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Increasing knowledge in healthy lifestyle of nutrition education in Samarinda Senior High Schools

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ABSTRACT

Introduction: Nutrition education is crucial in promoting a healthy lifestyle, including nutritious food consumption, to prevent anemia and stunting in Samarinda, East Kalimantan. The teenage years represent a crucial phase characterized by significant physical and psychological maturation, essential for optimal growth and development. Within this period, adolescents have distinct physiological and psychological requirements. Furthermore, nutritional deficiencies during this time can pose significant health challenges. This study evaluated the association between nutrition education and knowledge of healthy behaviors in Samarinda adolescents.

Methods: This study used an action study among 59 high school students (10% overweight, 15-18 years) in Samarinda. Three meetings at every school, with pre-test, nutrition education, Kahoot game, and post-test. All participants were given information regarding the benefits and risks of the program before participation and signed an informed consent. A questionnaire measured knowledge of balanced nutrition, MyPlate contents, and physical activity. Paired t-test was used for the statistical analysis.

Results: The majority of participants were female (80%), had normal nutritional status (63%), and did not regularly consume iron tablets (95%). Most participants knew about anemia from their parents (88%), so they suggested nutrition education such as anemia through face-to-face training and social media. An improvement in knowledge before and after face-to-face nutritional education was found in this study ($p<0.001$)

Conclusion: There is an effect of providing education to increase knowledge in nutrition education among adolescents.

Keywords: Tropical rainforest; anemia; stunting; malnutriton.
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INTRODUCTION

Adolescent health is essential to create a better future generation. Various nutritional problems experienced by teenagers make the quality of teenagers low. A healthy lifestyle can start with oneself; consuming nutritious food through proper nutritional education will be an effort to prevent anemia and stunting in teenagers. School is where most adolescents spend their daily activity time. The school also serves as a pivotal arena wherein the principles of nutrition education can be effectively implemented to guide adolescents in selecting foods. Therefore, adolescents can be healthy and happy.

East Kalimantan is a province with lush tropical rainforests, rich in high-diversity polyphenols. The higher consumption of polyphenols was associated with decreasing body mass index and anti-inflammation biomarkers among European adolescents.[1,2] A dragon fruit is one of the tropical fruits in East Kalimantan. A systematic review and meta-analysis of 401 research articles concluded that consuming dragon fruit significantly reduces fasting blood sugar levels in pre-diabetic individuals.[3] Red dragon fruit exhibits various beneficial activities, including antimicrobial, anti-hypercholesterolemia, anti-diabetes mellitus, cardiovascular risk reduction, and health supplement properties.[4]

The prevalence of overweight and obesity among adolescents aged 13-15 is 12% and 7.1%, respectively, in sequence, exceeding the national prevalence of 11.2% and 4.8%, respectively.[5] The same trend is observed in adolescents aged 16-18. Overweight among adolescents in East Kalimantan may be attributed to inadequate consumption of vegetables and fruits. Most of the population in East Kalimantan, namely 95.6%, does not sufficiently consume vegetables and fruits.[5]

Stunting in East Kalimantan remains above the WHO target at 22.8%[6] and increased to 23.9% in 2022.[7] Stunting prevalence also rose in Samarinda, reaching 25.3% in 2022, up from 21.6% in 2021.[7] Stunting prevention can begin during the first 1000 days of life, with female adolescents being a target for improving nutritional status.[7,8] Therefore, nutritional education is necessary to promote a healthy lifestyle, including the

consumption of healthy foods, as an effort to prevent stunting in Samarinda, East Kalimantan.

Various activities introducing healthy food consumption have been conducted, involving fellow students, parents, teachers, and school canteen providers.[8] Research in Samarinda concluded that training and the formation of junior nutrition experts can enhance knowledge of healthy and safe food consumption behaviors.[9] Previous research on the Nutrition Education Centre (Nutrecent) digital education platform found that it could increase participant knowledge.[10] Nutrecent nutritional education was previously conducted online due to social activity restrictions during the COVID-19 pandemic.[10] Therefore, the three high schools in Samarinda should implement the diversity of vegetables and fruits from the lush tropical rainforest rich in polyphenols, malnutrition prevention, and a healthy lifestyle. Nutrition Education Centre (Nutrecent) as a learning platform for empowering female adolescents in promoting a healthy lifestyle will be conducted offline, targeting Indonesian adolescents, especially those in East Kalimantan. Previous research identified a 37.3% prevalence of anemia among female adolescents in Samarinda in 2022 across three public high schools: SMA (*Sekolah Menengah Atas*) Negeri 1 Samarinda, SMKN (*Sekolah Menengah Kejuruan Negeri*)16 Samarinda, and SMA Katolik 020 Samarinda.[11] Therefore, nutritional education is needed in these schools to supplement and prevent adolescent malnutrition. The research aims to determine the relationship between nutrient nutritional education and the improvement of nutritional knowledge among female adolescents in Samarinda, 2023.

METHOD

The methodology of this research was an action study. The research was conducted on high school teenagers. The participants and their parents provided written informed consent, and the Faculty of Medicine ethics committee approved the study protocol, Universitas Mulawarman (No. 151/KEPK-FK/VIII/2023). This study initiative promoted healthy eating among Samarinda, East Kalimantan high school students. The study began with the advocation and permissions to secure approval from key stakeholders (the Head of Provincial Education Office of East Kalimantan and the Principals of SMAN 1 and SMKN 16 Samarinda). The selection of the schools for participation in the nutrition education program was guided by previous research findings indicating a significant prevalence of anemia among students, with approximately 37.3%, alongside the expressed willingness of the respective educational institutions to accommodate face-to-face instructional sessions on nutrition. Identifying participants for the nutrition education sessions within these schools was contingent upon mutual agreement between the educational authorities and the research team, ensuring minimal disruption to the regular teaching and learning routines. Deliberate efforts were made to maintain an optimal learning environment by limiting the size of each class to a maximum of 30 students, facilitating meaningful interaction between the instructor and participants. A single speaker led the proceedings during the instructional sessions, supported by a team of eight assistant speakers, to facilitate effective student engagement and learning outcomes. Such meticulous planning and organization aimed to optimize the educational experience and promote the efficacy of nutrition education interventions in school settings.

The second stage involved crafting dynamic learning materials, including modules (*Remaja Sehat Bebas Stunting; Ayo, Konsumsi Sayur dan Buah; Say No to Mager)* and captivating videos promoting fruit and vegetable consumption. The third stage was implementing healthy behaviors through face-to-face training at SMAN 1 and SMKN 16 Samarinda; the last stage was evaluating improving knowledge after implementation. The researchers conducted three meetings; the first was by providing education related to balanced nutrition and measuring body height, weight, BMI, and waist circumference. The second meeting was the promotion of MyPlate content. The third meeting was education on improving physical activity and preventing sedentary activity. In every meeting, the methods were pre-test, education, Kahoot game, and post-test. All participants were given information regarding the benefits and risks of the program before participation and signed an informed consent.

The test (pre-test and post-test) consisted of 10 questions (every meeting). The correct answer was scored one, so the total score for each ranged from 0 to 10 at maximum. The questions included three education materials, i.e., balanced nutrition, MyPlate contents, and psychical activity. Consultation and discussion with experts in the education material were used to validate the instruments. The five participants were randomly tested to test the instrument validation. The questions were graded and revised until sample participants understood the sentences. Education materials turned into presentations promoting fruit and vegetable consumption uploaded on social media and in PDF files.

For the anthropometry measurement, height was measured using a microtoise (General Care Products Co. Ltd., Thailand) in the nearest 0.1 cm. Weight was measured using the weight scale (ADE BM 708, Germany). Height, weight, and waist circumference were measured according to the International Standards for Anthropometric Assessment Procedures of the International Society for the Advancement of Kinanthropometry. BMI (in kg/m^2) was calculated by dividing weight (kg) by the square of height (m) into underweight, normal, overweight, and obese, as recommended by WHO for Asian populations.

Data were tabulated using descriptive analyses. The statistical analyses used were paired tests. Data were analyzed using the SPSS package (SPSS Inc version 25). The p-value determined statistically significant values ($p<0.05$).

RESULT

Based on previous research, anemia was found among female adolescents in Samarinda at 37.3% in 2022, across three high schools: SMA 1, SMKN 16, and SMA Katolik 020.[11] Therefore, nutritional education is necessary in these schools to prevent adolescent malnutrition. The study has been conducted since August

2023 in three schools: SMAN 1 Samarinda and SMKN 16 Samarinda (Figure 1). The research was carried out in the following stages:

1. Permissions at SMAN 1 and SMKN 16 Samarinda in August 2023.
2. Nutritional education at SMAN 10 Samarinda
   a. October 11, 2023:
      Training on "My Plate" by Mrs. Nastitie Cinintya Nurzihan, S.Gz., M.Gizi. The training involved 10 female students using an LCD. Lunch and fruit snack consumption were examples of "My Plate" consumption. Anthropometric measurements were taken at the first meeting.
   b. October 19, 2023:
      Training on "My Plate" by Mrs. Nurul Afiah, S.Gz., M.Kes. The training involved 30 female students using an LCD. The number of participants increased due to improved knowledge from the first meeting.
   c. October 26, 2023:
      Training on physical activity with packed lunches from home, following "My Plate" guidelines. The facilitator provided advice on the carried food, emphasizing the importance of physical activity. The final training ended with a commitment to making SMAN 1 Samarinda Anemia-Free.
3 Nutritional education at SMKN 16 Samarinda:
   Recognizing the impracticality of involving only female students, training was conducted in one class, involving both female and male students. Consumption according to "My Plate" guidelines was also given during this training. Pre-tests and post-tests were conducted at each session. Nutritional education at SMKN 16 Samarinda was conducted three times:
   a. October 20, 2023:
      Height and weight measurements were taken for all students. Other anthropometric measurements were only taken for female students, the main target for anemia prevention. "My Plate" training by Mrs. Nastitie Cinintya Nurzihan, S.Gz., M.Gizi involved 25 female students using an LCD. Lunch and fruit snack consumption were examples of "My Plate" consumption. Anthropometric measurements were taken at the first meeting.
   b. November 3, 2023:
      Due to a school bazaar, weekly planning could not be carried out. Therefore, nutritional education was held the following week, on November 3, 2023. The second meeting discussed the recommended diet for adolescents, emphasizing the importance of quality food for their future health. "My Plate" was the chosen topic for the second meeting, with Mrs. Nurul Afiah, S.Gz., M.Kes, as the speaker. Books, PowerPoint presentations, videos, and a game assisted the material. A Kahoot game was played at the end of the session to reinforce the "My Plate" material.
   c. November 7, 2023:
      The final session focused on increasing physical activity and reducing sedentary behavior. Participants were asked to comment on images of food portions on a plate to evaluate the previous meetings. Initially, participants were supposed to bring packed lunches from home, as done at SMAN 1 Samarinda. However, due to the conditions of the students at that school, it was not feasible. The Kahoot game on assessing students' knowledge about media was well-received. After the Kahoot game, a post-test was conducted to assess any knowledge improvement among participants.

Most participants in this study are 11th-grade or second-year high school students with an average age of 16. Most parents' highest education level is high school (51-52%). Private-sector employment is the most common occupation for fathers (36%), while homemaking is the most common for mothers (34%). The most common number of siblings is 2 or 3 (56%). Most respondents have never had their hemoglobin checked (87%). Although 68% of students have received iron supplement tablets, only 26% consume them regularly. Iron supplement tablets are most commonly obtained from teachers, as health centers typically entrust them to teachers.

In a previous study, anemia was found in 37.4% of high school female students in Samarinda, highlighting the need for respondents' knowledge about anemia.

Figure 1. Nutrition Education in SMKN 16 Samarinda (A) and SMAN 1 Samarinda (B), 2023.

Table 1. Characteristics of Respondents

Characteristics	N	Percentage
School		
SMAN 1	31	53
SMAK 16	28	47
Gender		
Male	12	20
Female	47	80
BMI		
Severely Underweight	10	17
Underweight	5	8
Normal	37	63
Mild Overweight	1	2
Overweight	6	10
Age		
15	8	13
16	29	50
17	21	36
18	1	1
Class		
10	9	14
11	41	69
12	9	15
Mother's education		
Elementary school	10	17
Junior High School	5	8
Senior High School	28	47
Diploma (D1/D3)	5	8
University	11	19
Father's education		
Elementary school	4	7
Junior High School	5	8
Senior High School	29	49
Diploma (D1/D3)	7	12
University	14	24
Mother's Occupation		
Housewife	42	71
Civil Servant	6	10
Entrepreneur	6	10
Private Employee	2	3
Others	3	5
Father's Occupation		
Unemployed	1	2
Civil Servant	13	22
Entrepreneur	20	34
Private Employee	15	25
Others	10	17
Number of Siblings		
0-1	20	34
2-3	28	47
>4	11	19
Ever Checked Haemoglobin		
Yes	0	0
No	59	100

The results of health center screenings in November 2023 at SMAN 1 Samarinda also revealed that 30% of female adolescents had anemia. Most respondents have never received an explanation about anemia (90%). Sources of information about anemia from highest to lowest are social media (27%), other media, such as friends (23%), health center staff (22%), websites (14%), parents (13%), subject teachers (10%), and health education teachers (3%). Face-to-face training is respondents' most desired nutritional education (62%). Details of respondents' knowledge about anemia before nutritional education can be seen in Table 2.

Nutritional education is conducted every week, once per week. Knowledge improvement occurs in each session, and the total sessions in face-to-face nutritional education can be seen in Figure 2. In the figure, differences in knowledge between pre-tests and post-tests are evident in each session and overall sessions ($p < 0.001$), with Balanced Nutrition training showing the highest improvement.

The distribution of correct answers in each face-to-face nutritional education session can be seen in Table 3. There is an improvement in knowledge for all questionnaire items, except for questions regarding the definition of balanced nutrition (decreased by 5%), the benefits of "My Plate" (decreased by 3%), daily portions of vegetables and fruits (decreased by 4%), and examples of moderate activities (decreased by 50%). Therefore, there is a need for enrichment regarding these knowledge items.

DISCUSSION

This study involved 59 high school students. Based on the results obtained, most respondents are female students. The nutrition-related anemia in Indonesian adolescents is generally regarded and treated as iron-deficient anemia, especially in female adolescents.[12] Furthermore, anemia remains a prevalent concern among female students in Indonesia, with insufficient iron intake recognized as a contributing factor to this health issue.[13] However, a review study found that the knowledge gaps around the etiology of anemia among adolescents

Characteristics	N	Percentage
Ever Received Iron Tablets		
Yes	47	80
No	12	20
Source of Iron Tablets		
Teachers	39	66
Community Health Centre	17	29
Self-purchased	3	5
Regularly Consume Iron Tablets		
Yes	3	5
No	56	95

The percentage
*one respondent received iron supplement tablets from multiple sources, so the total percentage of sources for iron supplement tablets is not 100%.

Table 2. Knowledge about Anemia

Variable	%
Received explanation about anemia	
Yes	44
No	56
Source of anemia explanation*	
Classroom teacher	35
School Health Unit Teacher	8
Parents	88
Social media	46
Suggestions for nutrition media*	
Social media	53
Website	17
Online training	3
Face-to-face training	63
Other methods	3

% percentage
* the total percentage is not 100, as one participant answers more than one option.

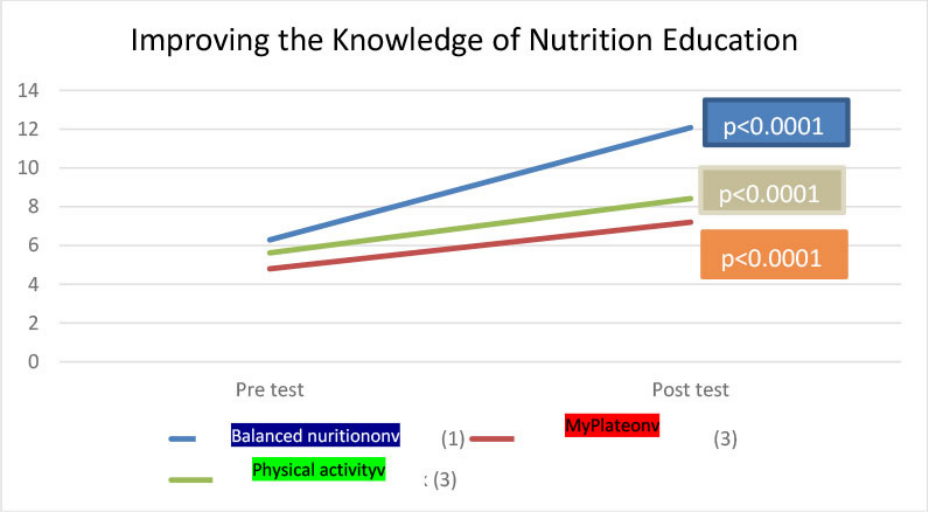

Figure 2. Improving the knowledge of balanced nutrition, physical activity, and My Plate Paired t test was tested.

are significant.[14] Youth food management systems, public health policies, and behavioral nutrition programs can use health and nutrition terminology and prescription food categories that are more easily understood by youth.[15] Therefore, nutrition education is emphasized with a focus on adolescent girls.

In our study, increasing knowledge was found in this study. In support of this finding, a previous study on adolescents found increasing knowledge after implementing education.[16] The Nutrition Education Centre focused on promoting a healthy lifestyle, emphasizing balanced nutrition and physical activity. Feedback from speakers was also collected during nutrition education sessions. This effectively enhances physical activity, promotes balanced eating patterns, and raises awareness of a healthy lifestyle.[16] Through this nutrition education center, we are committed to providing valuable information and engaging participants to gather feedback. Thus, our goal is to improve the public's understanding of the importance of health aspects, including balanced nutrition and physical activity, in achieving a healthy lifestyle. The school food environment on adolescents' dietary behaviors was not implemented in this study. However, the nutrition knowledge of adolescents, their interaction with parents and peers, and their school food environment influence the dietary behaviors of adolescents in urban Ethiopia.[17]

Nevertheless, the three interventions with one weekly intervention were insufficient to improve adolescent nutrition knowledge in this study. The package of nutrition interventions (breakfast and weekly iron-folic acid supplementation, a school-based nutrition education program, and a social behavior change communication strategy) in Klaten and Lombok, Indonesia, might increase the knowledge.[18] A previous study among Lithuanian adolescents also found that nutrition information for adolescents and adults should be provided continuously through multiple channels and that socio-demographic factors should be considered when planning public health interventions.[19]

The limitations are sample size is minimal and only in two schools, so it cannot be representative of students in the city of Samarinda, and there is no repetition of knowledge measurements after the intervention, so it is not known how long respondents will remember the

Table 3. Distribution of correct answers on the pre-test and post-test

Knowledge	Pre test	Post Test
Education of Nutrition		
Definition	100	95
Diverse food	55	66
Maximum daily sugar consumption	58	100
Maximum daily oil consumption	11	53
Water consumption	71	100
Aspects of balanced nutrition	26	66
Animal protein food	63	79
Vegetable consumption	8	74
Balanced nutrition guidance	47	82
Balanced nutrition messages	11	68
Consequences of excess energy	47	84
Minimal physical activity	39	92
Example of nutrients sources	50	79
Handwashing steps	50	100
Fruit consumption portion	42	71
Education of MyPlate Contents		
Staple food in MyPlate	87	100
Benefits of MyPlate Contents	100	97
Meat portion in MyPlate Contents	50	17
Vegetable and fruit portions	3	13
Vegetable portion	60	97
Principles of adolescent nutrition	67	100
Needs of adolescent girls and boys	13	100
Portions of fruit and vegetables every day	7	3
Realization of fruit and vegetables consumption	20	97
Benefit of following MyPlate Contents	97	97
Education of Physical Activity		
Benefits of physical activity	100	100
Duration	62	96
Requirements	46	96
Types	54	96
Definition	96	100
Maintaining Body Weight	35	81
Benefits of exercise	73	85
Light activity	23	81
Moderate activity	65	15
Intense activity	65	92

% percentage

knowledge. This study did not investigate the impact of the school environment, including factors such as the availability of nutritious food options on campus. Thus, future research endeavors should prioritize exploring the potential influence of school-based initiatives to promote access to fruits, vegetables, and other wholesome dietary choices within canteen facilities, potentially through strategies such as subsidized pricing schemes for healthy food items.

CONCLUSION

The majority of respondents are 11th-grade students or second-year high school students, with an average age of 16 years. There is an improvement in knowledge before and after face-to-face nutritional education in both schools. Nutritional education activities must be regularly carried out in collaboration with health centers and universities. Implementing an environment that supports a healthy lifestyle should also be applied in schools.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

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AUTHOR CONTRIBUTION

RW. Wisnuwardani formulated the research question, analyzed the data, and wrote a paper draft. NC. Nurzihan, RR. Susanto and N Afiah helped set up the database and analyze the data. All authors were involved in the community research, read the draft, and agreed on the final version.

REFERENCES

1. Wisnuwardani RW, De Henauw S, Ferrari M, Forsner M, Gottrand F, Huybrechts I, et al. Total Polyphenol Intake Is Inversely Associated with a Pro/Anti-Inflammatory Biomarker Ratio in European Adolescents of the HELENA Study. J Nutr. 2020. https://doi.org/10.1093/jn/nxaa064
2. Wisnuwardani RW, De Henauw S, Forsner M, Gottrand F, Huybrechts I, Knaze V, et al. Polyphenol intake and metabolic syndrome risk in European adolescents: the HELENA study. Eur J Nutr. 2019. https://doi.org/10.1007/s00394-019-01946-1
3. Poolsup N, Suksomboon N, Paw NJ. Effect of dragon fruit on glycemic control in prediabetes and type 2 diabetes: A systematic review and meta-analysis. PLoS One. 2017;12(9):e0184577. https://doi.org/10.1371/journal.pone.0184577
4. Wahdaningsih S, Wahyuono S, Riyanto S, Murwanti R. Terpenoid-lupeol of red dragon fruit (Hylocereus polyrhizus) and its immunomodulatory activity. Pak J Pharm Sci. 2020;33(2):505-10. https://pubmed.ncbi.nlm.nih.gov/32276891/
5. Kesehatan BPdP. Laporan Nasional RISKESDAS 2018. Kementrian Kesehatan RI. 2019. https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/
6. Launching Hasil Study Status Gizi Indonesia (SSGI) [Internet]. Kementrian Kesehatan Republic Indonesia. 2021. https://www.badankebijakan.kemkes.go.id/buku-saku-hasil-studi-status-gizi-indonesia-ssgi-tahun-2021/

7. Pocket Book Nutrition Status Survey Results Indonesia (SSGI) 2022 [Internet]. Ministry of Health of the Republic of Indonesia. 2022. https://kesmas.kemkes.go.id/assets/uploads/contents/attachments/09fb5b8ccfdf088080f2521ff0b4374f.pdf
8. Dewayani N, Sukihananto. Relationship between maternal knowledge of balanced nutritional guidelines and snack food selection by school-aged children at school. Enferm Clin. 2018;28 Suppl 1:280-4. https://doi.org/10.1016/S1130-8621(18)30170-0
9. Iwan MR, Ratih WW, Riyan N. Laporan penelitian ahli gizi anak sebagai upaya peningkatan perilaku anak dalam pemilihan jajanan sehat dan aman di Samarinda, Kalimantan Timur. 2015.
10. Ratih Wirapuspita Wisnuwardani RN, Nurul Afiah, Moch. Faisal. Nutrition Education Centre (Nutrecent) Sebagai Promosi Konsumsi Polyphenols, Dengan Penganekaragaman Pangan Olahan Hutan Tropis Lembab Di Pandemi Covid-19. Samarinda: Laporan Akhir; 2021.
11. Wulandari S. WR. Hubungan Citra Tubuh Dan Asupan Zat Gizi Mikro (Fe, Vitamin C Dan Asam Folat) Terhadap Kejadian Anemia Pada Remaja Putri Di Kota Samarinda. Samarinda: Skripsi; 2023.
12. Juffrie M, Helmyati S, Hakimi M. Nutritional anemia in Indonesia children and adolescents: Diagnostic reliability for appropriate management. Asia Pac J Clin Nutr. 2020;29(Suppl 1):S18-S31. https://doi.org/10.6133/apjcn.202012_29(S1).03
13. Sari P, Herawati DMD, Dhamayanti M, Hilmanto D. Anemia among Adolescent Girls in West Java, Indonesia: Related Factors and Consequences on the Quality of Life. Nutrients. 2022;14(18). https://doi.org/10.3390/nu14183777
14. van Zutphen KG, Kraemer K, Melse-Boonstra A. Knowledge Gaps in Understanding the Etiology of Anemia in Indonesian Adolescents. Food Nutr Bull. 2021;42(1_suppl):S39-S58. https://doi.org/10.1177/0379572120979241
15. Barco Leme AC, Fisberg RM, Baranowski T, Nicklas T, Callender CS, Kasam A, et al. Perceptions About Health, Nutrition Knowledge, and MyPlate Food Categorization Among US Adolescents: A Qualitative Study. J Nutr Educ Behav. 2021;53(2):110-9. https://doi.org/10.1016/j.jneb.2020.11.008
16. Fradianto IP, D. Yulanda, N. A. Andriyanto, A. Increasing knowledge in the health protocol of COVID-19 prevention with health education in boarding schools. Journal of Community Empowerment for Health (JCOEMPH). 2023;6(2):70-5. https://doi.org/10.22146/jcoemph.71980
17. Iyassu A, Laillou A, Tilahun K, Workneh F, Mogues S, Chitekwe S, et al. The influence of adolescents' nutrition knowledge and school food environment on adolescents' dietary behaviors in urban Ethiopia: A qualitative study. Matern Child Nutr. 2023:e13527. https://doi.org/10.1111/mcn.13527
18. Oddo VM, Roshita A, Khan MT, Ariawan I, Wiradnyani LAA, Chakrabarti S, et al. Evidence-Based Nutrition Interventions Improved Adolescents' Knowledge and Behaviors in Indonesia. Nutrients. 2022;14(9). https://doi.org/10.3390/nu14091717
19. Maceinaite R, Zandaras Z, Surkiene G, Strukcinskiene B, Stukas R, Dobrovolskij V, et al. The need for information on nutrition among adolescents and adult knowledge regarding food consumption recommendations. Cent Eur J Public Health. 2021;29(3):236-43. https://doi.org/10.21101/cejph.a6635