Body Image, Energy Adequacy, Polyunsatyrated Fatty Acid (PUFA) Intake with Percentage of Body Fat In Overweight And Obesity Adolescent at SMA Institut Indonesia Semarang

Sri Hapsari Suhartono Putri[1], Ali Rosidi[1], Nur Azizah Maharani[1], Rr.Annisa Ayuningtyas[1], Sufiati Bintanah[1*], Amaliya Widayanti [1]

[1] Nutrition Department, Faculty of Nursing and Health Sciences, Universitas Muhammadiyah Semarang, Semarang, Central Java 50273 Indonesia
sofi_unimus@yahoo.com

Abstract. Overweight and obesity can occur in all age groups and is most common in teenagers. The adolescent group is still in the growth phase so they still require a relatively large nutritional intake which can cause several dietary problems. The aim of this study was to analyze the relationship between perceived body image, fat intake (PUFA), and energy adequacy with body fat percentage in adolescents with over-nutritional status and obesity at SMA Institut Indonesia Semarang. The research method used a cross sectional design with 50 subjetcs using a total sampling technique. Research methods include measuring percent fat using the Omron brand HBF-37 BIA tool, interviewing PUFA fat and energy intake using a 2x24 hour recall form and body image using the BSQ-34 questionnaire. Statistical tests use the Pearson and Spearman tests. The results of the study showed that there was a relationship between PUFA intake (p-value: 0.047; r: -0.283) and there was no relationship between body image perception (p-value: 0.121), energy adequacy (p-value: 0.709) with body fat percentage in overweight and obese teenagers at SMA Institut Indonesia Semarang. It can be concluded that increasing PUFA intake is associated with decreasing body fat percentage in overnourished and obese adolescents.

Keywords: Body Fat Percentage, Body Image, Polyunsaturated Fatty Acid Intake, Overweight and Obesity Adolescents

1 INTRODUCTION

Nutritional problems, especially Overweight, have become a double nutritional problem in Indonesia, namely causing overweight and obesity which can be experienced from children to adults, while the handling of malnutrition problems has not been resolved. Nutritional problems in adolescents are important to pay attention to because they have a 70% risk of experiencing Overweight or obesity as adults [1]. According to UNICEF (2018), teenagers in Indonesia are at risk of nutritional problems such as Overweight, undernutrition, and micronutrient deficiencies [2]. Adolescence

K. Nugraheni et al. (eds.), *Proceedings of the 2nd Lawang Sewu International Symposium on Health Sciences: Nutrition (LSISHSN 2023)*, Advances in Health Sciences Research 80,
https://doi.org/10.2991/978-94-6463-550-8_18

requires adequate nutritional needs both in terms of quantity and quality in terms of diet, which is important to overcome rapid growth and reduce the risk of other health problems that increase nutritional needs [3].

Overweight and obesity are an imbalance in the amount of intake consumed according to needs, where more energy intake is consumed than is needed by a person's body [4]. High intake of macronutrients such as carbohydrate intake, protein intake, and fat intake is a risk factor for obesity in adolescents. Obesity is basically caused by excess fat tissue. Several factors that cause adolescents to become obese include unbalanced eating patterns, heredity, lifestyle, and psychological, environmental, individual, and biological factors that can influence energy intake and expenditure [5]. Nutritional problems such as Overweight and obesity are classified as complex and chronic problems that can cause serious health problems and can potentially cause metabolic disease, degenerative diseases such as cardiovascular disease, hypertension, type II diabetes mellitus, heart failure, stroke, and several types of cancer. it can even cause reproductive problems in adulthood and can be a cause of death [6].

Based on Riskesdas Basic Health Research data (2018), the comparison of nutritional status measurements, BMI/U, the prevalence of Overweight or obesity in adolescents aged 16-18 years in Indonesia is 13.5%, consisting of (9.5%) including Overweight or obesity. and (4.0%) including obesity. Riskesdas data (2018), states that the prevalence of nutritional status of adolescents aged 16-18 years in Central Java consists of very thin (1.59%), thin (8.12%), obese (7.91%), and obesity (3.66%). The prevalence of adolescents aged 16-18 years in Semarang City in 2018 consisted of very thin (0.43%), thin (5.28%), fat (9.49%), and obese (5.39%). This shows that the prevalence of fat and obesity nutritional status at the Semarang City level exceeds the prevalence rate at the Central Java level [7].

Study at SMA Institut Indonesia Semarang with 353 students consisting of a total of 198 class XI students and 155 class XII students, it was found that the prevalence of overweight and obesity in women reached (8.78%) while men reached (7.08%). Being overweight is closely related to a high percentage of fat because there is an imbalance between energy intake and energy output that lasts for a long time, resulting in excessive fat accumulation [4]. which comes from foods consumed that are high in energy and stored as body fat. Percent body fat is the percentage of fat and non-fat tissue mass (fat-free mass) in a person's body which is measured using a tool, namely the Bioelectric Impedance Analyzer (BIA), and expressed in percent units (%). Percent body fat is an indicator used to determine status. More nutrition compared to BMI/U.

Overweight and obesity are related to macronutrient intake and the individual's perception of themselves. Nutrients that are synonymous with overweight or obesity are fat and energy. Fat intake has a higher energy density than other macronutrients. Fat intake (PUFA) is the most easily digestible fat that contains several essential fatty acids that the body needs through intake from food for normal tissue growth and function. PUFA is divided into n-3 (omega-3) and n-6 (omega-6). According to the AKG (2019), the daily requirement for omega-3 fats for teenagers aged 16-18 years for girls is 1.1 grams/day, while for men it is 1.6 grams/day and omega-6 per day for teenagers aged 16-18 years, girls 11 grams and boys. male 16 gr. Polyunsaturated Fatty Acid (PUFA) has an important role in physiological function and fat metabolism,

immune function, and maintenance of cell membrane function and integration. Polyunsaturated Fatty Acid (PUFA) is useful for reducing obesity by reducing appetite, increasing oxidation, and accumulation of fat in the body [8]

Body image or what is known as body image is a person's attitude regarding feeling satisfied or dissatisfied with their body, resulting in a negative or positive assessment of themselves. Body image can cause perceptions that tend to judge the individual's body size and weight [9].

Research by Nazhif Ghifari et al on teenagers in DKI Jakarta found that there was a relationship between energy intake and percent body fat (p-value: 0.019) [10]. The research results show that there is also a strong positive correlation between fat intake and body fat percentage (p-value: 0.002) [11].

2 METHOD

This type of research is observational research with a cross-sectional design [12]. The research was conducted at the Institut Indonesia Semarang High School from October to December 2023. Samples were taken using the total sampling technique used in the research with as many as 50 subjects who met the inclusion criteria having a BMI/U category (+1SD to +2SD) and (> +2SD) [13], willing to be a respondent to take part in research procedures and aged 16-18 years. The data measured includes anthropometric measurements of body weight and height with the help of digital scales and microtoices to determine students' nutritional status according to the BMI/U category. Data on PUFA fat intake and energy adequacy were carried out using a 2x24-hour recall method carried out on Friday and Monday and then analyzed using nutrisurvey software.

Body image data using the Body Shape Questionnaire (BSQ) questionnaire instrument with a Likert scale of 1 to 6 consisting of 34 questions divided into 2 categories: positive body image (≤ 110) and negative body image (> 110) [14]. Body fat percent data was measured directly with the help of a BIA (Bioelectrical Impedance Analysis) Omron model HBF-375. Data were tested for normality using the Kolmogorov-Smirnov test. The Pearson test was used to analyze PUFA intake, body image, and percent body fat. Analysis of the relationship between knowledge and energy adequacy and body fat percentage using the Spearman test, with a confidence interval of 5%. Research ethics has obtained permission from the Unimus ethical clearance agency.

3 RESULTS AND DISCUSSION

The subjects in this research were female students in class XI and XII who were overweight based on BMI/U. From the results of data collection, 50 research subjects were obtained based on inclusion and exclusion criteria. The characteristics of the research subjects include gender, age, nutritional status based on BMI/U, Body Image Perception, Polyunsaturated Fatty Acid (PUFA) fat intake, and Body Fat Percentage.

Table 1 shows that the gender of respondents with the highest percentage is female with the number of respondents being 26 (52%) which is 9 more than male teenagers, namely 24 (48%). The age of respondents with a higher percentage was 17 years old with a total of 26 respondents (52%). The average age of respondents in this study was 17 years.

Table 1. Distribution of Subject Characteristics

Characteristics	n	%
Gender		
Male	24	48
Female	26	52
Total	50	100
Age		
16 Years old	**15**	**30**
17 Years old	**26**	**52**
18 Years old	**9**	**18**
Total	50	100
Nutritional Status		
Overweight (>+1SD sd +2SD)	22	44
Obesitas (>2SD)	28	56
Total	50	100
PUFA Intake		
Less Intake (25,97gr)	36	72
More Intake (>25,97gr)	14	28
Total	50	100
Energy Adequacy		
More	30	60
Normal	15	30
Mild Level Deficit	3	6
Moderate Level Deficit	1	2
Severe Level Deficit	1	2
Total	50	100
Body Image		
Positive (<110)	20	40
Negative (≥ 110)	30	60
Total	50	100
Body Fat Percentage		
Very High (>25%)	31	62
High (20-≤25%)	15	30
Normal (10-≤20%)	4	8
Total	50	100

The nutritional status (BMI/U) of respondents with a higher percentage of males in the obese category was 18 respondents (75%) while the female gender was in the overweight category of 16 respondents. (61.5%) Body mass index (BMI/U) is an indicator to determine whether someone is in the underweight or overweight category. The majority of respondents have over-nutritional status and are obese due to irregular food intake, food and drink choices that do not look at quantity and nutritional value, and prioritizing preferences for certain foods and drinks based on the criteria of being

practical, fast, and affordable. Foods that respondents tend to like include fast food, fast food which, when viewed from its composition, contains high calories, high fat, sugar, low fiber, and most importantly, if consumed in large quantities, it is not good for the body in the long term and can cause harm. one factor in weight gain. According to the results of observations on respondents, factors that can influence nutritional status and obesity apart from food intake are low physical activity. Respondents with nutritional status are more likely to have low physical activity, such as rarely exercising, and respondents have the habit of preferring to play gadgets, play games, or relax during break times rather than being active. This is in line with research by Suryana and Fitri (2017) which revealed that nutritional status is influenced by physical activity.

Mostly subjects' PUFA intake was less (72%), and energy adequacy was more (60%). Most of the respondents had insufficient PUFA intake and excessive energy intake because the foods that respondents frequently consumed included saturated fat, such as fast and instant foods such as fried chicken, instant noodles, and fried foods. This shows that the level of saturated fat consumed is higher than unsaturated fat [15].

The body image perception of men and women shows that the majority of respondents' body image perception is in the negative body image category. Perception of body image (body image) has an influence on a person's eating pattern, where diet plays an important role in fulfilling daily nutrition and a person's nutritional status [16]. Perception of body image has an impact on a person's condition, namely for teenagers with over-nutritional status or perceived obesity. Negative body image has advantages, including encouragement to change their body shape by going on a diet to achieve ideal body proportions [17]. While teenagers with a positive body image perception.

Most of the subjects had a very high body fat percentage (62%), According to (Limbong and Malinti, 2023) body fat is closely related to nutritional status or BMI because the higher the BMI value, the body fat percentage is in the high or very high category and if The lower the BMI value, the percent body fat is in the low or normal category [18]. Adolescent girls are at greater risk of obesity and a high percentage of body fat compared to boys based on influencing factors including poor sleep patterns, consumption of high-fat foods, and lack of physical activity [19]. Adolescent girls tend to have a higher body fat percentage compared to boys because adolescent girls have a distribution of fat in certain parts of the body such as (upper arms, breasts, and hip area) than boys, especially due to through hormonal factors [20]. When physical maturity occurs, the amount of body fat in teenage girls is usually twice that of boys [21]. Fat stores in women are found in the hip area (pear shape) while in men in the stomach area (apple shape), apart from that the role of the hormone estrogen which influences weight gain in women, and the hormone testosterone plays a role in increasing fat mass in men 15 so that men tend to have low body fat [22]. Based on observations of respondents, it was found that respondents with more body weight and obesity tended to have a high percentage of fat because it was seen from the food intake factors of teenagers in high school Indonesian Institutets tend to rarely bring provisions and prefer to eat food from outside which is high in fat such as fried foods (risol mayo, mendoan, bakwan, donuts) and packaged sweet drinks such as iced tea, coffee almost during break times and after school hours.

Increasing PUFA intake correlates with decreasing body fat percentage (p-value: 0.047; r: -0.283) according to Figure 1. Polyunsaturated fatty acids (PUFA), including omega-3 and omega-6 fatty acids, play an important role in various physiological functions of the body, including the regulation of metabolism and inflammation. Adequate PUFA intake has potential anti-inflammatory, anti-apoptotic, anti-proliferative and anti-angiogenic effects. Omega-3 fatty acids, such as EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), can increase fat oxidation in the body. This occurs because omega-3 increases the activity of enzymes involved in burning fat, such as lipoprotein lipase and hormone-sensitive lipase. Increasing fat oxidation can help reduce body fat accumulation [23]. PUFA can also increase energy metabolism by increasing basal metabolic rate and heat generation through the process of thermogenesis. It contributes to the reduction of body fat by increasing the number of calories burned by the [24].

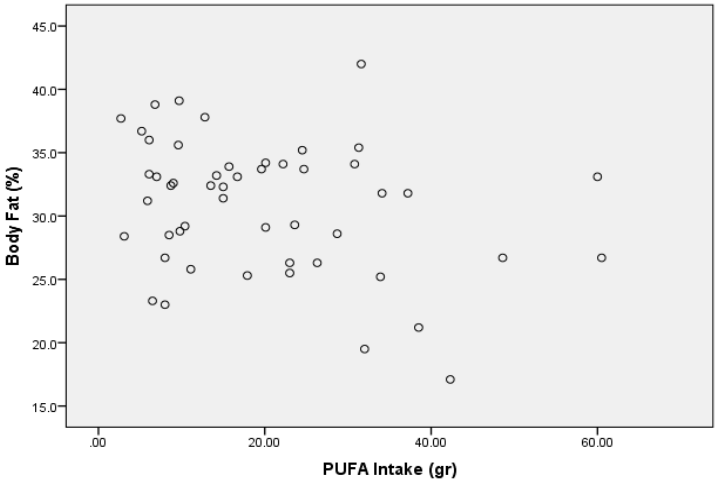

Fig. 1. Relationship between PUFA intake and body fat percentage

According to Lestari et al's research which shows that there is a relationship between increasing PUFA intake and decreasing body fat (p-value<0.001:r=-0.714) in female students [25]. In contrast to Gholamalizadeh's research, the results showed that there was no relationship between PUFA intake and percent body fat (p-value: 0.610) in male adolescents [26].

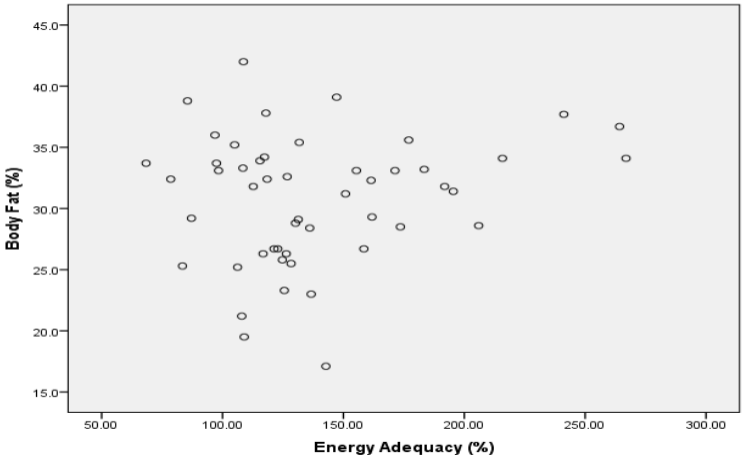

Fig. 2. Relationship between Energy Adequacy and Body Fat Percentage

Figure 2 shows that energy adequacy does not correlate with body fat percentage (p-value: 0.054). Energy adequacy refers to sufficient calorie intake to meet the body's energy needs. Adequate energy intake can support normal metabolic function, including fat burning. Adequate energy helps maintain the balance of hormones that regulate fat metabolism, such as leptin and ghrelin and ensures that the body does not adapt to metabolism by reducing energy expenditure [27]. According to Sholichah's research, the results showed that there was no relationship between energy intake and body fat percentage (p-value: 0.467) [28]..This is not in line with Gifari et al's research, which found that getting sufficient energy was correlated with body fat percentage (p-value: 0.019) [10]. Energy adequacy in this study did not correlate with body fat percentage, which could occur because teenagers have regular activities with sports lessons every week in high school.

Figure 3 shows that body image is not correlated with body fat percentage (p-value: 0.121). Body image perception is the way individuals perceive and feel the appearance of their own body. It involves how a person assesses the size, shape, and proportions of their body. Body image perceptions can influence mental health, eating behavior, and social relationships. This eating behavior can affect body fat percentage. The results of Gifari et al's research also show that there is no relationship between body image and body fat in adolescents (p-value: 0.44) [10].

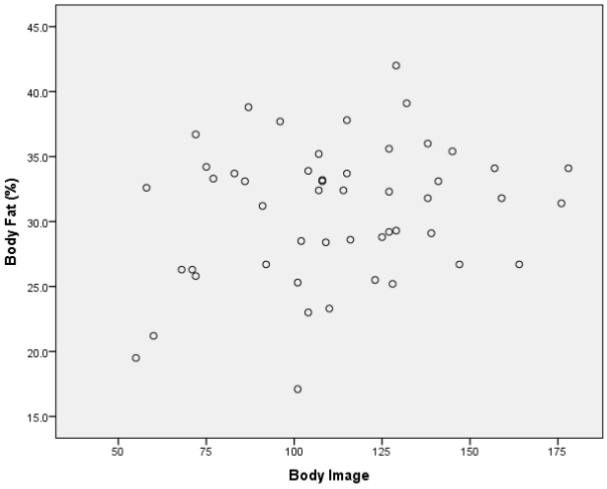

Fig. 3. Relationship between body image and body fat percentage

4 CONCLUSION

The improvement in PUFA intake was reduced body fat percentage. Energy adequacy and body image are not associated with body fat percentage in overweight and obese adolescents at SMA Institut Indonesia Semarang.

References

1. Suryani I, Isdiani N, Kusmayanti GAD (2018). Bahan Ajar Gizi Dietetik dan Penyakit Menular. Jakarta: Pusat Pendidikan Sumber Daya Manusia Badan Pengembangan dan Pemberdayaan Sumber Daya Manusia Andita et al. JAKAGI, Volume 1, Nomor 1, Desember 2020 35 Kesehatan; 2018. Tersedia pada: http://bppsdmk.kemkes.go.id/pusdiksdmk/wpcontent/uploads/2018/09/DietetikPenyakit-Tidak-Menular_SC.pdf.
2. UNICEF, WHO, & World Bank Group (2018). Joint Child Malnutrition Estimates 2018 Edition. Available: http://www.who.int/nutgrowthdb/estimates2017/en/. Accessed 23 May 2018.
3. Kahssay, M., Mohamed, L. and Gebre, A. (2020) 'Nutritional Status of School Going Adolescent Girls in Awash Town , Afar Region , Ethiopia', 2020.
4. Ermona, N.D.N. and Wirjatmadi, B. (2018) 'Hubungan Aktivitas Fisik Dan Asupan Gizi Dengan Status Gizi Lebih Pada Anak Usia Sekolah Dasar Di Sdn Ketabang 1 Kota Surabaya Tahun 2017 Relationship between Physical Activity , Nutrition Intake and Overweight Status among Elementary School Student in SD', pp. 97–105. Available at: https://doi.org/10.20473/amnt.v2.i1.2018.97-105.
5. Bitung, D.I.K. and Manampiring, A.E. (2016) 'Faktor-Faktor Risiko Terhadap Obesitas Pada Remaja',4, pp. 2–6.

6. Pakar Gizi Indonesia. (2017) Ilmu gizi teori dan aplikasi. Hardinsyah dan Supariasa IDN, editor. Jakarta: Buku Kedokteran EGC
7. Kemenkes RI. (2018). Hasil Riset Kesehatan Dasar Tahun 2018. Kementrian Kesehatan RI, 53(9), 1689–1699.
8. Salman, H.B., Salman, M.A. and Akal, E.Y. (2022) 'The effect of omega-3 fatty acid supplementation on weight loss and cognitive function in overweight or obese individuals on weight-loss diet', Nutricion Hospitalaria, 39(4), pp. 803–813. Available at: https://doi.org/10.20960/nh.03992.
9. Merita, N. H., & Djayusmantoko. (2020). Persepsi Citra Tubuh, Kecenderungan Gangguan Makan Dan Status Gizi Pada Remaja Putri Di Kota Jambi. Journal of Nutrition College, 9(2), 2–7. http://ejournal3.undip.ac.id/index.php/jnc/.
10. Gifari Nazhif, Laras Sitoayu, Rachmanida Nuzrina, Putri Ronitawati, Mury Kuswari, Teguh Jati Prasetyo. 2022. The Association of Body Image, Nutrient Intake, Physical Activity Among Adolescent. Nutritional & Food Science. DOI 10.1108/NFS-10-2021-0305.
11. Rahman, M. M., Salikunna, N. A., Sumarni, S., Wahyuni, R. D., Badaruddin, R. ., Ramadhan, M. Z. ., & Arief, A. . (2021). Hubungan Asupan Lemak Terhadap Persentase Lemak Tubuh Mahasiswa Fakultas Kedokteran Universitas Tadulako Angkatan 2019. Healthy Tadulako Journal (Jurnal Kesehatan Tadulako), 7(1), 21-29. https://doi.org/10.22487/htj.v7i1.137.
12. Herdiani, F.D., 2021. Survey Design : Cross Sectional dalam Penelitian Kualitatif. Jurnal Ilmiah Ilmu Terapan Universitas Jambi, 5(1), pp.31–38.
13. Pemenkes RI (2020) Peraturan Menteri Kesehatan RI Nomor 2 tahun 2020 tentang Standar Antropometri Anak. Jakarta: Menteri Kesehatan RI.
14. Sitepu, F. H. (2020) Validitas Dan Reliabilitas Dari Instrumen Body Shape Questionnaire – 34 (BSQ – 34) Versi Bahasa Indonesia. USU.
15. Suryana, S., & Fitri, Y. (2017). Hubungan Aktivitas Fisik dengan IMT dan Komposisi Lemak Tubuh. AcTion: Aceh Nutrition Journal, 2(2), 114-119. doi:http://dx.doi.org/10.30867/action.v2i2.64.
16. Margiyanti, N.J. (2021) 'Analisis Tingkat Pengetahuan, Body Image dan Pola Makan terhadap Status Gizi Remaja Putri', Jurnal Akademika Baiturrahim Jambi, 10(1), p. 231. Available at: https://doi.org/10.36565/jab.v10i1.341.
17. Suaebah & Widyana Lakshmi Puspita (2020). Body Image And Nutrition Assessment As A Predictor Of Nutritional Status Among Adolescents In Public Senior High School 9 Pontianak City. Jurnal teknologi Kesehatan Borneo, 1(2), pp.78–84.
18. Limbong, M.N.A. and Malinti, E. (2023) 'Hubungan Indeks Massa Tubuh dengan Persen Lemak Tubuh dan Lemak Visceral Pada Mahasiswa Fakultas Ilmu Keperawatan', Nutrix Journal, 7(1), p. 43. Available at: https://doi.org/10.37771/nj.v7i1.929.
19. Groth, S. W., & Morrison-Beedy, D. (2011). Obesity Risk in Urban Adolescent Girls: Nutritional Intentions and Health Behavior Correlates. The Journal of the New York State Nurses' Association, 42(0), 15. /pmc/articles/PMC3640335/.
20. Oktaviani, W. D., & Saraswati, L. D. (2012). Hubungan kebiasaan konsumsi fast food, aktifitas fisik, pola konsumsi, karakteristik remaja dan orang tua dengan indeks massa tubuh (IMT). Jurnal Kesehatan Masyarakat Universitas Diponegoro, 1(2), 542–553.
21. Nisa, N. C., & Rakhma, L. R. (2019). Hubungan persepsi body image dengan asupan lemak dan komposisi lemak tubuh pada siswi di MAN 2 Surakarta. Jurnal Gizi.
22. Karastergiou, K., Smith, S. R., Greenberg, A. S., & Fried, S. K. (2012). Sex differences in human adipose tissues – the biology of pear shape. Biology of Sex Differences, 3(1), 13. https://doi.org/10.1186/2042-6410-3-13.

23. Fonda, G., Pranata, R., & Deka, H. (2017). Role of Omega-3 Fatty Acids in Dyslipidemia and Cardiovascular Diseases. Indonesian Journal of Cardiology, 37(4), 213-22. https://doi.org/10.30701/ijc.v37i4.586.
24. Albracht-Schulte K, Kalupahana NS, Ramalingam L, Wang S, Rahman SM, Robert-McComb J, Moustaid-Moussa N. Omega-3 fatty acids in obesity and metabolic syndrome: a mechanistic update. J Nutr Biochem. 2018 Aug;58:1-16. doi: 10.1016/j.jnutbio.2018.02.012. Epub 2018 Feb 27. PMID: 29621669; PMCID: PMC7561009.
25. Ayu Lestari, Mita, Margawati Ani, Sandi Wijayanti Hartanti, dan Tri Susilo Mursid. 2023. Hubungan Antara Asupan Jenis Lemak dengan Persen Lemak Tubuh pada Mahasiswi. . https://eprints2.undip.ac.id/id/eprint/17913.
26. Gholamalizadeh M, Ahmadzadeh M, BourBour F, Vahid F, Ajami M, Majidi N, Hajipour A, Doaei S, Kalantari N, Alizadeh A, Jarrahi AM. Associations between the dietary inflammatory index with obesity and body fat in male adolescents. BMC Endocr Disord. 2022 May 2;22(1):115. doi: 10.1186/s12902-022-01001-x. PMID: 35501761; PMCID: PMC9059349.
27. Löffler MC, Betz MJ, Blondin DP, Augustin R, Sharma AK, Tseng YH, Scheele C, Zimdahl H, Mark M, Hennige AM, Wolfrum C, Langhans W, Hamilton BS, Neubauer H. Challenges in tackling energy expenditure as obesity therapy: From preclinical models to clinical application. Mol Metab. 2021 Sep;51:101237. doi: 10.1016/j.molmet.2021.101237. Epub 2021 Apr 18. PMID: 33878401; PMCID: PMC8122111.
28. Sholichah Farohatus, Yuli Irnaini Aqnah, Cyntia Ratna Sari. 2021. Asupan Energi dan Zat Gizi Makro Terhadap Persen Lemak Tubuh. Jurnal Ilmiah Gizi dan Kesehatan (JIGK). Vol.02, No.02. pp.15-22.