



The impact of a free nutritious meal program on elementary school students' concentration levels

Dampak program makan bergizi gratis terhadap tingkat konsentrasi siswa sekolah dasar

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Abstract

Nutritional problems among school-aged children negatively affect both physical growth and academic achievement. In Indonesia, approximately 41% of children attend school while hungry, and only 10% habitually consume a nutritionally balanced breakfast. This study aimed to analyze the effect of the "Free Nutritious Meal" (Makan Bergizi Gratis, MBG) program on concentration levels among elementary school students. A quasi-experimental design with pre-test and post-test assessments and a control group was applied. The study was conducted in Banda Aceh, with SD Negeri 50 serving as the intervention group and SD Negeri 20 as the control group. A total of 83 students in the intervention group received free nutritious meals, while 83 students comprised the control group. The study was carried out from April to June 2025. Concentration levels were measured using the Grid Concentration Test, a simple psychological tool to assess focus and attention. Data analysis included descriptive statistics to present respondent characteristics and concentration distribution, and Chi-Square tests to compare within-group and between-group changes. Results demonstrated a significant improvement in concentration among students in the intervention group between baseline and endline ($p = 0.020$), whereas no significant change was observed in the control group ($p = 0.328$). The MBG program effectively enhanced student concentration. Strengthening program quality and providing nutrition education to families are recommended to support healthy eating habits and maximize the program's impact on children's cognitive function.

Keywords: Concentration levels, free nutritious meals, program MBG, nutritional intervention, school nutrition program

Abstrak

Masalah gizi pada anak usia sekolah berdampak negatif terhadap pertumbuhan fisik maupun prestasi akademik. 41% anak Indonesia bersekolah dalam kondisi lapar, hanya 10% yang terbiasa sarapan dengan gizi seimbang. Penelitian ini bertujuan menganalisis pengaruh Program Makan Bergizi Gratis terhadap tingkat konsentrasi siswa sekolah dasar. Desain penelitian menggunakan quasi-eksperimen dengan rancangan pre-test dan post-test serta kelompok kontrol. Lokasi penelitian adalah SD Negeri 50 (kelompok intervensi) dan SD Negeri 20 (kelompok kontrol) di Banda Aceh. Penelitian ini terdiri atas 83 siswa kelompok intervensi yang menerima makanan bergizi gratis dan 83 siswa kelompok kontrol. Penelitian dilaksanakan pada April–Juni 2025. Tingkat konsentrasi diukur menggunakan Grid Concentration Test, yaitu metode psikologis sederhana menilai kemampuan fokus. Analisis data meliputi statistik deskriptif untuk menggambarkan karakteristik responden dan distribusi konsentrasi, serta uji Chi-Square untuk membandingkan perubahan dalam kelompok maupun antar kelompok. Hasil penelitian menunjukkan adanya peningkatan signifikan pada konsentrasi siswa kelompok intervensi antara baseline dan endline ($p = 0,020$), yang menandakan program memiliki dampak positif. Sebaliknya, kelompok kontrol tidak menunjukkan perubahan signifikan ($p = 0,328$). Program Makan Bergizi Gratis mampu meningkatkan konsentrasi

siswa. Peningkatan kualitas program serta edukasi gizi kepada keluarga diperlukan untuk mendukung pola makan sehat dan memaksimalkan dampak terhadap fungsi konsentrasi anak.

Kata Kunci: Anak sekolah, intervensi gizi, makan bergizi gratis, program gizi sekolah, tingkat konsentration

Introduction

Education serves as a crucial foundation for shaping the future quality of human resources. The success of education is not solely determined by the quality of the curriculum or adequate facilities but also by the quality of the human resources involved (Sholihah, 2018). To support an optimal learning process, students must be in good physical and mental condition (Harmini, 2017). One of the factors that influence students' physical readiness for learning in school is the regular consumption of food (Firdaus et al., 2023). Norasyidah et al. (2024) found that students who regularly consume food (especially breakfast) before school each day tend to perform better in the classroom.

Nutritional status is an important indicator of the balance between nutrient intake and the body's need to function properly (Rokhmah et al., 2022). In elementary school-aged children, good nutritional status significantly influences cognitive development including thinking ability, memory, and concentration (Rohim et al., 2024). One of the factors contributing to poor nutritional status is irregular eating habits, particularly the frequent omission of breakfast. This is a dominant factor contributing to nutritional problems, such as underweight, stunting, and anemia (FAO et al., 2020).

Skipping breakfast consistently prevents the body from meeting its diverse nutritional needs, particularly for the synthesis of hemoglobin (Spence, 2017). In addition, children who skip breakfast tend to compensate by consuming unhealthy foods high in sugar and fat (Kelishadi et al., 2017). Children experiencing nutritional issues, such as anemia or micronutrient deficiencies (iron, iodine, and zinc), are at greater risk of having decreased concentration, fatigue, and difficulty in understanding lessons (Bassuoni et al., 2021).

According to a report by FAO (2022) approximately 179 million school-aged children attend school hungry, an increase of 35 million compared to pre-COVID-19 pandemic levels.

Elementary and junior high school children accounted for approximately 71% of the increase. Data from Indonesia's Basic Health Research (2018) reported that 41% of school-aged children went to school hungry (Kemenkes RI, 2018). Kang et al. (2020) found that 21,8% of Indonesian children skip breakfast. Only approximately 10% of children consume a nutritionally balanced breakfast, 25% eat meals consisting solely of carbohydrates, and 50% eat a single-food meal. Eating breakfast before school is crucial because hunger can disrupt concentration and impair learning ability in the classroom (Hazizah et al., 2024).

Children aged 5–12 years are in the second phase of growth. Nutritional deficiencies during this phase may result in a failure to achieve catch-up growth (Aiga et al., 2019; Cameron & Schel, 2021). School-age children are also seen as agents of change for healthy living, including good nutritional practices (Ibrahim et al., 2023). Ensuring proper nutrition for school-aged children is vital for achieving global developmental goals and reducing the future burden of non-communicable diseases (Williams & Suchdev, 2017). Instilling balanced nutritional practices in children at this age is essential to help shape positive attitudes, behaviors, and knowledge that support good health and nutritional status in the future (Bennett et al., 2015).

In 2025, the Government of Indonesia began designing and gradually implementing the Free Nutritious Meal Program (Makan Bergizi Gratis, MBG). This program aims to increase the availability of and access to balanced and nutritious food, while creating an environment that supports the adoption of healthier dietary habits. School-aged children are one of the target groups of this program (BGN, 2025). Good access to food supports both the quality and quantity of dietary practices, ultimately impacting an individual's adequacy of energy and nutrient intake (Weerasekara et al., 2020; Wirawan & Rahmawati, 2016).

Access to food refers to the ability of individuals or groups to obtain sufficient, nutritious, safe, and affordable food to meet the

body's nutritional needs sustainably. Food access is influenced by several factors, including individual and family characteristics, the physical environment, the social and cultural environment, and economic conditions (Kementan, 2019).

Studies conducted in Finland have shown that school-based nutritious meal programs promote healthy eating habits and physical activity, positively influence children's behavior, and reduce absenteeism (Cuciureanu 2017). An adequate intake of nutritious and balanced food has a positive impact on students' academic performance and improves school outcomes. Children with better physical fitness tend to achieve higher academic scores. Those who consume healthy and balanced meals also tend to maintain a better focus in class (Hautamaa & Hiljanen, 2017; Tilles-Tirkkonen et al., 2011). In Indonesia, no study has specifically examined the effect of free nutritious meals on students' concentration levels.

Based on this background, this study aims to examine the extent to which the free nutritious meal program (Makan Bergizi Gratis, MBG) in schools affects the concentration levels of elementary school students. The findings of this research are expected to provide valuable input for policymakers and program implementers in designing more effective nutritional interventions to support the achievement of program goals.

Methods

Study Design, Location and Timing.

This study employed a quasi-experimental pre-post design with a control group consisting of elementary schools that received the nutritious meal program (intervention group) and those that had not yet received the program (control group). The selected research sites were 50 Banda Aceh public elementary schools (intervention group) and 20 Banda Aceh public elementary schools (control group). In this study, the intervention was provided by the Indonesian government through a nutrition service delivery unit. The researcher monitored and supervised the entire process from food preparation to distribution.

The research sites were selected based on the following criteria: 1) socioeconomic

variation, 2) similarity in school accreditation between the intervention and control groups, and 3) geographical proximity.

This study was designed to observe the short-term effects of the intervention over a period of two months, from April to June 2025. The study was approved by the Ethics Committee of the Aceh Health Polytechnic, Ministry of Health (approval number DP.04.03/12.7/094/2025).

Sample

The total sample in this study comprised 166 students, with 83 in the intervention group and 83 in the control group. The inclusion criteria for participants were as follows: good health with no history of diseases that could interfere with nutrient absorption, ability to read, and provision of written consent (informed consent) from a parent or guardian. The exclusion criteria were student attendance of less than 80% and students who transferred to another school during the study period.

Type and Data Collection Method.

In this study, the level of student concentration was measured using a Grid Concentration Test. This test was designed to assess a child's ability to focus and maintain attention over a short period of time. During the test, each participant was asked to find and mark sequential numbers randomly scattered within a grid within a time limit of one minute. The number of correctly identified and marked numbers was recorded as a concentration score. The Grid Concentration Test was chosen for this study because it is a simple psychological test method, easy to understand, and can be administered in a short time to elementary school children. The test does not require special equipment or advanced technical skills, making it practical to implement in a school setting with a large number of participants.

Based on the number of figures identified, concentration levels are categorized into four tiers: < 5, very low concentration; 6–10, low concentration; 11–15, moderate concentration; and 16–20, good concentration. This test is considered effective in providing an objective overview of children's concentration abilities, which are closely related to their academic performance in the school environment.

Data on family characteristics were also collected to provide a general overview of the respondents. These data included gender, amount of daily allowance, mother's education and occupation, and family income, and are presented in Table 3.

Data Processing and Analysis

The data obtained were analyzed using both descriptive and inferential statistical approaches. A descriptive analysis was conducted to describe the characteristics of the study subjects and the distribution of children's concentration levels based on categories (very low, low, moderate, and good) within each group (intervention and control) before and after the intervention.

An inferential analysis was used to evaluate the effect of the intervention program on changes in children's concentration levels. Before conducting inferential analysis, a normality test was performed to assess the distribution of the data. The results indicate that the data were not normally distributed. Therefore, non-parametric tests were

performed. Consequently, inferential analysis was carried out using the chi-square test to evaluate differences in the distribution of concentration levels, both within groups between baseline and endline and between the intervention and control groups. A significance level was set at $p < 0,05$, with p-values less than 0,05 considered statistically significant.

Free Nutritional Meal Intervention (Makan Bergizi Gratis, MBG)

The intervention was in the form of a balanced nutrition package designed to meet 20-25% of the daily energy needs. The amount of nutrients provided in this intervention refers to the Ministry of Health Regulation Number 28 of 2019 concerning the Nutritional Adequacy Rates. In this study, the intervention was provided by the Indonesian government through a nutrition fulfillment service unit. Food standards in the nutritious meal program (breakfast) were adjusted to the balanced nutrition guidelines, as shown in Table 1. The estimated amounts of nutrients in one portion of the menu are listed in Table 2.

Table 1. Food standards for the MBG program for primary school students in grades 1-3 (Kemenkes RI 2024).

Food Group	Unit of Exchange (SP)	Food Ingredients	URT	Gross Weight (g)	Net Weight (g)
Carbohydrate Source	1	Rice	½ cup	50	50
		Rice	10 tbsp	100	100
		Potatoes	2 pieces	247	210
		Dry noodles	1 glass	50	50
		White bread	3 pieces	70	70
		Sweet potato	1 piece	159	135
Animal Protein	1	Egg	1 grain	62	55
		Chicken meat	1 piece	69	40
		Beef	1 piece	35	35
		Fresh fish	1 piece	50	40
Vegetable Protein	0,25	Tempeh	¼ piece	12,5	12,5
		Tofu	½ piece	27,5	27,5
		Oncom	½ piece	10	10
Vegetable	0,5	Coles	½ bowl	62,5	50
		Kale	-	70	50
		Mustard	-	56	50
		Carrots	-	50	50
		Long Beans	-	67	50
		Chickpeas	-	50	50
		Spinach	-	70	50
		Siamese Pumpkin	-	57,5	50
		Banana	1 fruit	67	50
Fruit	1	Orange	1 piece	153	110

Fat Source	1	Watermelon	1 piece	391	180
		Melon	1 piece	327	190
		Papaya	1 piece	147	110
		Oil	1 tsp	5	5
		Coconut milk	4 tbsp	40	40
		Butter	1 tsp	5	5

Table 2. Amount of nutrients in one serving of free nutritious meal menu class 1-3 (7-9 years old) (Kemenkes RI, 2024).

Nutrients	Amount of nutrients in 1 serving of free nutritious meal, grades 1-3 (7-9 years old)
Energy (kcal)	330 - 413
Protein (gram)	8 - 10
Fat (gram)	11 - 14
Carbohydrate (grams)	50 - 63
Fiber (grams)	5 - 6
Calcium (mg)	200 - 250
Iron (mg)	2 - 3
Vitamin A (RE)	100 - 125
Vitamin C (mg)	9 - 11
Folate (mcg)	60 - 75
Vitamin B12 (mcg)	0,4 - 0,5

Result and Discussion

Family socioeconomic characteristics showed significant differences in several variables. In terms of pocket money, the control group tended to have higher allowances than the intervention group, while the proportion of students who did not receive any allowances was greater in the intervention group.

Pocket money is associated with children's purchasing power for snacks; the higher the allowance, the greater the likelihood of children

buying food without considering its nutritional content (Desi et al., 2018).

The maternal education level also showed significant differences. In both groups, most mothers had completed secondary education or higher. However, in the control group, a proportion of mothers had never attended school, whereas this was not observed in the intervention group. Maternal education plays an important role in nutritional knowledge and child-rearing practices (Tampubolon et al., 2024).

Household incomes also differed significantly. The control group tended to have a higher income, whereas the intervention group was more frequent in the lower-income category. Household income influences access to nutritious foods, health services, and education (Novita et al. 2024; Rahmatika et al. 2024). In addition, non-socioeconomic factors, such as sleep duration, showed a tendency toward differences, although not statistically significant, where lack of sleep was more prevalent in the intervention group. Insufficient sleep may negatively affect learning concentration and children's cognitive functions (Gustiawati & Murwani, 2020; Roficha et al., 2018).

The differences observed in several socioeconomic characteristics and supporting factors represent a limitation of this study as they may influence children's nutritional status and concentration independently of the intervention provided.

Table 3. Subject characteristics

Subject Characteristics	Intervention group n (%)	Control group n (%)	P*
Pocket Money			
None	7 (8,4)	1 (1,2)	0,030
IDR 1,000 - Rp.5,000	36 (43,4)	26 (31,3)	
IDR 6,000 - Rp.10,000	30 (36,1)	44 (53)	
>IDR 10,000	10 (30,1)	12 (14,5)	
Mother's Education			
Not in school	0 (0)	8 (9,6)	0,046
Elementary school	1 (1,2)	0 (0,0)	
Junior high school	9 (10,8)	8 (9,6)	
Senior high school	28 (33,7)	22 (26,5)	

Diploma/graduate	45 (54,2)	45 (54,2)	
Mother's occupation			
Not working/ Housewife	46 (55,4)	48 (57,8)	0,212
Employee (Public/Private)	21 (25,3)	23 (27,7)	
Self employed /entrepreneur	7 (8,4)	9 (10,8)	
Farmer, Fisherman, Laborer	0 (0,0)	1 (1,2)	
Others	9 (10,8)	2 (2,4)	
Household Income			
< IDR 1,900,000	24 (28,9)	13 (15,7)	0,020
IDR 1,900,00 - 3,500,000	25 (30,1)	19 (22,9)	
> IDR 3,500,000	34 (41,0)	51 (61,4)	
Sleep Duration			
Lack of Sleep	51 (61,5)	41 (49,4)	0,126
Sufficient	29 (34,9)	41 (49,4)	
Excessive	3 (3,6)	1 (1,2)	

*Significant (p<0,05)

Table 4. The impact of a free nutritious meal program on elementary school students' concentration levels

Concentration Levels	Intervention Group n (%)	Pa*	Control Group n (%)	Pa*	Pb*
Baseline				0,328	0,014
Very Low	36 (43,4)	0,020	43 (51,8)		
Low	46 (55,4)		32 (38,6)		
Moderate	1 (1,2%)		8 (9,6)		
Good	0(0)		0(0)		
Endline					0,312
Very low	23(27,7)		28 (33,7)		
Low	52(62,7)		43(51,8)		
Moderate	8 (9,6)		10 (12,0)		
Good	0(0)		2(1,2)		

^aComparison in each intervention and control group (Baseline and Endline)

^bComparison between intervention and control groups

*Significant (p<0,05)

The analysis results presented in Table 4 indicate a significant improvement in concentration levels among the intervention group following the implementation of the free nutritious meal program (FNMP). At baseline, the majority of students in the intervention group were categorized as having "Very Low" (43,4%) and "Low" (55,4%) levels of concentration, with only 1,2% classified as having "Moderate" concentration and none reaching the "Good" category. After the intervention (endline), the proportion of students in the "Very Low" category decreased to 27,7%, while the proportion in the "Moderate" category increased to 9,6%. This change was statistically significant, indicating that the nutritional meal program had a positive impact on improving students' concentration levels. There was an effect size difference that was approximately 4,8% higher in the intervention

group than in the control group, indicating that the program made a substantial contribution to the improvement of concentration levels.

In contrast, the control group showed no significant changes in concentration levels between the baseline and endline measurements. The distribution of students across concentration categories remained relatively stable, with a slight decrease in the "Very Low" category from 51,8% to 33,7%, and a marginal increase in the "Moderate" category from 9,6% to 12,0%. These findings suggest that in the absence of a nutritious meal intervention, there was no meaningful improvement in students' concentration levels.

Interestingly, at the initial measurement (baseline), a significant difference was observed between the intervention and control groups, indicating that the two groups were not entirely equivalent. However, after the intervention

(endline), this difference became statistically insignificant, suggesting that the intervention group had achieved concentration levels comparable to those of the control group. According to Souza (2023), breakfast plays an important role in providing the energy and nutrients needed by the body after overnight fasting, thereby supporting metabolism, nutritional status, and children's cognitive functions. An ideal breakfast should contribute 20–35% of daily energy requirements and consist of three food groups: milk and dairy products, whole grains, and fresh fruits or unsweetened fruit juices.

Concentration levels in individuals are influenced by a range of multidimensional factors including physiological, psychological, and environmental factors (Haslianti, 2019; Riinawati, 2021). Nutritional status is a fundamental factor affecting cognitive development, including the ability to concentrate, which directly affects academic achievement (Acharya et al., 2019). Adequate and balanced intake of essential nutrients, such as iron, iodine, and omega-3 fatty acids, plays a key role in the development of brain function, particularly in areas related to attention and working memory (Roberts et al., 2022).

Malnutrition in children can lead to reduced attention span, increased fatigue, and decreased performance in school activities (Hardinsyah and Aries 2016). Daily dietary patterns, especially breakfast habits, significantly contribute to the concentration capacity. A steady supply of energy and glucose from breakfast helps maintain mental alertness. This is supported by meta-analytical findings that show a positive relationship between breakfast consumption and cognitive performance in children. Iron is essential for the development of neurological pathways that influence brain function. Iron deficiency or iron deficiency anemia can negatively affect intelligence and overall cognitive development, especially in early childhood (McCann et al., 2020).

Therefore, it is essential to focus on optimal nutritional intake and healthy dietary habits, which can be effectively reinforced through school-based interventions such as free nutritious meal programs (FNMP). Mostert (2021) reported that school meal programs can enhance cognitive abilities by reducing vulnerability to illness. Additionally, they can improve children's health and reduce the risk of school absenteeism (Nida & Sari 2023).

Concentration is also affected by sleep duration and quality. Poor sleep patterns can lead to attention deficits, slower cognitive responses, and impaired short-term memory (Khan and Al-Jahdali, 2023). During sleep, individuals undergo three stages of non-rapid eye movement (NREM) and one stage of rapid eye movement (REM). Sleep deprivation during REM stages significantly disrupts neuronal activation, which is critical for threat assessment and response to stimuli. A lack of NREM sleep may impair the normal release of specific neurotransmitters, affecting the ability of the brain to restore itself and diminish cognitive performance (Eugene & Masiak, 2015).

The physical environment also plays a role in influencing concentration. High noise levels, poor lighting, uncomfortable temperatures, and cluttered or cramped classroom spaces can become distractions that reduce cognitive efficiency, thereby impairing concentration and productivity (Widati et al., 2019; Widati, 2018).

Psychological factors are equally important in determining one's ability to concentrate because emotional and mental states significantly influence attentional focus. Children experiencing stress, anxiety, or low motivation are more likely to have poor concentration (Fisak et al., 2023). Emotional discomfort, such as fear, pressure from the learning environment, or social conflict at school, can destabilize a child's mental state, making it difficult to absorb and process information (Anderson et al., 2025). Furthermore, psychological disorders, such as *Attention Deficit Hyperactivity Disorder* (ADHD), are closely linked to difficulties in maintaining sustained concentration. Therefore, efforts to improve concentration should not only focus on physical or nutritional aspects, but also address the overall psychological well-being of children (Wahidah, 2018).

Conclusion

The Free Nutritious Meal Program (FNMP) contributes to the improvement in students' concentration levels. However, enhancing the quality of the program and providing nutrition education to families are essential to supporting healthy eating habits at home, thereby maximizing the program's impact on children's concentration. Moreover, regular monitoring and evaluation of both meal quality and changes

in children's concentration behavior are crucial for the development of a sustainable and effective program.

This study had several strengths. Methodologically, it employed a rigorous design using a pretest and posttest approach with a control group. This design enabled researchers to objectively compare changes before and after the intervention while controlling for external factors that might influence the outcomes. The presence of the control group strengthened the internal validity of the study, thereby increasing the reliability of the findings.

However, this study had certain limitations. The relatively short duration of the intervention highlighted the need for further research to examine its long-term effects. In addition, the imbalance in baseline characteristics between the groups could have increased the risk of bias in this study. This study is novel in that it examines the free nutritious meal program (FNMP), which is still relatively new in its implementation, and scientific evidence regarding its impact remains very limited. This study provides important preliminary data on the program effectiveness.

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References

- Acharya, Y., Luke, N., Haro, M. F., Rose, W., Russell, P. S. S., Oommen, A. M., & Minz, S. (2019). Nutritional status, cognitive achievement, and educational attainment of children aged 8-11 in rural South India. *PLOS ONE*, 14(10), e0223001. <https://doi.org/10.1371/journal.pone.0223001>
- Aiga, H., Abe, K., Andrianome, V. N., Randriamampionona, E., Razafinombana, A. R., Murai, T., & Hara, M. (2019). Risk factors for malnutrition among school-aged children: a cross-sectional study in rural Madagascar. *BMC Public Health*, 19(1), 773. <https://doi.org/10.1186/s12889-019-7013-9>
- Anderson, T. L., Valiauga, R., Tallo, C., Hong, C. B., Manoranjithan, S., Domingo, C., Paudel, M., Untaroiu, A., Barr, S., & Goldhaber, K. (2025). Contributing Factors to the Rise in Adolescent Anxiety and Associated Mental Health Disorders: A Narrative Review of Current Literature. *Journal of Child and Adolescent Psychiatric Nursing*, 38(1). <https://doi.org/10.1111/jcap.70009>
- Bassuoni, R. A., AbdEl-Megeid, M., Zeinab Mohammed, M., & AbdEl-Megeid, A. A. (2021). Relationship between Nutritional Status and Cognitive Performance among Primary School Students. *Egyptian Journal of Nutrition*, 36(2), 49-87. <https://doi.org/10.21608/enj.2021.209229>
- Bennett, B. J., Hall, K. D., Hu, F. B., McCartney, A. L., & Roberto, C. (2015). Nutrition and the science of disease prevention: a systems approach to support metabolic health. *Annals of the New York Academy of Sciences*, 1352(1), 1-12. <https://doi.org/10.1111/nyas.12945>
- BGN. (2025). *BGN akan Memulai Program MBG Secara Bertahap*. Badan Gizi Nasional.
- Cameron, N., & Lawrence M. Schell. (2021). *Human Growth and Development* (N. Cameron. & Lawrence M. Schell (eds.); Third). Academic Press. <https://www.elsevier.com/books-and-journals>
- Cuciureanu, M. (2017). *Living And Learning Together*. <https://doi.org/10.15405/epsbs.2017.05.02.69>
- D souza, S. (2023). Why Breakfast should be an important meal among school children life? *Egyptian Journal of Nutrition*, 38(4), 88-95. <https://doi.org/10.21608/enj.2023.247292.1020>
- Desi, D., Suaebah, S., & Dwi Astuti, W. (2018). Hubungan Sarapan, Uang Saku dengan Jajanan Di SD Kristen Immanuel II Kubu Raya. *Jurnal Vokasi Kesehatan*, 4(2), 103. <https://doi.org/10.30602/jvk.v4i2.142>
- Eugene, A. R., & Masiak, J. (2015). The Neuroprotective Aspects of Sleep. *MEDtube Science*, 3(1), 35-40.

- <http://www.ncbi.nlm.nih.gov/pubmed/26594659>
- FAO. (2022). Food Security and Nutrition around the world. In *The State of Food Security and Nutrition in the World 2022* (2022nd ed.). Food and Agriculture Organization of the United Nations. <https://doi.org/https://doi.org/10.406/cc0639en>
- FAO, IFAD, UNICEF, WFP, & WHO. (2020). The State of Food Security and Nutrition in the World 2020. In *The State of Food Security and Nutrition in the World 2020*. <https://doi.org/10.4060/ca9692en>
- Firdaus, M. N., Ermawati, D., & Rondli, W. S. (2023). Faktor Sarapan Pagi yang Memengaruhi Konsentrasi Belajar Siswa dan Hasil Belajar Siswa. *JLEB: Journal of Law, Education and Business*, 1(2), 147–153. <https://doi.org/10.57235/jleb.v1i2.1191>
- Fisak, B., Penna, A., Mian, N. D., Lamoli, L., Margaris, A., & Cruz, S. A. M. F. Dela. (2023). The Effectiveness of Anxiety Interventions for Young Children: A Meta-Analytic Review. *Journal of Child and Family Studies*, 32(8), 2546–2557. <https://doi.org/10.1007/s10826-023-02596-y>
- Gustiawati, I., & Murwani, A. (2020). Hubungan Kualitas Tidur Dengan Konsentrasi Belajar Siswa Kelas VII Dan VIII. *Jurnal Kesehatan Poltekkes Kemenkes Ri Pangkalpinang*, 8(2), 107. <https://doi.org/10.32922/jkp.v8i2.187>
- Hardinsyah, H., & Aries, M. (2016). Jenis Pangan Sarapan dan Perannya dalam Asupan Gizi Harian Anak Usia 6—12 Tahun di Indonesia. *Jurnal Gizi Dan Pangan*, 7(2), 89. <https://doi.org/10.25182/jgp.2012.7.2.89-96>
- Harmini, T. (2017). Pengaruh Kesiapan Belajar Terhadap Prestasi Belajar Mahasiswa Pada Pembelajaran Kalkulus. *MATHLINE: Jurnal Matematika Dan Pendidikan Matematika*, 2(2), 145–158. <https://doi.org/10.31943/mathline.v2i2.42>
- Haslianti, H. (2019). Pengaruh Kebisingan Dan Motivasi Belajar Terhadap Konsentrasi Belajar Pada Siswa. *Psikoborneo: Jurnal Ilmiah Psikologi*, 7(4), 608–614. <https://doi.org/10.30872/psikoborneo.v7i4.4839>
- Hautamaa, P., & Hiljanen, T. (2017). *Eating and learning together: recommendations for school meals*. Finnish Institute for health and welfare.
- Hazizah, A. W., Embrik, I. S., & Pratiwi, A. (2024). Pengaruh Sarapan Pagi Terhadap Konsentrasi Belajar Pada Anak Kelas V Di SDN 04 Tigaraksa Amalia. 2, 323–328. <https://doi.org/https://doi.org/10.59435/gjik.v2i2.864>
- Ibrahim, I., Hasanah, N., Hasibuan, H. L. P., Lestari, A. A., Adina, N., Batubara, I. M., Siregar, P. A., & Taufiq, A. (2023). Clean and Healthy Living Behaviour in Primary School. *International Archives of Medical Sciences and Public Health*, 4(1), 8–15. <https://pcijournal.org/index.php/iamsph/article/download/592/332>
- Kang, R. Y., Lee, S. J., & Ryu, H. K. (2020). Analysis of Factors Affecting Breakfast Eating Behavior of Children in Indonesia: An Application of the Health Belief Model. *Korean Journal of Community Nutrition*, 25(1), 1. <https://doi.org/10.5720/kjcn.2020.25.1.1>
- Kelishadi, R., Mozafarian, N., Qorbani, M., Motlagh, M. E., Safiri, S., Ardalan, G., Keikhah, M., Rezaei, F., & Heshmat, R. (2017). Is snack consumption associated with meal skipping in children and adolescents? The CASPIAN-IV study. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 22(2), 321–328. <https://doi.org/10.1007/s40519-017-0370-4>
- Kemenkes RI. (2018). *Hasil Utama Riskesdas 2018*. <https://doi.org/10.12691/jfnr-2-12-26>
- Kementan RI. (2019). *Kebijakan Strategis Ketahanan Pangan dan Gizi* (1st ed.). Badan Ketahanan Pangan Kementerian Pertanian.
- Khan, M. A., & Al-Jahdali, H. (2023). The consequences of sleep deprivation on cognitive performance. *Neurosciences*, 28(2), 91–99. <https://doi.org/10.17712/nsj.2023.2.20220108>
- McCann, S., Perapoch Amadó, M., & Moore, S. E. (2020). The Role of Iron in Brain Development: A Systematic Review.

- Nutrients*, 12(7), 2001.
<https://doi.org/10.3390/nu12072001>
- Mostert, C. M. (2021). The impact of the school feeding programme on the education and health outcomes of South African children. *Children and Youth Services Review*, 126, 106029.
<https://doi.org/10.1016/j.chilyouth.2021.106029>
- Nida, R., & Sari, D. D. P. (2023). School Meals Program and Its Impact Towards Student's Cognitive Achievement. *Journal of Economics Research and Social Sciences*, 7(1), 69–80.
<https://doi.org/10.18196/jerss.v7i1.17014>
- Norasyidah, Sam, N. F., & Adhani, A. (2024). Hubungan Kebiasaan Sarapan Anak dengan Hasil Belajar Psikomotorik Siswa Di Sekolah SMP Negeri 01 Sebatik. *Prosiding Seminar Nasional Biologi*, 3, 4–11.
- Novita, T. L., Ningtyias, F. W., & Ratnawati, L. Y. (2024). Hubungan Ketahanan Pangan Keluarga Dan Tingkat Konsumsi Zat Besi Dengan Kejadian Anemia Dan Prestasi Belajar Pada Remaja Putri. *Journal of Nutrition College*, 13(3), 220–232.
<https://doi.org/10.14710/jnc.v13i3.41955>
- Rahmatika, T., Pangestuti, D. R., & Asna, A. F. (2024). Hubungan Ketahanan Pangan , Pola Asuh , dan Tingkat Kecukupan Gizi dengan Kejadian Stunting Balita 6-59 Bulan di Puskesmas Dawe , Kabupaten Kudus The Association of Food Security , Parenting Patterns , and Nutritional Adequacy Levels with Stunting. 8(3), 82–93.
<https://doi.org/10.20473/amnt.v8i3SP.2024.82-93>
- Riinawati, R. (2021). Hubungan Konsentrasi Belajar Siswa terhadap Prestasi Belajar Peserta Didik pada Masa Pandemi Covid-19 di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 3(4), 2305–2312.
<https://doi.org/10.31004/edukatif.v3i4.886>
- Roberts, M., Tolar-Peterson, T., Reynolds, A., Wall, C., Reeder, N., & Rico Mendez, G. (2022). The Effects of Nutritional Interventions on the Cognitive Development of Preschool-Age Children: A Systematic Review. *Nutrients*, 14(3).
<https://doi.org/10.3390/nu14030532>
- Roficha, H. N., Suaib, F., & Hendrayati. (2018). Pengetahuan Gizi Ibu Dan Sosial Ekonomi Keluarga Terhadap Status Gizi Balita Umur 6-24 Bulan. *Media Gizi Pangan*, 25(1), 39–46.
- Rohim, A., Mursali, D., Ashilah, S., & Fidrayani. (2024). Hubungan status gizi terhadap perkembangan kognitif anak usia dini. *Jurnal Ilmiah Multidisiplin*, 2(6), 234–243.
<https://doi.org/10.5281/zenodo.11554540>
- Rokhmah, laela nur, Setiawan, ryan budi, Purba, deasy handayani, Anggraeni, N., Suhendriani, S., Faridi, A., Widhi haspari, M., Kristianto, Y., Hasanah, laeli nur, Argaheni, niken bayu, Anto, Handayani, T., & Rasmaniar. (2022). *Pangan Dan Gizi* (R. Watrionthos (ed.)). Yayasan Kita Menulis.
- Sari, L. R., Sadi, S., & Berlianty, I. (2019). Pengaruh Lingkungan Kerja Fisik Terhadap Produktivitas dengan Pendekatan Ergonomi Makro. *Jurnal Opsi*, 12(1), 48.
<https://doi.org/10.31315/opsi.v12i1.2939>
- Sholihah, H. (2018). Implementasi Manajemen Sumber Daya Manusia di MAN Yogyakarta III. *Al-Fikri: Jurnal Studi Dan Penelitian Pendidikan Islam*, 1(1), 58.
<https://doi.org/10.30659/jspi.v1i1.2425>
- Spence, C. (2017). Breakfast: The most important meal of the day? *International Journal of Gastronomy and Food Science*, 8, 1–6.
<https://doi.org/10.1016/j.ijgfs.2017.01.003>
- Tampubolon, A. N., Ingtyas, F. T., & Ginting, L. (2024). Influence of Mother's Education Level on Child Development: A Meta-Analysis Study. *Journal Corner of Education, Linguistics, and Literature*, 4(001), 130–136.
<https://doi.org/10.54012/jcell.v4i001.369>
- Tilles-Tirkkonen, T., Pentikäinen, S., Lappi, J., Karhunen, L., Poutanen, K., & Mykkänen, H. (2011). The quality of school lunch consumed reflects overall eating patterns in 11–16-year-old schoolchildren in Finland. *Public Health Nutrition*, 14(12), 2092–2098.

- <https://doi.org/10.1017/S1368980011001388>
- Wahidah, E. Y. (2018). Identifikasi dan Psikoterapi terhadap ADHD (Attention Deficit Hyperactivity Disorder) Perspektif Psikologi Pendidikan Islam Kontemporer. *Millah: Journal of Religious Studies*, 17(2), 297–318.
<https://doi.org/10.20885/millah.vol17.iss2.art6>
- Weerasekara, P. C., Withanachchi, C. R., Ginigaddara, G. A. S., & Ploeger, A. (2020). Understanding Dietary Diversity, Dietary Practices and Changes in Food Patterns in Marginalised Societies in Sri Lanka. *Foods*, 9(11), 1659.
<https://doi.org/10.3390/foods9111659>
- Widati, T. (2018). Pengaruh Lingkungan Fisik Terhadap Performa Belajar Siswa. *Jurnal Perspektif Arsitektur*, 13(01), 374–386.
- <https://e-journal.upr.ac.id/index.php/JTA/article/view/1992>
- Williams, A. M., & Suchdev, P. S. (2017). Assessing and Improving Childhood Nutrition and Growth Globally. *Pediatric Clinics of North America*, 64(4), 755–768.
<https://doi.org/10.1016/j.pcl.2017.03.001>
- Wirawan, N. N., & Rahmawati, W. (2016). Ketersediaan dan Keragaman Pangan serta Tingkat Ekonomi sebagai Prediktor Status Gizi Balita (The Availability and Diversification of Food as Well as Economic Status as the Predictor of Nutritional Status of Children Under 5 Years Old). *Indonesian Journal of Human Nutrition*, 3(1), 80–90.
<https://doi.org/10.21776/ub.ijhn.2016.003.Suplemen.9>