

Dietary Pattern and Nutritional Intake: Implications for the Nutritional Status of Papuan University Students in Surabaya

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ABSTRACT

Background: The double burden of malnutrition, including rising obesity rates, has become a global health challenge, including in Indonesia. In 2024, 23.4% of Indonesian adults were classified as obese, exceeding the national target of 21.8%. Papuan students pursuing higher education in Surabaya City face a similar situation, which is closely linked to unbalanced dietary habits and inadequate nutritional intake.

Objectives: This study aims to analyze the relationship between balanced nutrition, nutrient intake, and nutritional status among Papuan college students in Surabaya City.

Methods: This quantitative observational study employed a cross-sectional design. A total of 97 Papuan students enrolled in universities in Surabaya City were selected using probability sampling. Data collected included respondent characteristics, height, weight, dietary patterns, and nutrient intake. Dietary patterns were assessed using a 5-point scoring system based on *Isi Piringku* compliance. Data were gathered through questionnaires and 24-hour dietary recalls. Chi-square and Spearman's rho tests were used for statistical analysis.

Results: The findings showed that most respondents were 19 years old (24.7%), female (56.7%), and had a monthly allowance greater than IDR 1,000,000 (66%). More than half of the respondents had imbalanced dietary patterns, excessive nutrient intake, and were categorized as obese. There were significant relationships between dietary patterns ($p=0.001$; $r=0.017$), nutrient intake ($p=0.001$; $r=0.869$), and nutritional status among Papuan university students.

Conclusion: This study concludes that balanced dietary patterns and adequate nutrient intake are associated with nutritional status. The more inappropriate the dietary intake, the higher the risk of abnormal nutritional status. Efforts to increase nutrition knowledge among Papuan students are necessary to promote healthy and balanced eating behaviors.

Keywords: Diet, Nutritional Intake, Nutritional Status, Papuan, Student

INTRODUCTION

Nutritional status reflects an individual's overall health and nutrient balance (Shahudin, Yulianto, & Faridah, 2024). It indicates the extent to which a person's nutritional needs are fulfilled to support optimal physiological functions, including growth, development, and disease resistance (Kesari & Noel, 2025). Nutritional status is therefore an important benchmark for assessing both individual and population health. However, poor nutrition has become a global health challenge. One major nutrition-related problem is obesity, whose prevalence continues to increase each year (Ahmed

& Mohammed, 2025). By 2022, approximately 16% of the global adult population (over 18 years) was classified as obese more than 890 million people out of 2.5 billion individuals who were overweight (WHO, 2024). Between 1990 and 2022, the prevalence of adult obesity more than doubled. Nutrition-related problems, particularly obesity, are most commonly observed in developing countries (Ahmed & Mohammed, 2025). According to the World Obesity Atlas 2024, by 2035, nearly 79% of obese adults are expected to reside in developing countries (World Obesity Federation, 2024).

Indonesia, as a developing country, also faces a high and increasing prevalence of obesity. According to Basic Health Research (RISKESDAS), obesity among adults has risen steadily from 10.5% in 2007 to 14.8% in 2013, 21.8% in 2018, and 28.7% in 2023. In 2024, 23.4% of Indonesian adults were obese, exceeding the national target of 21.8%. This rise may be related to increasingly sedentary lifestyles, particularly among individuals transitioning from late adolescence to young adulthood (Alfionita et al., 2023). Changes in daily activities and increasing responsibilities—such as academic workloads and employment often reduce the time available for regular physical activity (Muhamad, 2019). Students are considered a vulnerable group because they spend much of their time sitting in lectures, studying, or completing academic assignments. Additionally, adapting to a new environment can cause stress and fatigue, leading many students to engage in passive activities or impulsive eating as coping mechanisms (Maillet & Grouzet, 2023).

According to Wulandari and Jones (2022), Papuan students are at higher risk of malnutrition and nutrient deficiencies due to socioeconomic limitations and environmental constraints. Limited access to food and challenges in adapting to a new cultural setting may hinder Papuan students ability to develop healthy eating habits, often resulting in heavy reliance on energy-dense foods. A study by Rachmawati et al. (2023) on overseas students in Jakarta showed that most were obese. Similar results were found by Velina and Nadhiroh (2023) in Surabaya, where many students were also overweight or obese. Obesity and overweight conditions are common among students in large urban areas such as Surabaya.

A preliminary study on Papuan students in Surabaya revealed that most had abnormal nutritional status, tending toward overweight and obesity. This vulnerability is associated with imbalanced dietary patterns and excessive nutrient intake, particularly high consumption of energy, fats, and sugars. Adapting to a new environment including adjusting to different food cultures and eating habits can influence dietary behaviors and ultimately affect nutritional status.

Dietary patterns influence nutritional status because they determine the types and amounts of food consumed daily (Fermeza & Isaura, 2022). Nutritional intake is similarly affected by both the quantity and quality of foods consumed (Basri et al., 2021). When dietary patterns do not follow the principles of balanced nutrition, such as the *Isi Piringku* guidelines, and when nutrient intake does not meet the recommended dietary allowances based on age, gender, and physiological conditions as specified in Ministry of Health Regulation No. 28 of 2019, nutrient imbalance may occur. Such imbalances can result in deficiencies or excesses,

increasing the risk of abnormal nutritional status, including undernutrition, overweight, or obesity, all of which impact health and productivity. Therefore, this study aims to analyze the relationship between dietary patterns, nutrient intake, and nutritional status among Papuan students pursuing higher education in Surabaya City.

METHODS

This quantitative study employed an observational, cross-sectional design to examine the relationship between the independent and dependent variables. The independent variables were dietary pattern and nutritional intake, while the dependent variable was nutritional status. The study population consisted of 130 Papuan students pursuing higher education in Surabaya City. Sampling was conducted through a screening process based on the following inclusion criteria: (1) students aged over 18 years, (2) students originating from Papua, (3) students enrolled in universities in Surabaya City, and (4) students willing to participate in the study. The sample size was determined using simple random sampling, giving each individual an equal chance of selection. Using the Lameshow formula, the required sample size was calculated to be 97 participants.

The research was conducted in 2025 in Surabaya City, East Java Province. Respondent characteristics—including age, gender, monthly allowance, height, and weight were collected through a questionnaire. Dietary patterns and nutrient intake were assessed using two non-consecutive 24-hour food recalls. Height, weight, and age data were analyzed using the WHO Anthro software to determine BMI-for-Age Z-score (BAZ).

Dietary patterns were evaluated based on adherence to the Indonesian *Isi Piringku* (MyPlate) guidelines established by the Ministry of Health. Each dietary component—carbohydrates, protein, vegetables, fruits, and beverages was scored using a five-point scale that reflected compliance with recommended portion sizes and consumption frequency. Participants were then categorized into three levels of adherence: low (≤ 2 points), moderate (3–4 points), or high (5 points).

Nutrient intake was assessed using two 24-hour dietary recalls covering one weekday and one weekend day. Energy, protein, fat, and carbohydrate intakes were calculated using NutriSurvey software and compared to the 2020 Indonesian Recommended Dietary Allowances (AKG). Nutrient intake was categorized as insufficient (below 80% of the RDA), adequate (80–110% of the RDA), or excessive (above 110% of the RDA).

Data on dietary patterns and nutritional intake were processed using NutriSurvey. Univariate analysis was conducted to describe the distribution of each variable in terms of frequency and

percentage. Bivariate analysis was then performed using SPSS (Statistical Product and Service Solutions) to assess the relationships between independent and dependent variables. The chi-square test at a 95% confidence level ($\alpha=0.05$) and Spearman's rho test were used to examine correlations. Spearman's correlation was applied for non-normally distributed data. This study received ethical approval from the Health Research Ethics Review Commission (KKEPK) of the Faculty of Dentistry, Universitas Airlangga, under certificate number 0689/HRECC.FODM/VII/2025.

RESULTS AND DISCUSSION

Table 1 presents the characteristics of the research respondents, who were Papuan college students in Surabaya. Of the 97 respondents, 24.7% were 19 years old and 56.7% were female. The majority (66%) received a monthly allowance of more than IDR 1,000,000. Furthermore, 76.3% of the respondents did not adhere to the *Isi Piringku* dietary guidelines. In addition, 43.3% consumed excess calories, and 30.9% were classified as obese.

Table 1. Distribution of Characteristics of Papuan Students who are Continuing Their Study in Surabaya City, Year 2025

Respondent Characteristics	n	%
Age		
18 years old	21	21.6
19 years old	24	24.7
20 years old	16	16.5
21 years old	16	16.5
22 years old	11	11.3
23 years old	6	6.2
Gender		
Male	42	43.3
Female	55	56.7
Pocket Money		
IDR <500.000	5	5.2
IDR 500.000	3	3.1
IDR 500.001-999.999	3	3.1
IDR 1.000.000	22	22.7
IDR >1.000.001	64	66
Dietary Pattern		
According to <i>Isi piringku</i> guideline	23	23.7
According to <i>Isi piringku</i> guideline	74	76.3
Nutritional Intake		
Low (<80%)	26	26.8
Adequate (80%-110%)	29	26.9
Excessive (>110%)	42	43.3
Nutritional Status		
Severely Underweight (IMT <17,0)	4	4.1
Underweight (IMT 17,0-18,4)	26	26.8
Normal (IMT 18,5-24,9)	18	18.6
Overweight (IMT 25,0-26,9)	39	30.9
Obese (IMT $\geq$ 27,0)	19	19.6
Total	97	100

Table 2 demonstrates the relationship between dietary patterns and nutritional status among Papuan college students in Surabaya City. The findings show a p-value of 0.001 (<0.05), indicating a significant relationship between dietary patterns and nutritional status among Papuan students studying in Surabaya. The strength of the relationship is 0.017, which reflects a very weak, positive (unidirectional) correlation between balanced dietary patterns and nutritional status. This means that the more a dietary pattern deviates from

the principles of balanced nutrition or *Isi Piringku*, the more likely it is to be associated with poorer nutritional status. The cross-tabulation results further show that dietary patterns that do not align with balanced nutrition are more likely to be associated with overweight status, particularly with BMI-for-age values above 25.0–26.9. These findings indicate that although balanced nutrition plays an important role, interventions should also consider lifestyle behaviors and environmental factors that contribute to obesity among university students.

Table 2. Analysis of Dietary Pattern and Nutritional Status of Papuan Students who are Continuing Their Study in Surabaya City, Year 2025

Nutritional Status															P-Value	r
Dietary Pattern	Severely Underweight		Underweight		Normal		Overweight		Obese		Total					
	n	%	n	%	n	%	n	%	n	%	n	%				
According to <i>Isi piringku</i> guideline	0	0	3	13	12	52.2	5	21.7	3	13	23	100	0.001	0.017		
Not According to <i>Isi piringku</i> guideline	4	5.4	23	31.1	6	8.1	25	33.8	16	21.6	74	100				

Table 3 presents the relationship between nutritional intake and nutritional status among the respondents. The analysis produced a p-value of 0.001 (<0.05), indicating a significant association between nutritional intake and the nutritional status of Papuan college students in Surabaya City. The strength of the relationship, represented by the r-value of 0.869, suggests a strong positive correlation between adequate nutritional intake and nutritional status. In other words, the better the nutritional intake, the better the students' nutritional status.

Cross-tabulation results show that lower nutritional intake is more likely to result in

underweight status, with BMI values ranging from 17.0–18.4, whereas higher nutritional intake is more likely to be associated with overweight status, with BMI values of 25.0–26.9. However, this strong correlation does not imply that nutritional intake alone fully explains variations in nutritional status. Other factors—such as meal frequency, dietary diversity, and lifestyle behaviors may also contribute significantly. Therefore, interventions should focus not only on improving nutrient adequacy but also on promoting balanced dietary practices and healthy daily routines among students.

Table 3. Analysis of Dietary Pattern and Nutritional Status of Papuan Students who are Continuing Their Study in Surabaya City, Year 2025

in Surabaya City, Year 2023														
Nutritional Intake	Nutritional Status										Total		P-Value	r
	Severely Underweight		Underweight		Normal		Overweight		Obese					
	n	%	n	%	n	%	n	%	n	%	n	%		
Low	4	15.4	20	76.9	0	0	2	7.7	0	0	26	100	0.001	0.869
Adequate	0	0	6	20.7	18	62.1	5	17.2	0	0	29	100		
Excessive	0	0	0	0	0	0	23	54.8	19	45.2	42	100		

Relationship Between Dietary Pattern and Nutritional Status

The significance test results indicated a weak level of relationship strength. Although the relationship strength is classified as very weak, the findings of this study remain relevant and can still serve as a basis for the argument that balanced nutritional intake is associated with an individual's nutritional status. These results are consistent with the findings of Multazami (2022), who reported that students in Semarang with balanced diets were 3.75 times more likely to have normal nutritional status than those without. The weaker correlation observed in this study may be due to differences in population characteristics (Papuan students in Surabaya versus general student populations in Semarang), variations in food environments, and adaptation challenges, suggesting that interventions must consider these contextual factors.

A balanced dietary pattern refers to the Indonesian Ministry of Health's *Isi Piringku* guidelines, which emphasize ideal meal proportions: half a plate of vegetables and fruits (with more vegetables than fruits), one-quarter plate of carbohydrate-rich staple foods, and one-quarter plate of protein-rich side dishes from both animal and plant sources. Most Papuan students continuing their university studies in Surabaya City have dietary patterns that do not align with these guidelines. Many consume high amounts of carbohydrates from foods such as rice, instant noodles, and processed flour products, while consuming very few vegetables and fruits. They also frequently consume packaged foods and sugary beverages. An imbalanced diet, particularly one high in carbohydrates and sugar but low in fiber, protein, and other essential nutrients, can lead to excess energy being stored as body fat, ultimately increasing BMI (Muhammad Amin et al., 2025).

These findings are consistent with studies conducted in Papua, which reported similar patterns. In the Arfak Mountains of West Papua, Kawulur et al. (2022) found that although adult obesity prevalence was high (33.33%), dietary patterns based on consumption frequency did not significantly influence nutritional status. Similarly, Syaiki et al. (2022) in Mimika reported no significant differences in body composition or albumin levels between individuals consuming sago-based or rice-based diets, despite variations in protein intake. The association between dietary patterns and nutritional status may be influenced by cultural dietary habits, environmental factors, and specific eating behaviors.

Dietary patterns also affect the regulation of the hunger hormone ghrelin and the satiety hormone leptin (Barakat et al., 2024). Consuming calorie-dense but nutrient-poor foods, combined with irregular eating habits such as excessive or infrequent meals, can disrupt appetite-regulation mechanisms. This can trigger cravings and increase the risk of weight gain (Alhussain, Macdonald, and Taylor, 2016). Students who frequently skip breakfast and compensate with larger portions at lunch or dinner tend to accumulate excess energy. These results align with a study by Soedwihajono, Widajanti, and Lisnawati (2021), which found that changes in eating patterns, including mealtimes, can increase the risk of abnormal nutritional status.

This issue is also closely linked to the cultural and dietary habits of Papuan students, who come from regions with distinct traditional food practices. In their hometowns, they commonly consume large portions of staple foods such as sago, sweet potatoes, and rice to support physically demanding activities such as long-distance walking. However, after moving to an urban environment like Surabaya City, their physical activity decreases significantly, yet they continue consuming high-carbohydrate diets (Rahayu, 2020). Adapting to urban life is also challenging for Papuan students, particularly regarding exposure to modern food environments. Campuses, boarding houses, and rental neighborhoods are often surrounded by fast-food vendors, trendy beverages, and instant snacks, making it easier for students to choose convenient, palatable foods that are typically high in calories and fat. With relatively high pocket money (over IDR 1,000,000 per month), students have greater freedom to purchase foods based on preference without necessarily considering nutritional value. As a result, an unbalanced diet becomes one of the contributing factors to overweight status.

Relationship Between Nutritional Intake and Nutritional Status

The results showed a significant relationship between balanced nutritional intake and the nutritional status of Papuan students continuing

their university studies in Surabaya City. The strength of the relationship between the two variables was very high. This indicates that the quantity and quality of consumed nutrients directly influence nutritional status, resulting in deficiencies, normal nutritional status, or excess weight. This finding aligns with the study by Cahyani, Puspitasari, and Sarbini (2024), who also reported a significant relationship between students' nutritional intake and their nutritional status.

According to the findings, most Papuan students consume nutrients exceeding the Recommended Dietary Allowance (RDA/AKG), particularly carbohydrates and fats. This contributes to excess body fat and obesity. Ideally, balanced nutrition adheres to the principle of complete and proportional intake of macronutrients—carbohydrates, proteins, and fats and micronutrients such as vitamins and minerals, adjusted according to age, sex, physical activity level, and physiological conditions (Kemenkes RI, 2019). However, the 2×24-hour food recall revealed that most respondents consumed large portions of carbohydrate-dense foods such as rice, instant noodles, and fried side dishes. Their fruit and vegetable intake was inadequate, while sugary packaged beverages were frequently consumed.

Inappropriate meal frequency further exacerbates this condition. Habits such as skipping breakfast and compensating with large meals at lunch or dinner, or eating more than three times per day without proper portion control, contribute to excessive energy intake. Students often ignore structured meal schedules, replacing them with snacks high in sugar and calories but low in essential nutrients. These findings are consistent with Mithra et al. (2018), who reported that unhealthy snacking habits outside of regular mealtimes negatively affect diet quality and metabolic health among Indian students.

Cultural factors also influence the nutritional intake of Papuan students. In their hometowns, staple foods such as sago, sweet potatoes, and bananas serve as primary energy sources and are typically balanced with high levels of physical activity. However, after moving to Surabaya City, they face significant lifestyle and environmental changes. Sedentary behavior becomes more common, and access to fast food increases. Consequently, energy intake exceeds energy expenditure (Alfionita et al., 2023). Pardamean, Wonda, and Sungono (2023) also noted in their Jayapura study that energy imbalance contributes to abnormal nutritional status and increases the risk of overweight and obesity. Furthermore, Papuan students generally have a monthly allowance of around one million rupiah, enabling greater access to instant foods, cafés, and contemporary snacks that are high in calories but low in micronutrients. This imbalance contributes to

changes in body composition and abnormal nutritional status.

This study has several strengths and limitations. One of its strengths is the specific focus on Papuan students in Surabaya—a population that is seldom examined in nutrition research. This focus provides meaningful contributions to the field. Additionally, the use of primary data obtained through questionnaires and 24-hour food recalls enabled a comprehensive assessment of dietary patterns and nutritional status. The study's findings are nationally relevant and offer practical implications for nutrition education among university students. However, several limitations exist. Some weight measurements may have been inaccurate because certain respondents were unwilling to remove specific items of clothing during weighing. Moreover, the food recall method relies on respondents' memory, which may lead to inaccuracies in reporting the types and amounts of food consumed and may affect data validity.

CONCLUSION

A significant relationship exists between the dietary patterns and nutritional intake of Papuan students studying in Surabaya City and their nutritional status. The greater the discrepancy between an individual's diet and the *Isi Piringku* (MyPlate) guidelines, the more likely their nutritional status is to deviate from normal. Likewise, substantial differences between actual nutritional intake and the Recommended Dietary Allowance (RDA) are associated with abnormal nutritional status. A holistic nutrition education intervention targeting Papuan students should consider their socio-cultural characteristics, including their consumption of sago-based staple foods and their limited access to diverse food sources. Future research is needed to explore other factors that may influence nutritional status, such as physical activity, stress levels, and nutritional knowledge.

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Conflict of Interest and Funding Disclosure

None

Author Contributions

AK: Roles/writing-original draft, conceptualization, data curation, formal analysis, funding acquisition, investigation, project administration, resources, software. TM: Conceptualization, methodology.

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