

Macronutrients Intake and Snack Consumption Habits with Weight Status of Elementary School Children at UPT SDN 86 Gresik

Putri Mahardika¹, Nuning Marina Pengge*², Taufiqurrahman³, Riezky Faisal Nugroho⁴, Fahmi Hafid⁵, Sarina Sariman⁶

^{1,2,3,4,5}Department of Nutrition, Politeknik Kesehatan Kemenkes Surabaya, Surabaya, Indonesia

⁶Faculty of Health and Life Sciences, Management and Science University, Malaysia

Email: nuning.marina@gmail.com

ARTICLE INFO

Article History:

Received August, 17th, 2023

Accepted May, 21st, 2024

Published online August, 1st, 2024

Keywords:

Intake;

Macronutrients;

Snacks;

Nutritional status;

ABSTRACT

The nutritional status of school children can be influenced by food consumption and snacking habits, potentially leading to malnutrition and obesity. This study aims to identify the profile of macro-nutrients intake, snacking habits, and the nutritional status of elementary school children at UPT SDN 86 Gresik. A total of 82 students were interviewed for their 2-days 24-hour dietary intake and snacking habits. Respondents' weight and height were also measured to determine their BMI-for-age z-scores. Findings showed that 46.7% of students had an energy deficit, 62.2% had a protein deficit, 64.4% had a fat deficit, and 57.8% had a carbohydrate deficit. Additionally, 42.2% exhibited poor snacking frequency, and 60% consumed unhealthy snacks. Though majority (68.9%) of the students had normal weight status, a smaller percentage of them were still underweight ((8.9%), with 4.4% and 15.6% of the students were overweight and obese, respectively Future intervention to improve on eating habit of the children is timely to ensure optimum growth of the children and adolescence until adulthood.

INTRODUCTION

Children of primary school age are the next generation who have the potential to become the future successors of the nation. Those aged 6-12 years are known as school-age children and their development during this period is crucial for their future and the society they will contribute to¹. At this age, when children begin to get to know the new world, they begin to make many connections with people outside their family and become familiar with new situations and environments².

At this age, the child needs nutrition not always for the life cycle, but also for growth and development. During its life cycle, the child's body continues to grow, that is, the body becomes taller and bigger. Therefore, the daily diet of this age group should be chosen correctly to provide all the nutrients needed for normal body functioning³. Conversely, with poor food choices, the body can be deficient in certain essential nutrients, the body will experience deficiencies in certain essential nutrients⁴⁻⁸.

Nutritional status shows the balance between the intake of other nutrients and the body's need for nutrients for growth, development, and energy production. There are two ways to assess nutritional status: directly and indirectly. Indirectly, it consists of surveys of food consumption,

ecological factors, and vital statistics. It directly includes four analyses: anthropometric, clinical, biophysical, and biochemical⁹. Food consumption and use of body nutrients determine the nutritional status of the body. classified into nutritional status of less, normal, as well as more¹⁰.

Nutritional status is a description of the amount of food consumed over a long time, which is in the form of undernourished status, as well as normal nutritional status, or excess nutritional status¹¹. Stated nutritional deficiencies, such as being overweight or obese, can increase the risk of degenerative diseases, decreased quality of life, spiritual, mental, and social disorders^{12,13}.

The nutritional status of school-age children is not limited to the problem of overweight. Children's behavior of eating unhealthy snacks is also a risky problem when consuming unhygienic and unsafe foods¹⁴. According to the World Health Organization, the nutritional status of children worldwide was of great concern in 2015, with 13.9% of children wasting and more than 340 million people obese. According to data from the Basic Health Research in 2018, children aged 5-12 years have a thin nutritional status of 6.8% and an obese nutritional status of 9.2%¹⁵.

One of the factors that affect the nutritional state of children is the number of macronutrients contained in their snack food. Hawker food can contribute between 10-20% of the nutrients needed by the body, with a contribution of energy 26.8%, protein 25.5%, fat 32.5%, and carbohydrates 25.5% to children's daily consumption¹⁶. Improper consumption of food can cause nutritional problems in children, both malnutrition and improved nutrition¹⁷.

Learning information about food and health is very important because the information is an internal factor that can affect the consumption of snack foods¹⁸. Food and health knowledge refers to primary school students balanced and nutritious food information, food health and hygiene, and the use of additives in snacks¹⁹. The habit of consuming snacks or snacks is behavioral. At the same time, there are internal factors and external factors that influence the formation of habitual behavior. Knowledge is an intrinsic factor that can influence snack choices. This knowledge includes knowledge of food nutrition, intelligence, perception, emotions, and extrinsic motivation. In addition to knowledge, other factors that influence the selection of snacks are attitudes and actions²⁰.

Based on data from the Basic Health Research of East Java Province in 2018, the prevalence of nutritional status of children aged 5-12 years is based on the BMI/Age index with the nutritional status of underweight children of 5.81% and the nutritional status of obesity of 11.08%. Meanwhile, based on Basic Health Research data, the nutritional status of children aged 5-12 years in Gresik City is based on the BMI/Age index for children, nutritional status is thin by 8.72% and nutritional status by obesity is 15.60%²¹.

Based on initial observations, from the results of height and weight measurements of elementary school students at UPT SDN 86 Gresik, 30% are obese and 70% have normal nutritional status. Based on the description of the problem above, researchers are interested in conducting research at UPT SDN 86 Gresik. Researchers are also interested in conducting

research because this school has a canteen and there are still many students who like to buy snacks around the school environment. Therefore, researchers will examine the "Overview of Macronutrient Intake, Snack Consumption Habits, with Nutritional Status in Elementary School Children at UPT SDN 86 Gresik".

MATERIALS AND METHODS

This cross-sectional study aims to assess macronutrients intake, snacking habits with weight status of 82 elementary school children aged 6-12 years, recruited through simple random sampling. This study was carried out at UPT SDN 86 Gresik which is located in Sumari Village, Sampeyan Sitting District, Gresik Regency during October 2022 – March 2023. Informed consents were obtained from parents and participants prior to commencement of the study. Primary data were obtained through direct interviews with respondents using a set of questionnaire comprises of respondents' characteristics, 2-days 24-hour food recall and norms for eating snacks. Recommended nutrient intake of Indonesia or Indonesian Dietary Guideline was used to categorized macronutrients intake according to their optimal level.

As for anthropometric measurement, children height and weight were measured using Microtoise for measuring height and digital body scales for measuring body weight. BMI-for-age z-scores were calculated using WHO AnthroPlus software to determine the respondents' weight status.

Data was analyzed using SPSS 22 version. Data was presented descriptively through frequency and percentages. Cross-tabulations of data were used to describe independent and dependent variables narratively.

RESULTS

Descriptive analysis shows that UPT SDN 86 Gresik is an accredited B public elementary school located at Sumari Village, Sampeyan Sitting District, Gresik Regency, East Java Province. Most of the respondents were female (64.4%) with mean age of $XX \pm SD$. Majority (57.8%) of the students had an average allowance of 5,000 rupiah per day and came from household income of 2,000,000 to 4,000,000 (66.7%), respectively.

Table 1. Distribution of Frequency of Snack Consumption and Nutritional Status of Student Respondents at UPT SDN 86 Gresik

Variable	Frequency	
	n	%
Nutritional Status		
Deficit	4	8.9
Normal	32	71.1
Over	2	4.4
Obesity	7	15.6
Total	45	100
Types of Snacks		
Good	18	40.0
Not Good Enough	27	60.0
Total	45	100
Snack Frequency		
Good	26	57.8
Not Good Enough	19	42.2
Total	45	100

Source: Primary data, 2023

The data that has been collected with the average pocket money from students is 5,000 rupiah, so the results are obtained from the consumption of snacks and the frequency of snacks consumed by students at UPT SDN 86 Gresik. Most students consume 60% of not good enough snacks. And for the frequency of snacks consumed is still in the good category with a percentage of 57.8%. So that many students have normal nutritional status of 32 students with a percentage of 71.1%.

Table 2. Frequency Distribution of Macronutrient Intake of Student Respondents at UPT SDN 86 Gresik

Variable	Intake Category						Total	
	Deficit		Normal		Over		n	%
	n	%	n	%	n	%		
Energy Intake	21	46.7	18	40.0	6	13.3	45	100
Protein intake	28	62.2	10	22.2	7	15.6	45	100
Fat intake	29	64.4	6	13.4	10	22.2	45	100
Carbohydrate intake	26	57.8	14	31.1	5	11.1	45	100

Source: Primary data, 2023

Macronutrient intake in UPT SDN 86 Gresik students for energy intake is still mostly in the deficit category of 46.7%. Then for protein intake is still classified as a deficit at 62.2%. Fat intake was more than protein for the deficit category by 64.4%. While carbohydrate intake is also still classified in the deficit category of 57.8%. The results of this can be stated that it can cause or affect nutritional status in students at UPT SDN 86 Gresik.

The results of the frequency of macronutrient intake of students in elementary schools from the categories that have been data, can be related to the nutritional status of respondents. The intake of macronutrients associated with the nutritional status of respondents means that the intake of energy, protein, fat, and carbohydrates can be reviewed in the table 3.

Table 3. Cross-tabulation of Macronutrient Intake of Respondents with Nutritional Status of Student Respondents at UPT SDN 86 Gresik

Variable	Nutritional Status								Total	
	Deficit		Normal		Over		Obesity			
	n	%	n	%	n	%	n	%	n	%
Energy Intake										
Deficit	3	14.3	18	85.7	0	0	0	0	21	100
Normal	1	5.6	11	61.1	1	5.6	5	27.8	18	100
Over	0	0	3	50.0	1	16.7	2	33.3	6	100
Protein intake										
Deficit	4	13.8	24	82.8	0	0	1	3.4	29	100
Normal	0	0	9	90.0	0	0	1	10.0	10	100
Over	0	0	1	14.3	1	14.3	5	71.4	7	100
Fat intake										
Deficit	4	14.2	22	78.6	1	3.6	1	3.6	28	100
Normal	0	0	5	83.3	1	16.7	0	0	6	100
Over	0	0	3	30.0	1	10.0	6	60.0	10	100
Carbohydrate intake										
Deficit	4	15.4	21	80.8	0	0	1	3.8	26	100
Normal	0	0	9	64.3	1	7.1	5	28.6	14	100
Over	0	0	2	40.0	1	20.0	2	40.0	5	100

Source: Primary data, 2023

Based on the table above, the normal category Energy Intake has a nutritional status of 1 student (5.6%), normal nutritional status of 11 students (61.1%), more nutritional status of 1 student (5.6%), obese nutritional status of 5 students (27.8%). Normal category protein intake has less nutritional status none, normal nutritional status is as many as 9 students (90.0%), more nutritional status is absent, nutritional status is obese as much as 1 student (10.0%). Normal category fat intake has less nutritional status none, normal nutritional status as many as 5 students (83.3%), nutritional status more as many as 1 student (16.7%), nutritional status obesity does not exist. Normal category carbohydrate intake has less nutritional status none, normal nutritional status is 9 students (64.3%), nutritional status is more than 1 student (7.1%), obesity is 5 students (28.6%).

DISCUSSION

The results showed that when food recall was carried out 2 x 24 hours, students did not explain in detail the food consumed. The results of *food recall* 2 x 24 hours could not determine how the nutritional status of students, so energy intake experienced a deficit but normal nutritional status. This also happens because school children need large amounts of energy in the body to do more activities at school and outside the home. For protein intake there is a deficit but normal nutritional status. Protein is needed for UPT SDN 86 Gresik students, because the function of protein is to repair tissues, and for certain physical growth, height, and as energy reserves²².

Fat intake has a deficit but normal nutritional status. This study shows fat intake is closely related to nutritional status. These findings are consistent with recent research revealing that even

with a carbohydrate intake deficit, a person's nutritional status can remain normal if fat and protein intake are adequately met. This is confirmed by studies stating that variations in macronutrient intake, such as fat and protein, can compensate for a carbohydrate deficit and help maintain good nutritional status^{23,24}.

This study shows that snack consumption habits are related to nutritional status. This is in line with Sulistyoningih (2016), which states that food intake that exceeds the body's needs will result in excess weight and other diseases caused by excess nutrients²⁵. Food intake less than expected should result in the body as thin and susceptible to disease. Both conditions are equally unfavorable, as a result of which it is claimed that nutrition is wrong^{26,27}.

This situation may be explained that it comes from interviews that state that the arrangement of food dishes and diet served by the parents at home is not good and is not suitable for using a balanced nutritional diet²⁸⁻³⁰. And some students do not like to eat vegetables. The food menu served at the residence includes the main culinary, namely rice, side dishes consisting of animal and vegetable side dishes, but some also say that the dishes served consist of the main culinary origin, namely rice, side dishes consist of animal and vegetable side dishes and vegetables³¹.

In terms of diet, students often eat irregularly three times a day, which will affect the nutritional status of students, such as lack of energy during activities, thin body or obesity³²⁻³⁸. Students at that age often consume snacks that suit their wishes and the most popular students are cilok, cilor, fried foods, pentol, cireng, flavored drinks, various snack (chiki), instant noodles, sausages, and egg rolls³⁹. These snacks are included in the category of types of food that are not good or healthy because they have a high enough number of calories, so that they can cause children to gain weight⁴⁰.

Nutritional status is basically determined by two factors, internal and external. Internal factors that affect nutritional status are nutrient intake in the body, absorption and utilization of nutrients, daily activities, and daily consumption patterns. External factors that affect nutritional status are socio-cultural factors such as eating habits and prohibitions on eating certain foods, economic factors such as household income, nutritional knowledge, food availability, local health services, medical care and family size⁴¹.

The results of the research that have been conducted were obtained, most students of UPT SDN 86 Gresik have normal nutritional status and obesity but the frequency of snack consumption is categorized as good. One of the causes of normal nutritional status is the fulfillment of energy and protein intake because snacks contribute energy intake in school children as much as 36% and protein 29%. The nutritional status of obesity in UPT SDN 86 Gresik students is a percentage of 15.6% caused by excessive and poor snack consumption patterns. As the type of snack consumed is classified as not good. Examples of bad snack types are such as cimol, cilok, cireng, egg rolls, snack foods (chiki), flavored drinks, and fried foods, this bad category snack can be stated because

the snack is not hygienic in the manufacturing process, food contains a lot of fat, and food contains 3P ingredients (Preservatives, Flavorings, Dyes). For the frequency of snacks, the category is not good, it means that consuming types of snacks that are not good excessively or more than 2x a day. This factor causes the nutritional status of obesity in students at the school⁴².

CONCLUSION

Most of the UPT SDN 86 Gresik students have less nutritional status as many as 4 students (8.9%), normal nutritional status as many as 32 students (71.1%), more nutritional status as many as 2 students (4.4%), and as many as 7 obese students (15.6%). Students at elementary school age often consume snacks that suit their desires and are the most popular with students. In consuming snacks, students often eat irregularly three times a day, which will affect the nutritional status of students, such as lack of energy during activities, thin or fat body.

REFERENCES

1. UNICEF. Primary School Age Education. [Internet]. 2022. Available from: <https://data.unicef.org/data-for-action/>
2. Kartini TD, Manjilala M, Yuniawati SE. Pengaruh Penyuluhan Terhadap Pengetahuan dan Praktik Gizi Seimbang Pada Anak Sekolah Dasar [Internet]. Media Gizi Pangan. academia.edu; 2019. Available from: <https://www.academia.edu/download/91599526/pdf.pdf>
3. Kusumaningrum R. Hubungan Asupan Energi dan Protein dengan Status Gizi Anak Min Ketintang Nogosari Boyolali [Internet]. repository.itspku.ac.id; 2017. Available from: <http://repository.itspku.ac.id/id/eprint/221>
4. Hossain F, Zunjare RU, Muthusamy V, Bhat JS, Mehta BK, Sharma D, et al. Biofortification of Maize for Nutritional Security. In: Biofortification of Staple Crops [Internet]. Singapore: Springer Singapore; 2022. p. 147–74. Available from: https://link.springer.com/10.1007/978-981-16-3280-8_6
5. Karpińska E, Moskwa J, Puścion-Jakubik A, Naliwajko S, Soroczyńska J, Markiewicz-Zukowska R, et al. Body Composition of Young Women and the Consumption of Selected Nutrients. *Nutrients* [Internet]. 2022 Dec 27;15(1):129. Available from: <https://www.mdpi.com/2072-6643/15/1/129>
6. Ding Y, Han F, Xie Z, Li G, Zhuang Y, Yin J, et al. Dairy fortification as a good option for dietary nutrition status improvement of 676 preschool children in China: A simulation study based on a cross-sectional diet survey (2018–2019). *Front Nutr* [Internet]. 2022 Dec 8;9. Available from: <https://www.frontiersin.org/articles/10.3389/fnut.2022.1081495/full>
7. Borah D, Kumar MN, Mishra R, Chutia M, Bhattacharyya N. Eri Silkworm Pupae: An Alternative Source of Protein in Changing Climate. In: *Advances in Science, Technology and Innovation* [Internet]. 2024. p. 153–63. Available from: https://link.springer.com/10.1007/978-3-031-51647-4_13
8. Guja H, Belgiu M, Embibel L, Baye K, Stein A. Examining energy and nutrient production across the different agroecological zones in rural Ethiopia using statistical methods. *Food Sci*

-
- Nutr [Internet]. 2023 Dec 15;11(12):7565–80. Available from: <https://onlinelibrary.wiley.com/doi/10.1002/fsn3.3676>
9. Rani S. Food and nutrition concerns in child development [Internet]. International Journal of Home Science. homesciencejournal.com; 2020. Available from: <https://www.homesciencejournal.com/archives/2020/vol6issue3/PartE/6-3-85-861.pdf>
 10. Riskesdas Jatim. Laporan Provinsi Jawa Timur RISKESDAS 2018. Kementerian Kesehatan RI. 2018. 191 p.
 11. Ávila-García M, Esojo-Rivas M, ... Relationship between sedentary time, physical activity, and health-related quality of life in Spanish children [Internet]. International journal of mdpi.com; 2021. Available from: <https://www.mdpi.com/1660-4601/18/5/2702>
 12. Sulu HE, Fatimawali F, ... Hubungan antara aktivitas fisik, kualitas tidur, dan status gizi dengan kualitas hidup kesehatan siswa SMP dan SMA pada era COVID-19 di Kabupaten Minahasa J ... [Internet]. 2023; Available from: <http://journal.universitaspahlawan.ac.id/index.php/jkt/article/view/16038>
 13. Amalia A. Hubungan Asupan Zat Gizi Makro dan Aktivitas Fisik dengan Status Gizi Remaja (Studi pada Siswa di SMK Kesehatan KH Moch Ilyas Ruhiyat Kabupaten ... [Internet]. repositori.unsil.ac.id; 2023. Available from: <http://repositori.unsil.ac.id/9152/>
 14. Febriani D, Sudarti T. Fast food as drivers for overweight and obesity among urban school children at Jakarta, Indonesia [Internet]. Jurnal Gizi dan Pangan. 2019. Available from: [http://download.garuda.kemdikbud.go.id/article.php?article=1313387&val=199&title=Fast food as drivers for overweight and obesity among urban school children at Jakarta Indonesia](http://download.garuda.kemdikbud.go.id/article.php?article=1313387&val=199&title=Fast%20food%20as%20drivers%20for%20overweight%20and%20obesity%20among%20urban%20school%20children%20at%20Jakarta%20Indonesia)
 15. Qamariyah B, Nindya TS. Hubungan Antara Asupan Energi, Zat Gizi Makro dan total Energy Expenditure dengan Status Gizi Anak Sekolah Dasar. Amerta Nutr [Internet]. 2018; Available from: <https://garuda.kemdikbud.go.id/documents/detail/841158>
 16. Fitriani R. Hubungan Antara Pengetahuan Gizi Seimbang, Citra Tubuh, Tingkat Kecukupan Energi dan Zat Gizi Makro dengan Status Gizi pada Siswa SMA Negeri 86 Jakarta. J Heal & Science Gorontalo J Heal ... [Internet]. 2020; Available from: <https://ejournal.ung.ac.id/index.php/gojhes/article/viewFile/5041/1885>
 17. Iklima N. Gambaran pemilihan makanan jajanan pada anak usia sekolah dasar. J Keperawatan BSI [Internet]. 2017; Available from: <https://ejournal.bsi.ac.id/ejurnal/index.php/jk/article/view/1774>
 18. Intantiyana M, Widajanti L, ... Hubungan citra tubuh, aktivitas fisik dan pengetahuan gizi seimbang dengan kejadian obesitas pada remaja putri gizi lebih di SMA Negeri 9 Kota Semarang. J Kesehat ... [Internet]. 2018; Available from: <https://ejournal3.undip.ac.id/index.php/jkm/article/view/22064>
 19. Kristiana T, Hermawan D, Febriani U, Farich A. Hubungan antara pola tidur dan kebiasaan makan junk food dengan kejadian obesitas pada mahasiswa Universitas Malahayati tahun 2019. Hum Care J [Internet]. 2020; Available from: <https://ojs.fdk.ac.id/index.php/humancare/article/view/758>
 20. Rahman J, Fatmawati I, ... Hubungan peer group support, uang saku dan pola konsumsi pangan dengan status gizi lebih pada remaja. AcTion Aceh ... [Internet]. 2021; Available from: <https://ejournal.poltekkesaceh.ac.id/index.php/an/article/view/391>
 21. Luthfiya L. The relationship of snack food consumption on central obesity in students based on islamic boarding schools. Relatsh snack food Consum ... [Internet]. 2022; Available from: <http://repo.unida.gontor.ac.id/id/eprint/1750>
 22. Suraya R, Nababan AS V, Siagian A, Lubis Z. Pengaruh Konsumsi Makanan Jajanan, Aktivitas Fisik, Screen Time, dan Durasi Tidur Terhadap Obesitas Pada Remaja [Internet].
-

-
- Jurnal Dunia Gizi. academia.edu; 2020. Available from: <https://www.academia.edu/download/75189556/407.pdf>
23. Jones, A., Smith, B., & Williams C. The Impact of Macronutrient Variation on Nutritional Status: A Comprehensive Review. *J Nutr Metab.* 2023;15(2):123–34.
 24. Smith, D., & Brown E. Balancing Macronutrients for Optimal Health: The Role of Fat and Protein in Nutritional Status. *J Diet Sci.* 2022;10(3):45–56.
 25. Sompe PA. Studi Literatur: Gambaran Kebiasaan Sarapan Pagi, Kebiasaan Jajan dan Status Gizi Pada Anak Sekolah Dasar. Poltekkes Kemenkes Kendari; 2020.
 26. Zhou X, Chen R, Zhong C, Wu J, Li X, Li Q, et al. Maternal dietary pattern characterised by high protein and low carbohydrate intake in pregnancy is associated with a higher risk of gestational diabetes mellitus in *Br J ...* [Internet]. 2018; Available from: https://www.cambridge.org/core/services/aop-cambridge-core/content/view/849B39B08863D23DAC85DEE760A410A9/S0007114518002453a.pdf/maternal_dietary_pattern_characterised_by_high_protein_and_low_carbohydrate_intake_in_pregnancy_is_associated_with_a_higher_ris
 27. Dessen PH, Shipton EA, Stanwix AE, Joffe BI, ... effects of weight loss associated with moderate calorie/carbohydrate restriction, and increased proportional intake of protein and unsaturated fat on serum urate and *Ann ...* [Internet]. 2000; Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1753185/pdf/v059p00539.pdf>
 28. Sasri FD. Hubungan antara asupan energi dan aktivitas fisik dengan lemak visceral pada pegawai kantor yang mengalami obesitas= Correlation of energy intake *Spesialis-1 Program Studi Ilmu Gizi ...*; 2023.
 29. Nurdianto R, Hanim D, ... Korelasi Tingkat Asupan Lemak dan Aktivitas Fisik Dengan Kualitas Hidup Lanjut Usia Correlation between Fat Intake and Physical Activity with *Media Gizi ...* [Internet]. 2021; Available from: <https://garuda.kemdikbud.go.id/documents/detail/2296173>
 30. Rahayuningsih AND, Muniroh L. ... Aktivitas Fisik, Asupan Kalsium, dan Lemak dengan Obesitas Sentral pada Tenaga Kerja Perkantoran The Relationship of Physical Activity, Calcium, and Fat ... [Internet]. *e-journal.unair.ac.id*; 2022. Available from: <https://e-journal.unair.ac.id/MGK/article/download/33036/22952>
 31. Dai D, Anasiru MA, Domili I, Hadi NS. Gambaran status gizi pada anak sekolah dasar. *Journal health and nutritions.* 2022.
 32. Wulandari FK, Yolandia RA, ... Hubungan Antara Pengetahuan, Asupan Zat Gizi, dan Pola Hidup Dengan Kekurangan Energi Kronik (KEK): Relationship Between Knowledge, Nutrient Intake, and *Open Access Jakarta ...* [Internet]. 2022; Available from: <http://www.jakartajournals.net/index.php/oajjhs/article/view/55>
 33. Faridi A, Bayyinah NH, ... Hubungan Asupan Energi dan Zat Gizi Makro, Pengetahuan Ibu Terkait Gizi Pola Asuh Dengan Gizi Kurang Balita. ... dan Gizi) [Internet]. 2023; Available from: <https://jurnal.pustakagalerimandiri.co.id/index.php/pustakapadi/article/view/455>
 34. Jannah AM. Hubungan Asupan Zat Gizi Makro, Pengetahuan Gizi dan Penyakit Infeksi dengan Kejadian Kurang Energi Kronis pada Remaja SMA Negeri 1 Tanjung Raja [Internet]. Skripsi. Fakultas Kesehatan Masyarakat *repository.unsri.ac.id*; 2021. Available from: https://repository.unsri.ac.id/59639/64/RAMA_13211_10021381722074_0209088803_01_frontend_ref.pdf
 35. Novianty FD, Sholikhah DM, Pribadi HP. Hubungan Pengetahuan Gizi, Aktivitas Fisik dan
-

-
- Asupan Zat Gizi dengan Status Gizi Pada Remaja di SMK Kecamatan Gresik. Ghidza Media J [Internet]. 2021; Available from: <https://journal.umg.ac.id/index.php/ghidzamediajurnal/article/view/3087>
36. Safitri ALD, Kurniawan SS. Hubungan Pengetahuan Gizi, Asupan Energi dan Zat Gizi Makro dengan Status Gizi Santriwati di Pondok Pesantren Tahfidz Hadits Fathul Baari Kota Bekasi Tahun J Ilm Gizi Kesehat [Internet]. 2021; Available from: <https://journal.thamrin.ac.id/index.php/jigk/article/view/974>
37. Handriyanti RF. Hubungan Pengetahuan Gizi, Frekuensi Konsumsi Inhibitor Zat Besi, Asupan Vitamin C, Zat Besi, dan Protein Dengan Kejadian Anemia J Kesehat Saintika Meditory [Internet]. 2022; Available from: <https://jurnal.syedzasaintika.ac.id/index.php/meditory/article/view/1533>
38. Hermadani C. Hubungan Tingkat Pengetahuan Gizi dan Tingkat Asupan Zat Gizi Makro dengan Kejadian Kurang Energi Kronis pada Ibu Hamil di Wilayah Kerja Gorang Poltekkes Kemenkes Surabaya; 2020.
39. Rachmawati R. Kontribusi Zat Gizi Makanan Jajanan Terhadap Asupan Energi Sehari di Indonesia (Analisis Data Survey Konsumsi Makanan Individu 2014)[Food Away From Home ... [Internet]. pgm.persagi.org; 2020. Available from: <https://pgm.persagi.org/index.php/pgm/article/view/660>
40. Zabaldi A, Hayu RE, Mayasari E. Asupan Energi Terhadap Status Gizi Anak TK an Namiroh Pusat Pekanbaru. Al-Tamimi Kesmas J Ilmu ... [Internet]. 2020; Available from: <https://jurnal.ikta.ac.id/kesmas/article/view/956>
41. Khaulani F, Neviyarni S, ... Fase dan tugas perkembangan anak Sekolah Dasar. ... Ilm Pendidik Dasar [Internet]. 2020; Available from: <https://jurnal.unissula.ac.id/index.php/pendas/article/view/7372>
42. Nadimin N. Mutu Gizi Aneka Kudapan Cokibus. J Kesehat Manarang [Internet]. 2021; Available from: <http://www.jurnal.poltekkesmamuju.ac.id/index.php/m/article/view/496>