

The Relationship Between Macronutrient Intake, Physical Activity, and Nutritional Status of Production Employees at PT Eurochair Internusa

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Article Info

Received: May 25, 2026

Revised: June 17, 2026

Accepted: June 20, 2026

Abstract

Nutritional status reflects the balance between nutrient intake and the body's requirements, influenced by various factors including macronutrient consumption and physical activity. This study aims to identify and analyze the relationship between energy, carbohydrate, protein, and fat intake, as well as physical activity, with employees' nutritional status. This research employed an observational analytical quantitative design with a cross-sectional approach, involving a sample of 74 respondents. Macronutrient intake was measured using a 2x24-hour food recall, and physical activity was assessed using the Baecke questionnaire, while nutritional status was measured based on Body Mass Index (BMI). Data analysis was performed using the Spearman Rank correlation test. There were significant positive correlations between energy intake and nutritional status ($p = 0.003$; $r = 0.342$), carbohydrate intake and nutritional status ($p = 0.022$; $r = 0.266$), and fat intake and nutritional status ($p = 0.000$; $r = 0.508$). The strongest positive correlation was observed between fat intake and nutritional status ($r = 0.508$). The strongest association was found between fat intake and nutritional status ($r = 0.508$). However, no significant relationship was observed between protein intake and nutritional status ($p = 0.057$; $r = -0.222$). There is a relationship between physical activity and nutritional status ($p = 0.000$; $r = -0.798$). These results indicate that the greater the intake of energy, carbohydrates, and fat, the higher the likelihood of an individual being overweight or obese.

Keywords: employees; macronutrient intake; nutritional status; physical activity



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INTRODUCTION

Nutritional status refers to the condition of an individual's body that arises from the balance between consumed nutrients and the nutrients required. According to the World Health

Organization (WHO, 2021), over 1.9 billion adults aged 18 years and older are overweight. Macronutrient intake, levels of physical activity, frequency of exercise, and nutritional knowledge are among the factors contributing to many people having an abnormal nutritional status. Research by Sari and Rizqiya (2023) indicates that the majority of adult respondents with excess nutritional status generally have a higher energy intake, indicating a correlation between nutrient consumption and nutritional status. Physical activity plays a vital role in balancing the nutrients expended by the body (Harjatmo et al., 2025). According to research conducted by Sugianto (2017), there is a significant relationship between physical activity and nutritional status. Respondents with light physical activity tend to have an excess nutritional status compared to respondents with heavy physical activity.

Abnormal nutritional status can affect employees' physical condition, motivation, and responsiveness. This can result in lower work productivity (Riyani, 2016). In addition to reduced productivity, abnormal nutritional status can also cause work fatigue. According to the International Labour Organization (ILO), each year, work-related accidents caused by fatigue kill two million workers (Bakri et al., 2021). According to Bakri et al. (2021), this can impact the welfare and economy of workers' families, and if it continues, it will affect the company's productivity levels. A study conducted by Hamid et al. on production workers at PT Maruki International Indonesia showed that workers' nutritional status greatly influences how often they feel tired at work.

PT. Eurochair Internusa is a manufacturing company that provides a variety of indoor and outdoor furniture and decor collections, most of which are made from natural materials such as rattan. Based on preliminary study data on BMI measurements, dietary intake, and physical activity among 22 production employees at PT. Eurochair Internusa, more than 50% of employees are overweight. The majority of employees with excess nutritional status tend to have high energy intake and low physical activity, whereas employees with normal nutritional status have good energy intake and tend to be physically active. Based on the data above, further research is necessary to investigate the underlying causes of abnormal nutritional status among production employees at PT. Eurochair Internusa, particularly concerning macronutrient intake and physical activity factors. Therefore, this study aims to examine the relationship between macronutrient intake and physical activity with nutritional status among production department employees at PT. Eurochair Internusa in Mojokerto Regency.

The benefits of this research are that it provides researchers with knowledge related to public nutrition, especially for workers. In addition, this research can provide information on each employee's nutritional status, education on a balanced diet, and awareness of the importance of physical activity for health. For companies, this research can serve as a basis for developing work policies such as a healthy canteen and periodic nutrition counselling.

RESEARCH METHOD

Research Design

This study is an observational analytical study with a cross-sectional design and a quantitative approach to determine the relationship between the level of macronutrient intake and physical activity with nutritional status among employees of PT. Eurochair Internusa.

Time and Place of Research

This research was conducted at PT Eurochair Internusa. Data collection was carried out from January to February 2026. The research location was selected based on preliminary study

results showing that the majority of employees have a high fat intake and light physical activity, which may affect nutritional status.

Research Target/Subject

The target population of this study consisted of all production employees at PT Eurochair Internusa. Research respondents were selected using purposive sampling techniques. The research sample consisted of 74 production employees who met the inclusion and exclusion criteria as follows: Inclusion criteria: employees willing to serve as research respondents by providing informed consent, employees aged 20 to 59 years, and no special needs. For the exclusion criteria, employees who were pregnant or had chronic illnesses that could affect nutritional status, employees who were ill during the study, and employees who resigned during the study.

Research Procedure

In this study, respondents' macronutrient intake was measured using a 2x24-hour food recall questionnaire administered via interviews during holidays and workdays. Respondents' physical activity was assessed using the Baecke questionnaire, and nutritional status was measured using Body Mass Index (BMI), calculated from directly measured weight and height. Eligible respondents will be informed about the research objectives and procedures and will sign a consent form to participate if willing. Once all data is collected, it will be analysed using the Statistical Package for the Social Sciences for univariate and bivariate analysis. The bivariate relationship between macronutrient intake and physical activity will be tested using the Spearman rank test with a significance level of $p < 0.05$.

Instruments and Data Collection Techniques

The data collected included respondent characteristics, macronutrient intake, physical activity, and nutritional status. Respondent characteristics such as age, gender, and education level were obtained through interviews using a structured questionnaire. Data on respondents' macronutrient intake were collected using a 2x24-hour Food Recall interview on both holidays and workdays to assess respondents' average daily intake. Physical activity was measured using the Baecke questionnaire, which assesses respondents' physical activity levels during work, sports, and leisure time. Body weight and height measurements were conducted directly using a digital scale and a microtoise to determine respondents' nutritional status.

Research data collection was obtained through several stages: (1) obtaining research permission from the research site, PT Eurochair Internusa; (2) obtaining approval to conduct research from the Health Research Ethics Committee of Universitas Negeri Surabaya; (3) recruiting respondents who met the inclusion criteria; (4) providing an explanation of the research objectives and obtaining consent from the respondents; (5) conducting interviews using a questionnaire to collect data on respondent characteristics, macronutrient intake, and physical activity; and (6) measuring weight and height. To ensure the completeness of the data obtained, the collected data will be re-verified to ensure that it is fully completed, and then the measurement and interview results will be coded according to their classification and analysed using the Spearman correlation test.

RESULTS

Respondent Characteristics

The population in this study comprises all employees working in the production department of PT. Eurochair Internusa. The characteristics of the respondents examined in this study include age, gender, and highest level of education. Respondents' age variable is grouped into 19–29

years, 30–49 years, and 50–59 years; gender is differentiated into male and female; and respondents' education level is classified into two categories: senior high school/vocational school and diploma/bachelor (D/S1).

Table 1. Respondent Characteristics

Respondent Characteristics		n	(%)
Age	19 - 29	25	33.8
	30 - 49	45	60.8
	50 - 59	4	5.4
Total		74	100
Gender	Male	46	62.2
	Female	28	37.8
	Total	74	100
Education Level	High School/Vocational School	66	89.2
	Diploma/Bachelor	8	10.8
	Total	74	100

Statistical analysis result of the relationship between macronutrient intake and nutritional status

The statistical test results of the relationship between macronutrient intake and nutritional status were analysed using the Spearman rank test, with the test results presented in the table.

Table 2. Statistical analysis results of the relationship between macronutrient intake and nutritional status

		Nutritional Status							Correlation Coefficient (r)	P-value
			Under-weight	Normal	Over-weight	Obesity I	Obesity II	Total		
Energy Intake	Less	n	3	7	1	1	1	13	0.342	0.003
		(%)	(23.07)	(53.8)	(7.6)	(7.6)	(7.6%)	(100)		
	Good	n	1	17	14	25	2	59		
		(%)	(1.6)	(28.8)	(23.7)	(42.3)	(3.38)	(100)		
	More	n	0	0	1	1	0	2		
Carbohydrate Intake		(%)	(0)	(0)	(50)	(50)	(0)	(100)	0.266	0.022
	Total	n	4	24	16	27	3	74		
		(%)	(5.4)	(32.4)	(21.6)	(36.4)	(4.05)	(100)		
	Less	n	3	9	5	2	2	21		
		(%)	(14.2)	(42.8)	(23.8)	(9.5)	(9.5)	(100)		
Protein Intake	Good	n	1	15	10	25	1	52	-0.222	0.057
		(%)	(1.9)	(28.8)	(19.2)	(48.07)	(1.9)	(100)		
	More	n	0	0	1	0	0	1		
		(%)	(0)	(0)	(100)	(0)	(0)	(100)		
	Total	n	4	24	16	27	3	74		
Fat Intake		(%)	(5.4)	(32.4)	(21.6)	(36.4)	(4.05)	(100)	0.508	0.000
	Less	n	2	9	1	1	0	13		
		(%)	(15.38)	(69.23)	(7.6)	(7.6)	(0)	(100)		
	Good	n	2	14	9	13	2	40		
		(%)	(5)	(35)	(22.5)	(32.5)	(5)	(100)		
	More	n	0	1	6	13	1	21		
		(%)	(0)	(4.7)	(28.5)	(61.9)	(4.7)	(100)		
	Total	n	4	24	16	27	3	74		
		(%)	(5.4)	(32.4)	(21.6)	(36.4)	(4.05)	(100)		

In Table 2, the results of the Spearman correlation analysis indicate that among the four nutritional intake variables, fat intake shows the strongest relationship with nutritional status, with a correlation coefficient $r = 0.508$ and $p = 0.000$, indicating a significant positive relationship of fairly strong magnitude. Meanwhile, for energy and carbohydrate intake, the p-values were found to be 0.003 for energy intake and 0.022 for carbohydrate intake, with correlation coefficients r of 0.342 for energy intake and 0.266 for carbohydrate intake, both indicating a significant positive relationship of weak magnitude. Thus, an increase in fat, energy, and carbohydrate intake is likely to be accompanied by an improvement in nutritional status towards overweight and obesity. Unlike the other three variables, protein intake has a correlation coefficient $r = -0.222$ with a p-value = 0.057, indicating no statistically significant relationship between protein intake and nutritional status.

Statistical analysis result of the relationship between physical activity and nutritional status

The results of the statistical test on the relationship between physical activity and nutritional status were analysed using the Spearman rank test, with the test results presented in a table.

Table 3. Statistical analysis results of the relationship between physical activity and nutritional status

		Nutritional Status						Correlation Coefficient (r)	P-value
			Under-weight	Normal	Over-weight	Obesity I	Obesity II		
Physical Activity	Light	n	0	0	0	0	0	-0.798	0.000
		(%)	(0)	(0)	(0)	(0)	(0)		
	Medium	n	0	4	16	27	3		
		(%)	(0)	(8)	(32)	(54)	(6)		
	Heavy	n	7	17	0	0	0		
		(%)	(29.1)	(70.8)	(0)	(0)	(0)		
	Total	n	7	21	16	27	3		
		(%)	(9.4)	(28.3)	(21.6)	(36.4)	(4.05)		

Based on the analysis results in Table 3, it can be concluded that there is a significant relationship between physical activity and respondents' nutritional status ($p = 0.000$) with a correlation coefficient of -0.798, which indicates a very strong negative relationship, meaning that the more active or higher the level of physical activity of the respondents, the more their nutritional status tends to be normal or lower.

DISCUSSION

The study results show a P value of 0.003 (<0.05) with a correlation coefficient (r) of 0.342, indicating a relationship between energy intake and nutritional status with a moderate strength of correlation, supporting the acceptance of H_a . This finding is consistent with research by Sunansyah et al. (2024), which found a relationship between energy intake and nutritional status among employees at the Tangerang Selatan National Unity and Politics Office. The correlation coefficient indicates that the higher a person's nutritional status, the higher their energy intake. In Table 4.5, the cross-tabulation shows that the group with adequate energy intake is dominated by respondents with obesity (45.7%), while the group with insufficient energy intake is dominated by respondents with normal nutritional status (46.1%). Excess energy intake can negatively impact the body if not utilised properly.

Statistical analysis of carbohydrate intake and nutritional status showed a p-value of 0.022 (< 0.05) with a correlation coefficient of 0.226, indicating a relationship between carbohydrate intake and nutritional status among employees. This result is consistent with the study by

Siregar (2019), which stated that there is a relationship between carbohydrate intake and nutritional status in workers. Carbohydrates play an important role as the main energy source for the body and as a supplier of glucose for the brain. When carbohydrate intake exceeds the body's needs, the excess is not immediately used but is stored as glycogen in the liver and muscles. However, the liver and muscles also have limited glycogen storage capacity. Once this capacity is reached, the excess glycogen will be converted into fat and stored in adipose tissue (Siregar, 2019).

Protein is a macronutrient that functions as a body-building substance, plays a role in the immune system, and serves as an energy source for the body after carbohydrates and fats (Tejasari, 2019). Protein will be used as an energy source once carbohydrate and fat reserves are depleted. Based on observations, respondents with adequate protein intake accounted for over 50% of the total and were predominantly those with overnutrition (overweight and obesity). This indicates that a person's nutritional status is more likely influenced by the overall balance of nutrient intake rather than protein intake alone. Based on statistical analysis, no relationship was found between protein intake and the nutritional status of respondents ($p=0.057$; $r=0.222$). This is in line with research by Ariyani et al. (2025), which found no relationship between protein intake and the nutritional status of employees at Mitra Kemayoran Hospital, Jakarta. Meanwhile, research by Rahmi (2023) on young adult age groups found a relationship between protein intake and nutritional status ($p=0.039$). This indicates that the relationship between protein intake and nutritional status may vary depending on population characteristics. Differences in research results regarding the relationship between protein and nutritional status may also be caused by methodological variations. This study used a cross-sectional design to measure protein intake over a short period (2×24 hours), which may not fully reflect the respondents' long-term protein intake patterns. This contrasts with studies using the Food Frequency Questionnaire (FFQ) or prospective methods, which can capture more stable consumption patterns. Research by Damayanti et al. (2024) on workers in the manufacturing sector in Surabaya indicates that the burden of physical activity has the strongest correlation with nutritional status, as it directly affects energy expenditure, which is more dominant compared to the intake of specific macronutrients.

The analysis of the relationship between fat intake and nutritional status found a p-value of 0.000 (<0.05) with a correlation coefficient (r) of 0.508. This result indicates that fat intake has a sufficiently strong and significant positive relationship with the nutritional status of production staff. This is in line with Siregar (2019), who stated that there is a significant relationship between fat intake and nutritional status, and research conducted by Sunansyah et al. (2024) found that there is a relationship between fat intake and nutritional status among employees. Fat is a macronutrient that provides the highest energy contribution of 9 calories per gram compared to protein and carbohydrates. Compared to excess intake of carbohydrates and protein, excess fat intake has a much higher conversion coefficient. Consequently, individuals with excessive fat intake are more prone to being overweight or obese. Based on the cross-tabulation results in this study, it was found that the majority of respondents with excessive fat intake tended to have an excessive nutritional status.

Bivariate analysis using Spearman's Rank Correlation revealed that there is a relationship between physical activity and employees' nutritional status, with a p-value of 0.000. Meanwhile, a negative correlation coefficient of -0.798 was obtained, indicating that the strength of the relationship between physical activity and nutritional status is very strong. The negative sign of the correlation coefficient signifies that the variables are inversely related. The higher the level

of physical activity, the lower the respondents' nutritional status, and conversely, the lower the level of physical activity, the higher their nutritional status. This result is consistent with the study by Zulfa et al. (2022), which reported a significant association between physical activity and employees' nutritional status ($p = 0.000$). Physical activity refers to any form of bodily movement involving skeletal muscles that results in energy expenditure (Atika et al., 2024).

CONCLUSION

Based on the findings, it was shown that energy, carbohydrate, and fat intake are significantly related to the nutritional status of respondents, meaning that the higher the consumption of these three nutrients, the greater the tendency for the respondents' nutritional status to lean towards overweight. Conversely, protein intake did not show a statistically significant relationship with nutritional status, indicating that the level of protein consumption is not directly reflected in changes in the respondents' nutritional status.

Meanwhile, physical activity has been shown to have a significant relationship with the nutritional status of respondents, where the lower the level of physical activity, the higher their nutritional status. In other words, respondents with low physical activity tend to have a higher nutritional status (overweight to obese). These findings affirm that the imbalance between macronutrient intake (particularly energy, carbohydrates, and fats) and low physical activity is a major factor that can increase nutritional status among production sector employees at PT. Eurochair Internusa.

ACKNOWLEDGMENTS

The author would like to express sincere gratitude to PT. Eurochair Internusa for providing the opportunity to conduct this research. The author also extends thanks to all parties who supported this study, as well as to friends and companions who have always accompanied the author until the research was completed.

AUTHOR CONTRIBUTIONS

All authors are responsible for this work and contributed to the preparation of this manuscript. The authors specifically designed and conducted the research, collected data, analysed the data, drew conclusions, and prepared the manuscript draft. This research was supervised by a mentor who also assisted in interpreting the research findings.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest related to this publication. This research has no sponsors and did not receive external funding. The study was conducted independently without any financial or non-financial support from any party that could influence the project planning, data collection and analysis, interpretation of results, project design, or decisions related to the publication of the findings.

DECLARATION OF ARTIFICIAL INTELLIGENCE USE

This research uses artificial intelligence or AI tools solely to support the manuscript preparation process. AI tools are used to assist the authors in drafting and refining the manuscript, including language management corrections, sentence structure, paraphrasing, and writing techniques. All output generated by AI is critically reviewed, edited, and validated by the authors. The authors are fully responsible for the accuracy, integrity, and originality of the

manuscript. AI tools are not used for data collection, data analysis, result interpretation, scientific finding creation, or formulation of research conclusions.

REFERENCES

- Abadini, D., & Wuryaningsih, C. E. (2019). Determinan Aktivitas Fisik Orang Dewasa Pekerja Kantoran di Jakarta Tahun 2018. *Jurnal Promosi Kesehatan Indonesia*, 14(1). <https://doi.org/10.14710/jpki.14.1.15-28>
- Amin, F. (2019). *Hubungan Antara Karakteristik Pekerja, Status Gizi Dan Kebiasaan Sarapan Dengan Produktivitas Kerja Pada Pengrajin Batu Bata Desa Bontobiraeng Kabupaten Gowa*. [Skripsi] Fakultas Kesehatan Masyarakat. Universitas Hasanuddin. <http://repository.unhas.ac.id:443/id/eprint/5112>
- Anindita, P., Darwin, E., & Afriwardi. (2016). Hubungan aktivitas fisik harian dengan gangguan menstruasi pada mahasiswa fakultas kedokteran universitas andalas. *Jurnal Kesehatan Andalas*, 5(3). <https://doi.org/10.25077/jka.v5i3.570>
- Ariyani, T., & Khasanah, T. A. (2025). Hubungan Asupan Zat Gizi Makro, Aktivitas Fisik dan Kualitas Hidup dengan Status Gizi Karyawan Rumah Sakit Mitra Keluarga Kemayoran Jakarta. *Media Gizi Ilmiah Indonesia*, 3, 25–33. <https://doi.org/10.62358/mgii.v3i1.50>
- Bakri, S.A, Suharni, Yusriani, Hardi.I, & Septiyanti. (2021). Hubungan status gizi dengan produktivitas kerja karyawan PT. Angkasa Pura I (Persero) Kota Makassar. *Window of Public Health Journal*, 2(4), 1414–1420. <https://doi.org/10.33096/woph.v2i6.313>
- Damayanti, R., Lutfiya, I., & Noviarmi, F. S. I. (2024). The determinants of Nutritional Status of Workers in Manufacturing Sector. *Public Health of Indonesia*, 10(4), 68–79. <https://doi.org/10.36685/phi.v10i4.872>
- Dewi, N., & Istianah, I. (2018). Activities with nutrition status in employee offices of the Poltekkes Kemenkes Jakarta II. *SANITAS: Jurnal Teknologi dan Seni Kesehatan*, 9, 143–151. <https://doi.org/10.36525/sanitas.2018.16>
- Fahmy, A., Tsani, A., Irawati, L., & Dieny, F.F. (2018). Pengaruh faktor jenis kelamin dan status gizi terhadap satiety pada diet tinggi lemak. *Journal of Nutrition College*, 7, 203. <https://doi.org/10.14710/jnc.v7i4.22281>
- Hardinsyah, P., & Supariasa, I. D. N. (2016). *Ilmu Gizi: Teori Aplikasi*. EGC.
- Mardalena, & Suryani. (2016). *Modul bahan ajar cetak Keperawatan Ilmu Gizi*. Pusat pendidikan sdm kesehatan.
- Myrnawati, M., & Anita, A. (2016). Pengaruh Pengetahuan Gizi, Status Sosial Ekonomi, Gaya Hidup Dan Pola Makan Terhadap Status Gizi Anak (Studi Kausal Di Pos Paud Kota Semarang Tahun 2015). *Jurnal Pendidikan Usia Dini*, 10(2), 213 – 232. <https://doi.org/10.21009/JPU.102.02>
- Rahmi, S. N. (2023). *Hubungan asupan energi, karbohidrat, protein, lemak, dan aktivitas fisik dengan status gizi kelompok usia dewasa muda* [Skripsi]. Universitas Islam Negeri Walisongo Semarang. <https://eprints.walisongo.ac.id/id/eprint/24336/>
- Ratnawati, D. E., Kusuma, T. S., & Marji. (2016). *Slimline Solusi Pengaturan Diet Mandiri Beserta Tutorialnya*. Universitas Brawijaya Press.
- Rondonuwu, D. B. & Sheeren, T. E. T. (2022). Pengaruh Pendapatan dan gaya hidup terhadap pola konsumsi masyarakat Kecamatan Amurang Barat. *Jurnal Equilibrium*, 3(1), 48-54. <https://garuda.kemdiktisaintek.go.id/documents/detail/3489387>

- Sari, W., & Rizqiya, F. (2023). Hubungan Asupan Zat Gizi dan Aktivitas Fisik Dengan Kejadian Gizi Lebih Pada Usia Dewasa Di Kelurahan Kebon Kosong Jakarta. *Tirtayasa Medical Journal*, 3(1), 9 –15. <https://doi.org/http://dx.doi.org/10.62870/tmj.v3i1.24950>
- Savitri, A. (2017). *Faktor-faktor yang berhubungan dengan Kejadian obesitas sentral pada wanita usia 15-44 tahun di Posbindu wilayah kerja Puskesmas Kecamatan Pasar Minggu Jakarta Selatan Tahun 2017* [Skripsi]. Universitas Islam Negeri Syarif Hidayatullah Jakarta. [https://repository.uinjkt.ac.id/dspace/bitstream/123456789/36713/1/AYU SAFITRI - FKIK.pdf](https://repository.uinjkt.ac.id/dspace/bitstream/123456789/36713/1/AYU_SAFITRI_FKIK.pdf)
- Sinaga, T. R., Hasanah, L. N., Shintya, L. A., Faridi, A., Kusumawati, I., Koka, E. M., Sirait, A., & Harefa, K. (2022). Gizi dalam siklus kehidupan. In *Yayasan Kita Menulis* https://repository.stikespersadanabire.ac.id/assets/upload/files/docs_1702607088.pdf
- Sirajuddin, Surmita, & Tri A. (2018). *Survei konsumsi pangan*. Kementerian Kesehatan RI.
- Siregar, E. (2019). The Influence of Life Style on Employee Nutritional Status of Health Polytechnic Directorate Health Ministry Medan. *Journal of Pharmaceutical and Sciences*, 2(2), 29-35. <https://doi.org/10.36490/journal-jps.com.v2i2.30>
- Soraya, D., Sukandar, D., & Sinaga, T. (2017). Hubungan pengetahuan gizi, tingkat kecukupan zat gizi, dan aktivitas fisik dengan status gizi pada guru SMP. *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)* (Vol. 6, Number 1). <https://doi.org/10.14710/jgi.6.1.29-36>
- Sugianto. (2017). *Hubungan kebiasaan konsumsi lemak dan aktivitas fisik terhadap status gizi pada pegawai di kantor fakultas matematika dan ilmu pengetahuan alam (fmipa) universitas negeri yogyakarta* [Skripsi]. Universitas Negeri Yogyakarta.
- Supariasa, I. D. N., Bakri, B., & Fajar, I. (2016). Penilaian status gizi. EGC.
- Syampurna, H. (2018). Studi tentang tingkat pengetahuan ilmu gizi siswa-siswi SMP Negeri 32 Padang. *Jurnal Menssana*, 3(1). <https://doi.org/10.24036/jm.v3i1.69>
- Tampubolon, E., Sinulingga, D., Siregar, R., & Rohaya, T. (2021). Pelatihan penerapan program gizi kerja pada tenaga kesehatan di RSUD Sembiring. *Jurnal Pengabdian Masyarakat Putri Hijau*, 1(2), 1-5. <https://doi.org/https://doi.org/10.36656/jpmph.v1i2.681>
- Tejasari. (2019). *Nilai Gizi Pangan* (Edisi 2). Pustaka Panasea.
- Yunitasari, A. R., Sinaga, T., & Nurdiani, R. (2019). Asupan Gizi, Aktivitas Fisik, Pengetahuan Gizi, Status Gizi dan Kebugaran Jasmani Guru Olahraga Sekolah Dasar. *Jurnal Media Gizi Indonesia*, 14 (2), 197-206. <https://doi.org/10.20473/mgi.v14i2.197-206>
