relationship between eating patterns and BMI. Then, students with certain carbohydrate consumption pattern categories had a 2.94 times greater chance of experiencing changes in BMI category, showing that consumption pattern of carbohydrate intake had the strongest contribution to the relationship with BMI compared to other variables. This statement is supported by Cahyani et al. (2024), who reported a significant association between carbohydrate intake and the nutritional status of university students, with the majority of students having inadequate carbohydrate intake despite having a normal nutritional status.

Overall, in meal frequency of energy intake, the majority of students had insufficient energy intake. In consumption patterns, students consumed meals 2 times per day with relatively small portions, or not infrequently students ate only 1 time a day with relatively large portions. This condition causes the total energy intake entering the body to be insufficient to meet daily needs even though several types of food are consumed routinely (Winarsih, 2021). Therefore, the amount of actual energy intake in consumption patterns has a relationship with BMI compared to meal frequency.

In protein intake, the majority of students had meal frequency of protein intake with a relatively small amount of consumption and had not met daily protein needs. In consumption patterns, most students only consumed one type of protein source in one

meal. This shows that high frequency of protein consumption does not necessarily produce sufficient protein intake (Winarsih, 2021). Therefore, the amount of protein intake in consumption patterns has a relationship with BMI compared to meal frequency.

In fat intake, students' meal frequency for oil and margarine was very frequent and for fast food was on average less than once a week. In consumption patterns, most students consumed fast food and processed fried foods. This shows that the quality and amount of food consumed determine total fat intake more than only the frequency of eating (Winarsih, 2021). Therefore, the amount of fat intake in consumption patterns has a relationship with BMI compared to meal frequency.

Different from carbohydrate intake in meal frequency and consumption patterns, both variables in carbohydrate intake equally had a relationship with BMI. White rice is the carbohydrate source with the highest consumption frequency among students, but the amount consumed had not been able to meet daily needs. When viewed from consumption patterns, the average daily consumption of white rice among students was quite frequent, but the portion was very small, so the carbohydrate intake obtained by students was still insufficient. In addition, students still often consumed snacks containing low carbohydrates such as snacks, batagor, seblak, and so on.

The results of the study showed that measurement of meal frequency using SQ-FFQ and consumption patterns using food recall provided mutually complementary information. The absence of a relationship in most meal frequency variables, but the presence of a relationship in all consumption pattern variables, shows that the type and amount of students' nutrient intake in consumption patterns have a greater influence on BMI compared to meal frequency. However, in carbohydrate intake, the significant relationship in both methods shows that the frequency of carbohydrate consumption also plays a role in determining the amount of actual intake in students' consumption patterns, which ultimately affects BMI.

4. Conclusion

Overall, the results of the study showed that there was no relationship between meal frequency of energy intake ($p = 0.125$), protein ($p = 0.140$), and fat ($p = 0.516$) with BMI. However, there was a relationship between meal frequency of carbohydrate intake and BMI ($p = 0.004$). In consumption patterns, there was a relationship between consumption patterns of energy ($p = 0.001$), carbohydrate ($p = 0.036$), protein ($p = 0.001$), and fat ($p = 0.026$) with BMI. The variables of consumption frequency of carbohydrate intake and consumption patterns of energy, carbohydrate, protein, and fat intake had a relationship with BMI of 22.6%, while 77.4% was influenced by other variables outside the tested model. The determinant factor most related to BMI of Culinary Education students at Universitas Negeri Jakarta was the consumption pattern of carbohydrate intake, namely 2.94 times toward BMI.

Future research is expected to explore other factors related to BMI. Then, future research is expected to use a larger sample size with more diverse respondent characteristics. In addition, future research can also apply more varied methods or instruments for measuring food consumption.

Students are advised to follow the Balanced Nutrition Guidelines and pay attention to the amount and type of food intake every day in order to maintain normal nutritional status.

5. Daftar Pustaka

- Abihail, C. T., Simanoah, K. H., & Muniroh, L. (2023). Hubungan Asupan Energi dan Zat Gizi Makro serta Durasi Tidur dengan Status Gizi Mahasiswa Baru Fakultas Kesehatan Masyarakat Universitas Airlangga selama Kuliah Online. *Amerta Nutrition*, 7(1), 1–6. <https://doi.org/10.20473/amnt.v7i1.2023.1-6>
- Alfitri, N., Syagata, A., & Susanto, P. (2023). *Buku Ajar Penilaian Konsumsi Pangan*. Deepublish.
- Amaliyah, M., Dewi Soeyono, R., Nurlaela, L., & Kristiastuti, D. (2021). POLA KONSUMSI MAKAN REMAJA DI MASA PANDEMI COVID-19. 10(1), 129–137. <https://ejournal.unesa.ac.id/index.php/jurnal-tata-boga/>
- Azmy Nasution, L., & Ayu, D. A. (2022). Hubungan Pola Makan dengan Indeks Massa Tubuh pada Santri/Santriwati. In *Jurnal Kesehatan Masyarakat Indonesia* (Vol. 17). <https://jurnal.unimus.ac.id/index.php/jkmi>,
- Boby Yitran Udju Tade, Marselinus Laga Nur, & Anna Henny Talahatu. (2025). Hubungan Asupan Zat Gizi Makro, Pengetahuan Gizi, dan Aktivitas Fisik dengan IMT Mahasiswa FKM UNDANA. *SEHATMAS: Jurnal Ilmiah Kesehatan Masyarakat*, 4(1), 114–127. <https://doi.org/10.55123/sehatmas.v4i1.4732>
- Cahyani, T. D., Puspitasari, D. I., & Sarbini, D. (2024) Hubungan Asupan Zat Gizi Makro dan Frekuensi Makan dengan Status Gizi pada Mahasiswa Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surakarta. *Ghidza: Jurnal Gizi Dan Kesehatan*, 8(2), 250-257. <https://doi.org/10.22487/ghidza.v8i2.1677>
- Hafiza, D., Utmi, A., & Niriyah, S. (2020). *Hubungan Kebiasaan Makan dengan Status Gizi pada Remaja SMP YLPI Pekanbaru*. <https://jurnal.stikes-alinsyirah.ac.id/index.php/keperawatan/>
- Ilham Azhari, M. (2025). *Hubungan Pengetahuan Gizi dan Pola Makan terhadap Indeks Massa Tubuh pada Mahasiswa Prodi Ilmu Keolahragaan Angkatan 2020–2021 [UNIVERSITAS NEGERI JAKARTA.]*. <http://repository.unj.ac.id/52481/>
- Irianti, C., Putri, H., Jannah, F., & Arsyad, M. (2023). Hubungan Pola Makan dan Aktivitas Fisik dengan Kejadian Obesitas pada Siswa SMAN 3 Subang dan Tinjauannya Menurut Pandangan Islam. In *Junior Medical Journal* (Vol. 1, Number 8).
- Lulu Afifah, N., Muharramah, A., & Dian Khairani, M. (2025). Hubungan Asupan Protein, Indeks Massa Tubuh Menurut Umur (IMT/U), Kualitas Tidur dengan Kadar Hemoglobin pada Remaja Putri. *Universitas Aisyah Pringsewu*, 8(2), 2025–2077. <http://journal.aisyahuniversity.ac.id/index.php/JGA>
- Lupiana, M., Indriyani, R., & Sutrio. (2022). *Hubungan Pola Makan Remaja dengan Indeks Massa Tubuh di SMP Advent Bandar Lampung*. 6. <https://journal.universitaspahlawan.ac.id/index.php/prepotif/article/view/4376/3268>
- Musthofa, A., Kenanga Purbasary, E., & Ailula, I. (2025). *Hubungan Aktivitas Fisik Dan Pola Makan Dengan Indeks Massa Tubuh (IMT) Pada Anak Sekolah di UPTD SDN 2 Jangga Losarang*.
- Noventa, C. (2015). *Early Childhood Nutritional Health: Kesehatan Gizi Anak Usia Dini*. EduGorilla Community Pvt. Ltd.
- Nugroho, P. S., Uci, A., & Hikmah, R. (2020). Kebiasaan Konsumsi Junk Food dan Frekuensi Makan Terhadap Obesitas. In *Andi Uci Riatul Hikmah) 185 Jurnal Dunia Kesmas* (Vol. 9, Number 2). Online. <http://ejurnalmalahayati.ac.id/index.php/duniakesmas/index>

- Octaviani Sagala, C. (2021). Hubungan Pola Makan dan Pengetahuan Gizi Seimbang dengan Gizi Lebih Mahasiswa STIKes Mitra Keluarga. In *Jurnal Ilmiah Kesehatan Masyarakat* (Vol. 13).
- Permenkes. (2014). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 41 Tahun 2014*. <https://peraturan.bpk.go.id/Details/119080/permenkes-no-41-tahun-2014>
- Prisilia, U., & Malinti, E. (2023). Hubungan Aktivitas Fisik dan Pola Makan dengan Indeks Massa Tubuh Mahasiswa Keperawatan. *Journal of Telenursing (JOTING)*, 5(2), 2205–2212. <https://doi.org/10.31539/joting.v5i2.7390>
- Putri, D. K., Fevria, R., Humaira, A. F., Suryani, E., & Febriani, S. (2024). *Pola Konsumsi Pangan dan Hubungan Status Gizi pada Mahasiswa: Studi Literatur*.
- Ramadany, A., & Pasaribu, S. R. (2021). Pengaruh Indeks Massa Tubuh terhadap Indeks Lengkung Telapak Kaki Mahasiswa dan Mahasiswi FK UISU. *Jurnal Kedokteran Ibnu Nafis*, 10, 94. <https://jurnal.fk.uisu.ac.id/index.php/ibnunafis/article/view/171/199>
- Refaldi, M. W., Kahtan, M. I., & Fitriangga, A. (2025). Hubungan Pola Makan dan Aktivitas Fisik terhadap Indeks Massa Tubuh Mahasiswa Program Studi Kedokteran Universitas Tanjungpura. In *Journal of Comprehensive Science* (Vol. 4, Number 8).
- RISKESDAS. (2018). *Laporan Riskesdas 2018 Nasional*. 528.
- Rizqi Fauziah, L., & Indrawati, V. (2023). Hubungan Konsumsi Sayuran dan Buah, Asupan Zat Gizi Makro dan Aktivitas Fisik dengan Status Gizi Remaja. In *Journal Health and Nutritions* (Vol. 9, Number 2).
- Sari, R. A. (2024). *Hubungan Antara Jenis Aktivitas Fisik dan Frekuensi*.
- Sholihah, L., Pratama, S., Dini, C., & Ruhana, A. (2024). *Buku Ajar Penilaian Status Gizi*. Nas Media Pustaka.
- Susanti, I., & Saumi, F. (2022). Penerapan Metode Analisis Regresi Linear Berganda untuk Mengatasi Masalah Multikolinearitas pada Kasus Indeks Pembangunan Manusia (IPM) di Kabupaten Aceh Tamiang. *Jurnal Gamma-Pi*, 4.
- Syifa Apriliana, T., Susantini, P., Noor Setiawati Ulvie, Y., & Fikri Jauharany, F. (2023). *Tingkat Kecukupan Protein, Zat Besi, Vitamin C, dan Pola Menstruasi pada Remaja Putri di Wilayah Kelurahan Bandarharjo Semarang Utara*.
- Tim Promkes RSST. (2023). *Bahaya Gorengan*.
- Winarsih, D. (2021). *Pola Konsumsi Makanan, Kecukupan Energi, Dan Zat Gizi Makro Mahasiswa Politeknik Kesehatan TNI AU Adisutjipto Yogyakarta*.
- Yuliana, I., Safriantini, D., & Lestari, M. (2022). Hubungan Asupan Zat Gizi Makro dengan Status Gizi Remaja Putri di SMKN 05 Kota Palembang. *Arsip Gizi Dan Pangan*. 2022, 7(2), 126–132. <https://doi.org/10.22236/argipa.v7i2.7989>
- Yusuf, H., Murzalina, C., Rahman, S., & Yusni. (2025). *Analisis Nilai Anthropometri Dan Malnutrisi Pada Laki-Laki Dan Perempuan Usia 17-22 Tahun: Suatu Studi Cross-Sectional*. <https://mki-ojs.idionline.org/jurnal/article/view/928/382>