

Relationship Between Dietary Diversity And Body Weight Monitoring With The Incidence of Overnutrition in Stikes Mitra Keluarga Students

Vini Andriani Taher^{1*} and Guntari Prasetya²

^{1,2}Department of Nutrition Science, Sekolah Tinggi Ilmu Kesehatan Mitra Keluarga, Indonesia

*Correspondence author : vinitaher09@gmail.com

Abstract

Overnutrition has impacts on the susceptibility to disease and the productivity level of college students. The application of the principle of balanced nutrition is an effort to maintain optimal nutritional status, such as dietary diversity and monitoring weight regularly. This study aimed to analyze the relationship between dietary diversity and body weight monitoring with the incidence of overnutrition. This study is a quantitative method with a cross-sectional design. The total sample was 69 students who were selected using the consecutive sampling technique. Dietary diversity was analyzed with an Individual Dietary Diversity Score (IDDS), which was obtained from 2x24 hours of food recall, and weight monitoring was analyzed with a questionnaire. The Chi-Square test analyzed the data. The results of the analysis showed that the dietary diversity with the incidence of overnutrition p-value = 0.052 and monitoring of body weight with the incidence of overnutrition p-value = 0.005 and Odds Ratio of 4.402. There is no significant relationship between dietary diversity and the incidence of overweight in STIKes Mitra Keluarga students. Still, there is a significant relationship between body weight monitoring and the incidence of overnutrition in STIKes Mitra Keluarga students.

Keywords: College Student, Body Weight Monitoring, Dietary Diversity Score, Nutritional Status, Overnutrition.

Introduction

Students are individuals who are studying to optimize their abilities in Higher Education so that they become intellectuals and professionals (PDDikti, 2020). Many of the students have unhealthy balanced nutrition behaviours, which increase the risk of having nutritional problems. Furthermore, nutritional problems in students can affect health status and productivity levels (Rahmadhani, 2017). According to the Basic Health Research Report (2018), it shows that the prevalence of overnutrition among adolescents in Indonesia had increased from 7.3% in 2013 to 13.5% in 2018. The prevalence of adolescents with overnutrition status in West Java Province is as much as 15.4%, and in Bekasi City, it was 17.4% in 2018. Overnutrition has an impact on disease susceptibility, especially the risk of non-communicable diseases, so it increases morbidity and mortality (Kemenkes RI, 2018).

Optimal nutritional status can achieve individuals who think critically and creatively and have high productivity (Kemenkes RI, 2020a). Optimal nutritional status can be achieved through the implementation of the principles of balanced nutrition as stated in the Guidelines for Balanced Nutrition. The principles of balanced nutrition consist of 4 pillars: diversity of food consumption, physical activity, clean and healthy lifestyle, and routine body weight monitoring (Kemenkes RI, 2014).

Consumption of a balanced nutrition diet can be achieved through a good variety of dietary. Dietary diversity is an indicator of the quality of nutritional intake, which reflects access to and adequacy of nutrition from individual or household food consumption (FAO, 2011). The more you eat a variety of foods, the better your nutritional needs will be fulfilled. Research which had been conducted by Fitriyani (2017) stated that the better the diversity score in food consumption, the better the nutritional status.

The Individual Food Consumption Survey in Indonesia (2014) showed that the food consumption pattern of the Indonesian population is still less diverse; the average consumption of vegetables and fruit is low, food is still dominated by grains, such as rice and wheat and low consumption of tubers. In addition, there is a lower average level of energy and protein adequacy in the adolescent age group (13-18 years) compared to other age groups, namely 72.3% and 82.5%. Ministry of Agriculture, the Republic of Indonesia is targeting to increase food diversification, especially in increasing consumption patterns of tubers by reducing consumption of grains, as well as increasing consumption of animal, plant, vegetable and fruit side dishes in order to fulfil nutritional needs for quality and type of food (Kementrian Pertanian RI, 2021).

Another effort to maintain and achieve optimal nutritional status is through routine body weight monitoring. Monitoring body weight can describe the level of nutritional adequacy of the individual, whether enough, deficiency or excess nutrition (Kemenkes RI, 2014). In addition, research which had been conducted by Rahmadhani's (2017) stated

that weight monitoring influences the nutritional status of students in the nutrition study program at the University of Indonesia.

STIKes Mitra Keluarga students are prospective health workers who have an active role in promoting health. Previous research shows that there are still many STIKes Mitra Keluarga students who have more nutritional problems. Furthermore, research which had been conducted by Sagala (2020) showed that as many as 34.8% of STIKes Mitra Keluarga Bekasi City students are categorized as overnutrition. As many as 37% of students who are categorized as overnutrition have bad eating patterns. Moreover, research which had been conducted by Noerfitri, Tivanny and Rizky (2021) showed that as many as 40% of STIKes Mitra Keluarga students are categorized as overnutrition and have low vegetable and fruit intake. Based on the description above, this study aims to analyze the relationship between dietary diversity and body weight monitoring with the incidence of overnutrition in STIKes Mitra Keluarga students.

Methods

This study used quantitative methods with a cross-sectional design. This study has independent and dependent variables. Dietary diversity and body weight monitoring are independent variables, while the incidence of overnutrition is the dependent variable. This study was conducted in March 2023. This research took place at STIKes Mitra Keluarga, East Bekasi District, Bekasi City, Indonesia. The target populations for this study were all STIKes Mitra Keluarga students, while the reachable populations were active students at STIKes Mitra Keluarga. In addition, the sampling technique used consecutive sampling. Exclusion criteria in this study were students who were on a fixed diet and had poor nutritional status (body mass index <18.5 kg/m²). Based on the calculation of the minimum sample size by using the different proportion test formula (Lemeshow *et al.*, 1990), a minimum sample size of 62 subjects was obtained. Meanwhile, the total samples in this study were 69 STIKes Mitra Keluarga students.

Dietary diversity was analyzed with an Individual Dietary Diversity Score (IDDS). Dietary Diversity data was obtained from 2x24 hour (weekend and weekday) food recall interviews. Then, it was input by using the Individual Dietary Diversity Score form (IDDS). IDDS classified five food groups, including staple foods, animal side dishes, plant side dishes, vegetables and fruits. Each food group gets a score of 1 if it consumes more than equal to 10 grams, and it is given a score of 0 if it consumes less than 10 grams (Felinda, 2021 & Mahmudiono, 2020). DDS is categorized into two categories: Low (if IDDS score <4 food group) and High (IDDS score \geq four food group). In addition, an analysis of the average nutritional adequacy of respondents was conducted by using the NutriSurvey software.

Body weight monitoring data was obtained from filling out questionnaires by respondents in the form of the habit of weighing regularly every month. The results of measuring body weight monitoring are in 2 categories, namely Not Routine (if you do not weigh yourself every month) and Routine (if you regularly weigh yourself at least 1x/month) (Kemenkes RI, 2014). Overnutrition data was obtained based on measurements of Body Mass Index (body weight in kg divided by height in m²) for students aged 18 years are classified as overnutrition if the results of BMI/Age > 1 SD, while those aged > 18 years are classified as overweight if the results of BMI > 25.0 kg/m² (Kemenkes RI, 2014). The results of measuring the incidence of excess nutrition are in two categories, namely, Yes and No.

The analysis conducted included univariate and bivariate analysis. The statistical test used was the Chi-Square test in order to determine the difference in proportions and the relationship between the independent and dependent variables. The ethics component of this study was submitted to the Research Ethics Commission Muhammadiyah University Prof. Dr. Hamka with Research Ethics Approval number 03/23.03/22347.

Results and Discussions

Respondents Characteristics

Table 1. shows that the highest number of research respondents aged 20 years old (37%), all respondents are female (100%), the majority of respondents live at home (98.6%), most of the respondents are nutrition students (52.2%), the total of overnutrition in the study respondents are 34.8% (overweight is 13.1% and obesity is 21.7%), the dietary diversity is low by 63.8% and non-routine weight monitoring is 47.8%.

Table 1. Distribution of Respondents based on Respondent Characteristics

No	Variable	Frequency (n)	Percentage (%)
1.	Age (year):		
	18	2	2,9
	19	20	29
	20	26	37
	21	16	23,2
	22	3	4,3
2.	Gender:		
	Female	69	100
3.	Place to live:		
	Boarding house	1	1,4
4.	Study Program:		
	Nutrition	36	52,2
	Medical Laboratory Technology	11	15,7
	Pharmacy	14	20,3
5.	Nutritional Status:		
	Overweight	9	13,1
	Obesity	15	21,7
6.	Dietary Diversity Score:		
	Low	44	63,8
7.	Body Weight Monitoring:		
	Non routine	33	47,8
	Routine	36	52,2
	Total (N)	69	100

The incidence of overnutrition in this study reaches 34.8%, with the proportion of overweight at 13.1% and obesity at 21.7%. This study is in line with research conducted by Sagala (2020), which shows that 34.8% of STIKes Mitra Keluarga students experience overnutrition. Furthermore, research conducted by Noerfitri *et al.* (2021) showed that as many as 40% of STIKes Mitra Keluarga students experience overnutrition. Factors contributing to nutritional problems in college students include inadequate nutritional intake, poor diet, low food quality, and lack of physical activity. It can be caused by students' busy schedules, stress, and . not having enough time to cook for themselves (Permana *et al.*, 2020).

Dietary Diversity

Table 2. Distribution of Respondents Based on Food Group Consumed

No.	Food Group	Frequency (n)	Percentage (%)
1.	Staple foods (carb)	69	100
2.	Animal side dishes	68	98.6
3.	Plant side dishes	25	36.2
4.	Vegetables	45	65.2
5.	Fruits	16	23.2

Based on **Table 2.**, the results of the number of food groups of DDS instrument which are consumed the least by respondents are the fruit group, only 23.2% of respondents, followed by 36.2% of respondents who consume plant side dishes.

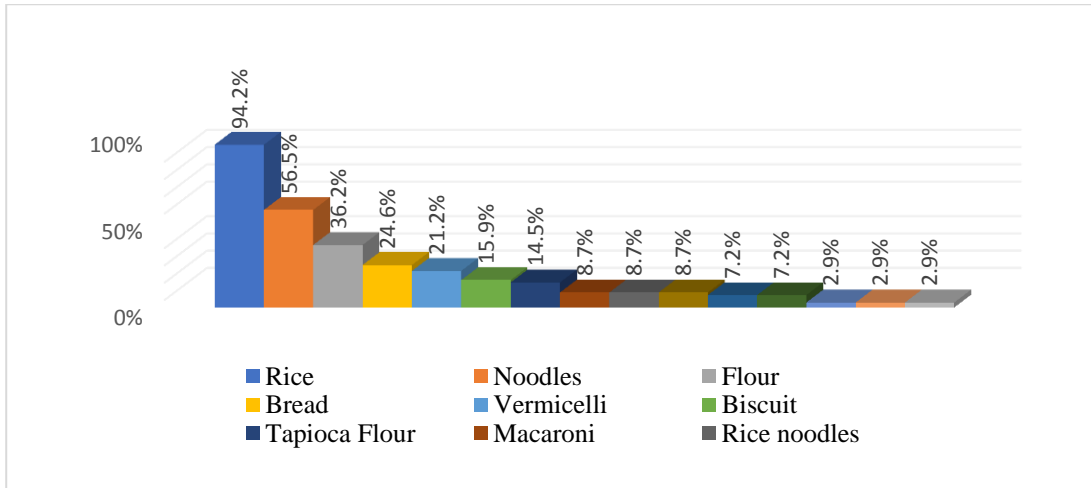


Figure 1. Percentage of Staple Foods Most Consumed by Respondents

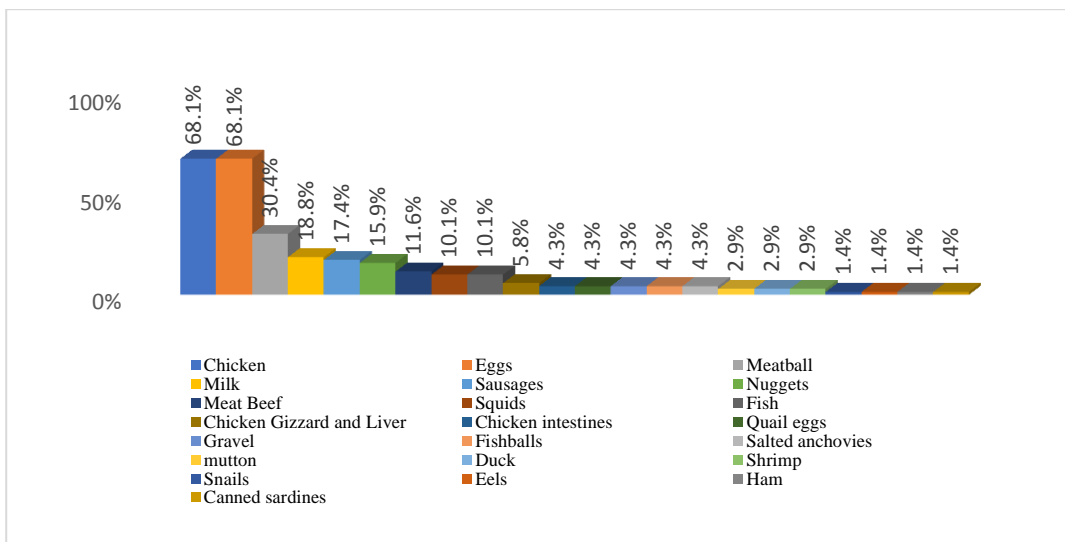


Figure 2. Percentage of Animal Side Dished Most Consumed by Respondents

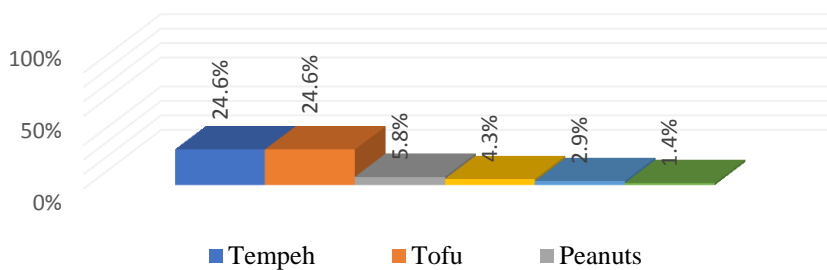


Figure 3. Percentage of Plant Side Dished Most Consumed by Respondents

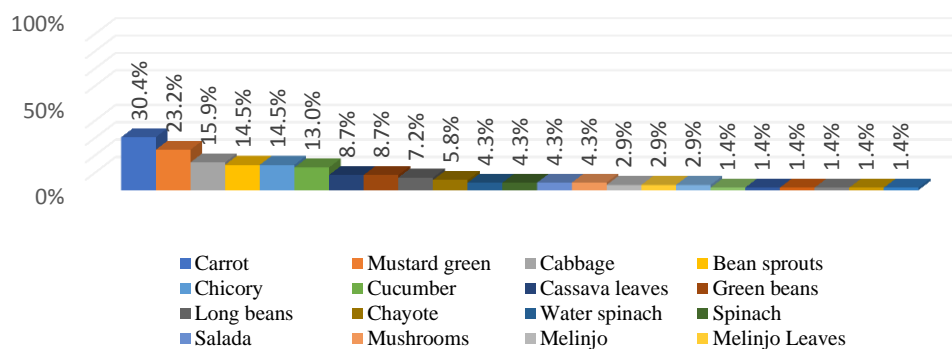


Figure 4. Percentage of Vegetables Most Consumed by Respondents

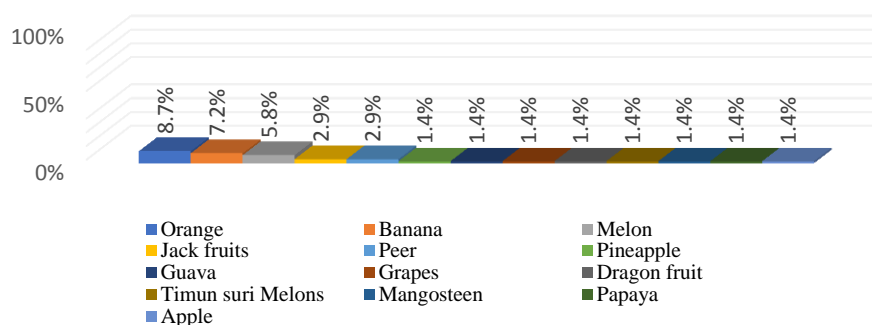


Figure 5. Percentage of Fruits Most Consumed by Respondents

The list of food types based on food groups consumed by respondents based on 2x24 hours food recall analysis is shown in Figures 1, 2, 3, 4, and 5. It is known that the staple food groups most consumed by respondents are rice and noodles, the most consumed animal side dishes are chicken meat and chicken eggs, the most consumed plant side dishes are tempeh and tofu, the most consumed vegetable group are carrots and mustard greens. The most consumed fruit groups are oranges and bananas.

Nutrition Intake

Table 3. Average Intake of Macronutrients in Respondents

No.	Nutrition Intake ^a	Nutrition Intake ^a			RDA ^b
		Weekday	Weekend	Average	
1.	Energy	1375 (61.1%)	1607 (71.4%)	1491 (66.3%)	2250
2.	Carbs	177 (49.1%)	205 (57%)	191 (53%)	360
3.	Protein	52 (86%)	55 (91.6%)	53 (88%)	60
4.	Fat	51 (78.5%)	63 (97%)	57 (87.7%)	65

Description:

^aunit= Energy (kcal), Carbs (gram), protein (gram), fat (gram)

^bRDA for the age 19-29 years for women (Republic of Indonesia’s Ministry of Health, 2019)

Table 3. shows that nutritional intake on college days (weekdays) is lower than on weekends. The average energy intake of respondents is lower than the recommended RDA for the age group of women, which is 2250 kcal. The average of all macronutrients (carbohydrates, protein, fat) consumed by the respondents is below the RDA.

Body Weight Monitoring

Table 4. Distribution of Respondents by Frequency of Body Weight Monitoring in a Month

Body weight monitoring/month	Frequency(n)	Percentage (%)
Never	33	47.8
One time	13	18.8
Two times	10	14.5
Three times or more	13	18.8
Total	69	100 %

Table 4. shows that the frequency of body weighing in a month in respondents is one time and three times or more each by 18.8%.

Relationship between Dietary Diversity and the Incidence of Overnutrition

Table 5 shows the results of the proportion of respondents who are included in overnutrition in respondents with a low dietary diversity score, namely 43.2%. Moreover, the chi-square test shows the value of $p = 0.052$ ($p > 0.05$). It can be concluded that there is no significant relationship between dietary diversity and the incidence of overnutrition in STIKes Mitra Keluarga students.

Table 5. Analysis of the Relationship between Dietary Diversity and the Incidence of Overnutrition

Dietary Diversity	Overnutrition				Total (N)		p-value*
	Yes		No		n	%	
	n	%	n	%			
Low	19	43.2	25	56.8	44	100	0.052
High	5	20	20	80	25	100	

N = 69 (*The data was significant if p-value <0,05)

This study used DDS based on five food groups consisting of staple foods, side dishes of animals, plants, vegetables, and fruits. The diversity of food consumption is in the less category if you consume <4 food groups. The proportion of respondents with less diversity in food consumption is 43.2%. Many respondents consume less or do not consume the plant side dishes, vegetables, and fruits, marked by the lower percentage of respondents who consume plant side dishes, vegetables, and fruits. It is in line with research conducted by Fitriyani's research (2017), which shows that respondents with overnutrition status tend to score less diversity in food consumption, as well as lower vegetable and fruit intake. Consuming less fiber from vegetables and fruits can risk nutritional problems such as overnutrition and obesity in adolescents and young adults. Consumption of adequate amounts of vegetables and fruits can reduce the risk of obesity and non-communicable diseases such as diabetes, metabolic syndrome, and heart disease (Singh *et al.*, 2019).

In the difference in nutritional intake of respondents on college days and weekends, respondents' energy intake and macronutrients on weekends tend to be higher than on weekdays. It is presumably because the respondents skip meals during a busy class schedule, and it may affect the amount of nutritional intake. It is in line with research conducted by Lestari (2017) that students tend to skip meals due to busy schedules, so nutritional intake on college days is lower than on weekends, and consumption of vegetables and fruit is very low.

The results of the statistical test analysis show that there is no significant relationship between dietary diversity and the incidence of overnutrition. However, the proportion of nutritional events tends to be smaller in the group of respondents with good food consumption diversity. These results align with research conducted by Swamilaksita & Sa'pang (2017) and Melani (2016), which stated that there is no relationship between diversity in food consumption and the nutritional status of obesity in adolescents. It is presumably because the respondents consumed a lot of high-calorie foods, so even though the diversity of food consumption is good, their calorie intake exceeds nutritional needs, which leads to overnutrition. An individual consumes excess intake and lacks physical activity in the long term, so there will be a risk of overnutrition (Praditasari & Sri, 2018).

The analysis showed that the low food consumption diversity group in the normal nutritional status group was more than the overnutrition group at 56.8%. Therefore, respondents with normal nutritional status also needed a better food consumption diversity score. Based on the analysis results and linkages with previous research, the incidence of overnutrition is not only influenced by the diversity of food groups consumed, but the multifactorial causes of the incidence of overnutrition also influence it. The causes of overnutrition can be influenced by various factors, including energy imbalances and poor eating patterns, poor sleep patterns, stress, and lack of physical activity (Amrynia & Prameswari, 2022). In addition, dietary diversity needs to pay attention to food with balanced proportions; the amount is not excessive, and it is consumed regularly (Kemenkes RI, 2014).

Relationship of Body Weight Monitoring and the Incidence of Overnutrition

Table 6. shows that the proportion of respondents who are included in overnutrition are respondents in the group who do not routinely monitor body weight, namely 51.5%. Furthermore, the statistical test results show the p-value = 0.005 ($p < 0.05$). Therefore, it is concluded that there is a significant relationship between monitoring body weight and the incidence of overweight in respondents. The Odds Ratio (OR) test results are known to be 4.4. It shows that respondents who do not monitor their weight routinely have a 4.4 times greater risk of experiencing overnutrition compared to respondents who monitor their weight routinely at least once a month.

Table 6. Analysis of the Relationship of Body Weight Monitoring and the Incidence of Overnutrition

No.	Body Weight Monitoring	Overnutrition				Total		Odds Ratio (95% CI)	p-value
		Yes		No		n	%		
		n	%	n	%				
1.	Non routine	17	51.5	16	48.5	33	100	4.402 (1.508-12.847)	0.005
2.	Routine	7	19.4	29	80.6	36	100		

Regular weight monitoring is one of the four pillars of balanced nutrition. Monitoring body weight is an effort to maintain normal weight (Kemenkes RI, 2014). In this study, routine weight monitoring is associated with the incidence of overnutrition. Based on the study results, it is known that most respondents have implemented routine weight monitoring, which is characterized by the proportion of respondents who weigh at least once a month as much as 52.2%. The results show that the proportion of respondents who do not weigh themselves regularly and are categorized as overnutrition is 51%. Based on the results of the statistical test analysis, it shows that there is a significant relationship between monitoring body weight and the incidence of overnutrition. Respondents who do not routinely monitor their weight have a 4.4 times greater risk of experiencing overnutrition compared to respondents who monitor their weight regularly.

These results are in line with research which had been conducted by Rahmadhani (2017) that there is a relationship between routine weight monitoring and nutritional status in college students. Students who do not monitor their weight have a 2.4 times greater risk of experiencing overnutrition. Monitoring body weight independently and routinely is a strategy for weight management in individuals with obesity (Carpenter *et al.*, 2022). In addition, routine monitoring of body weight can provide information on weight deviations that may be experienced by individuals so that it can be useful in weight management (Kemenkes RI, 2014).

Conclusions

STIKes Mitra Keluarga students in this study experience 34.8% of overnutrition, 63.8% of low dietary diversity, and 47.8% of non-routine weight monitoring. There is no significant relationship between dietary diversity and the incidence of overnutrition in STIKes Mitra Keluarga students. However, there is a significant relationship between body weight monitoring and the incidence of overnutrition in STIKes Mitra Keluarga students. Students who do not routinely monitor their weight have a 4.4 times greater risk of experiencing overnutrition compared to students who regularly monitor their weight.

It is expected that future researchers will examine the factors of overnutrition that are not present in this study in more depth. There are research limitations in this study, namely that there is no data on the history of respondents' conditions before the study, such as a family history of obesity and a history of obesity since childhood. In addition, there are areas for improvement of the food recall instrument that cannot describe the eating habits of individuals in the long term. Meanwhile, one of the factors affecting overnutrition status is long-term eating habits. Is there any limitation of the study? It may help to be added as a messages to future studies.

References

- Carpenter, C. A., et al. 2022. Using self-monitoring technology for nutritional counseling and weight management. *Digital Health*, 8. <https://doi.org/10.1177/20552076221102774>
- FAO. 2011. *Guidelines for measuring household and individual dietary diversity*. FAO, Rome.
- FAO. 2019. *Food-based dietary guidelines*. Dikutip dari <https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/indonesia/en/>
- Felinda, V. 2021. Hubungan Keanekaragaman Pangan dengan Status Gizi Remaja Usia 16-18 Tahun di MAN 2 Kota Bengkulu. *Skripsi*. Poltekkes Kemenkes Bengkulu.
- Fitriyani. 2017. Keragaman Konsumsi Pangan kaitannya dengan Status Gizi dan Usia Menarche pada Remaja Putri. *Skripsi*. Institut Pertanian Bogor.
- Kemenkes RI. 2014. *Permenkes No. 41 Tahun 2014 Tentang Pedoman Gizi Seimbang*. Jakarta: Kementerian Kesehatan RI, Jakarta.
- Kemenkes RI. 2018. *Kenali Masalah Gizi yang Ancam Remaja Indonesia*. Kementerian Kesehatan RI. Dikutip dari <https://www.kemkes.go.id/article/view/18051600005/kenali-masalah-gizi-yang-ancam-remaja-indonesia.html>
- Kemenkes RI. 2019. *Laporan Nasional Riskesdas 2018*. Kementerian Kesehatan RI, Jakarta.
- Kemenkes RI. 2019b. *Permenkes No. 28 tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia*. Kementerian Kesehatan RI, Jakarta.
- Kemenkes RI. 2020a. *Gizi saat Remaja Tentukan Kualitas Keturunan*. Kemenkes RI. Dikutip dari <https://www.kemkes.go.id/article/print/20012600004/gizi-saat-remaja-tentukan-kualitas-keturunan.html>
- Kemenkes RI. 2020b. *Panduan Hari Gizi Nasional*. Kementerian Kesehatan RI.
- Kemenkes RI. 2020c. *Permenkes RI No. 2 Tahun 2020 tentang Standar Antropometri Anak*. Kementerian Kesehatan RI.
- Kementerian Pertanian RI. (2021). *Buletin Konsumsi Pangan*. Kementerian Pertanian RI. Dikutip dari <http://epublikasi.setjen.pertanian.go.id/arsip-buletin/53-buletin-konsumsi/772-buku-buletin-konsumsi-pangan-semester-i-2021>.
- Kementerian Pertanian RI. 2022. *Outlook Komoditas Peternakan Telur Ayam Ras Petelur*. Kementerian Pertanian RI Jakarta.
- Lemeshow, S., et al. 1990. *Adequacy of Sample Size in Health Studies*. World Health Organization.
- Lestari, C. F. 2017. Keragaman Tingkat Keanekaragaman Konsumsi Pangan, Tingkat Kecukupan Gizi dan Status Gizi Mahasiswa Gizi IPB. *Skripsi*. Institut Pertanian Bogor.
- Lubis, Y. T. 2018. Hubungan Penerapan Prinsip Gizi Seimbang dengan Status Gizi Pada Mahasiswa Jurusan Gizi Poltekkes Kemenkes Medan. *Skripsi*. Poltekkes Medan.
- Mahmudiono, T., Andadari, D. P. P. S., & Segalita, C. 2020. Difference in the association of food security and dietary diversity with and without imposed ten grams minimum consumption. *Journal of Public Health Research*, 9(3), 316–320. <https://doi.org/10.4081/jphr.2020.1736>
- Melani, V. 2016. Hubungan Keragaman Konsumsi Pangan dan Status Gizi Wanita. *Jurnal Gizi - Dietetik*, 8(2), 80–84.
- Noerfitri, N., Putri, T. W., & Febriati, R. U. 2021. Hubungan antara Kebiasaan Melewatkan Sarapan, Konsumsi Sayur Buah dan Fast Food, Aktivitas Fisik, Aktivitas Sedentary dengan Kejadian Gizi Lebih. *JURNAL ILMIAH KESEHATAN MASYARAKAT: Media Komunikasi Komunitas Kesehatan Masyarakat*, 13(2), 56–63. <https://doi.org/10.52022/jikm.v13i2.205>
- PDDikti. 2020. *Higher Education Statistics 2020*. pp. 81–85. Dikutip dari <https://pddikti.kemdikbud.go.id/publikasi>.
- Permana, L., et al. 2020. Analisis Status Gizi, Kebiasaan Makan Dan Aktivitas Fisik Pada Mahasiswa Kesehatan Dengan Pendekatan Mix-Method. *Husada Mahakam : Jurnal Kesehatan*, 10(2), 19–35.
- Praditasari, J. A., & Sri, S. 2018. Asupan Lemak, Aktivitas Fisik dan Kegemukan pada Remaja Putri di SMP Bina Insani Surabaya. *Media Gizi Indonesia*, 13(2), 117–122. <https://doi.org/10.20473/mgi.v13i2.117>
- Pritasari., Damayanti, D., & Lestari, N. T. (2017). *Gizi Dalam Daur Kehidupan*. Jakarta: Kementerian Kesehatan RI.

- Purnamasari, A., Musni, Nurwildan, Al, Andi, Ratnasari, Nur, Desyani, Misnarliah, Haryanto, Arwan, & Syarifuddin. 2022. *Fisiologi Manusia dan Zat Gizi*. Cendekia Publisher.
- Rahmadhani, A. R. 2017. Hubungan Pengetahuan dan Perilaku Gizi Seimbang serta Faktor lainnya terhadap Status Gizi pada Mahasiswa Program Studi Gizi Fakultas Kesehatan Masyarakat Universitas Indonesia. *Skripsi*. Universitas Indonesia.
- Sagala, C. O. 2020. Hubungan Pola Makan dan Pengetahuan Gizi Seimbang dengan Kejadian Gizi Lebih Pada Mahasiswa STIKes Mitra Keluarga Bekasi Tahun 2020. *Skripsi*. STIKes Mitra Keluarga.
- Singh, J. K., Acharya, D., Gautam, S., Adhikari, M., Park, J. H., Yoo, S. J., & Lee, K. 2019. Socio-demographic and diet-related factors associated with insufficient fruit and vegetable consumption among adolescent girls in rural communities of southern Nepal. *International Journal of Environmental Research and Public Health*, 16(12), 1–11. <https://doi.org/10.3390/ijerph16122145>
- Sirajuddin, Surmita, & Astuti, T. 2018. *Bahan Ajar Gizi: Survey Konsumsi Pangan*. Kementerian Kesehatan RI, Jakarta.
- Swamilaksita, P. D., & Sa'pang, M. (2017). Keragaman Konsumsi Pangan dan Densitas Gizi Pada Remaja Obesitas dan Non Obesitas. *Nutrive Diaita*, 9(2), 44–50.