

THE RELATIONSHIP BETWEEN KNOWLEDGE, PHYSICAL ACTIVITY, AND BODY IMAGE PERCEPTION
AND CHRONIC ENERGY DEFICIENCY (CED) AMONG ADOLESCENT GIRLS AT SMA NEGERI 6 METRO
CITY

Ayu Windina¹, Martini², Riyanto³

^{1,2,3} Tanjungkarang Health Polytechnic Midwifery Department Study Program
Bachelor of Applied Midwifery, Metro Campus
Email correspondence : ayuwindina14@gmail.com.

ABSTRAK

Latar Belakang: Kekurangan Energi Kronis (KEK) merupakan salah satu masalah gizi pada remaja putri yang dapat memengaruhi pertumbuhan, kesehatan reproduksi, dan kualitas sumber daya manusia di masa mendatang. Hasil prasuvei di SMA Negeri 6 Kota Metro tahun 2024 menunjukkan bahwa 36,77% siswi mengalami KEK. Tujuan: Penelitian ini bertujuan menganalisis hubungan pengetahuan, aktivitas fisik, dan persepsi *body image* dengan kejadian Kekurangan Energi Kronis (KEK) pada remaja putri di SMA Negeri 6 Kota Metro. Metode: Penelitian kuantitatif analitik dengan desain *cross-sectional* dilakukan pada 124 dari 337 siswi yang dipilih menggunakan teknik *simple random sampling*. Kejadian KEK ditentukan berdasarkan pengukuran Lingkar Lengan Atas (LILA) dengan titik potong <23,5 cm. Data pengetahuan, aktivitas fisik, dan persepsi *body image* dikumpulkan menggunakan kuesioner yang telah diuji validitas dan reliabilitas. Analisis data menggunakan uji Chi-square dengan penyajian *Odds Ratio* (OR), 95% *Confidence Interval* (95% CI), dan nilai *p*. Hasil: Sebanyak 48,4% responden mengalami KEK. Terdapat hubungan yang bermakna antara pengetahuan dengan kejadian KEK ($p=0,015$; OR=2,694; 95% CI: 1,192–6,088), aktivitas fisik dengan kejadian KEK ($p=0,040$; OR=2,248; 95% CI: 1,032–4,899), serta persepsi *body image* dengan kejadian KEK ($p=0,020$; OR=5,471; 95% CI: 1,131–26,462). Kesimpulan: Terdapat hubungan yang bermakna antara pengetahuan, aktivitas fisik, dan persepsi *body image* dengan kejadian KEK pada remaja putri di SMA Negeri 6 Kota Metro. Upaya peningkatan edukasi gizi, penerapan aktivitas fisik yang sesuai, dan pembentukan persepsi *body image* yang positif perlu terus didukung sebagai bagian dari promosi kesehatan remaja.

Kata Kunci: KEK, Pengetahuan, Aktivitas Fisik, Persepsi *Body Image*, Remaja Putri.

ABSTRACT

Background: Chronic Energy Deficiency (CED) is a nutritional problem among adolescent girls that may adversely affect growth, reproductive health, and future quality of life. A preliminary survey conducted at SMA Negeri 6 Kota Metro in 2024 showed that 36.77% of female students experienced CED. Objective: This study aimed to analyze the relationship between nutritional knowledge, physical activity, and body image perception and the incidence of Chronic Energy Deficiency (CED) among adolescent girls at SMA Negeri 6 Kota Metro. Methods: This quantitative analytic study employed a cross-sectional design involving 124 of 337 female students selected using simple random sampling. CED was determined based on Mid-Upper Arm Circumference (MUAC) measurement, with a cut-off point of <23.5 cm. Data on nutritional knowledge, physical activity, and body image perception were collected using validated and reliable questionnaires. Data were analyzed using the Chi-square test, and the results were presented as Odds Ratios (ORs), 95% Confidence Intervals (95% CIs), and p-values. Results: A total of 48.4% of respondents were classified as having CED. Significant associations were found between nutritional knowledge and CED ($p=0.015$; OR=2.694; 95% CI: 1.192–6.088), physical activity and CED ($p=0.040$; OR=2.248; 95% CI: 1.032–4.899), and body image perception and CED ($p=0.020$; OR=5.471; 95% CI: 1.131–26.462). Conclusion: Nutritional knowledge, physical activity, and body image perception were significantly associated with the incidence of Chronic Energy Deficiency (CED) among adolescent girls. Efforts to improve nutrition education, promote appropriate physical activity, and foster a positive body image should be strengthened as part of health promotion programs for adolescent girls.

Keywords : Body image perception, Chronic Energy Deficiency (CED), Nutritional knowledge, Physical activity, Adolescent girls.

INTRODUCTION

Chronic Energy Deficiency (CED) is a nutritional problem caused by an imbalance between energy intake and the body's energy requirements over a prolonged period. Among adolescent girls, this condition is a major public health concern because adolescence is a critical stage of growth characterized by increased energy and nutrient requirements to support physical growth, reproductive organ development, and preparation for the reproductive period. Inadequate fulfillment of these nutritional needs may increase the risk of growth impairment, decreased immune function, reduced learning capacity, and reproductive health problems later in life (Almatsier, 2009; Ministry of Health of the Republic of Indonesia, 2018).

Chronic Energy Deficiency remains a significant public health problem in many countries, particularly among adolescent girls. National data indicate that the prevalence of CED among adolescents aged 15–19 years remains relatively high, highlighting the need for continuous preventive and control efforts (Ministry of Health of the Republic of Indonesia, 2018). Similar conditions have also been reported in Lampung Province, where the Provincial Health Office identified CED as one of the major nutritional problems among adolescents (Lampung Provincial Health Office, 2023). The high prevalence of CED among adolescents deserves serious attention because it may increase the risk of anemia, reduced physical fitness, impaired learning concentration, and adverse maternal and neonatal outcomes in the future, including a higher risk of delivering low birth weight infants (Ariyani et al., 2012).

Previous studies have demonstrated that CED among adolescents is influenced by various interrelated biological, behavioral, and social factors. Although inadequate energy intake is the most direct determinant of nutritional status, behavioral factors that influence dietary intake also play an essential role. Therefore, this study focused on three behavioral variables, namely nutritional knowledge, physical activity, and body image perception, because these factors may affect adolescents' dietary habits and energy balance. Nutritional knowledge influences food selection according to the body's nutritional requirements, physical activity determines energy expenditure, while body image perception may lead to unhealthy eating behaviors or excessive weight-control practices that reduce energy intake. These behavioral factors are modifiable through health

promotion interventions implemented in the school setting (Jaelani & Sitawati, 2024).

Although numerous studies have investigated factors associated with CED, previous findings remain inconsistent, particularly regarding the relationships between physical activity, body image perception, and the occurrence of CED among adolescent girls. Furthermore, studies examining these three variables simultaneously among adolescent girls at SMA Negeri 6 Metro City are still limited. Differences in school environment, adolescent behavior, and local socio-cultural characteristics may contribute to variations in research findings compared with other regions. Therefore, this study was conducted to examine the relationships between knowledge, physical activity, and body image perception and Chronic Energy Deficiency (CED) among adolescent girls at SMA Negeri 6 Metro City.

This study aimed to analyze the relationships between knowledge, physical activity, and body image perception and Chronic Energy Deficiency (CED) among adolescent girls at SMA Negeri 6 Metro City. The study hypothesized that knowledge, physical activity, and body image perception are significantly associated with the occurrence of Chronic Energy Deficiency (CED) among adolescent girls at SMA Negeri 6 Metro City.

RESEARCH METHODS

This study employed a quantitative research design with a cross-sectional approach to examine the relationships between knowledge, physical activity, and body image perception and Chronic Energy Deficiency (CED) among adolescent girls at SMA Negeri 6 Metro City. The study population consisted of all female students in grades X and XI, totaling 337 students. A total of 124 respondents were selected based on the sample size calculation using a simple random sampling technique. Respondents who met the inclusion criteria were included in the study, whereas questionnaires with incomplete data were excluded from the analysis.

The dependent variable was the incidence of Chronic Energy Deficiency (CED), which was assessed by measuring Mid-Upper Arm Circumference (MUAC) using a standardized MUAC tape according to the guidelines of the Ministry of Health of the Republic of Indonesia. Measurements were performed directly by the researcher using the same standardized procedure for all respondents. Respondents with an MUAC of <23.5 cm were classified as having CED, whereas those with an MUAC of ≥23.5 cm were classified as not having CED.

The independent variables included knowledge, physical activity, and body image perception. Knowledge was assessed using a 10-item questionnaire developed based on the concept of knowledge regarding Chronic Energy Deficiency and measured using a Guttman scale. Each correct response was scored as 1, whereas an incorrect response was scored as 0. The total score was categorized into good knowledge (>50% correct answers) and poor knowledge (≤50% correct answers).

Physical activity was assessed using a daily physical activity questionnaire developed based on the Physical Activity Level (PAL) concept. Physical activity was classified as low (PAL 1.40–1.69) and adequate (PAL 1.70–2.00) according to the recommendations of the FAO/WHO/UNU (2001).

Body image perception was measured using a questionnaire adapted from the concepts proposed by Cash and Pruzinsky (2011). The questionnaire consisted of 20 items rated on a four-point Likert scale ranging from Strongly Agree, Agree, Disagree, to Strongly Disagree. The instrument assessed five dimensions: appearance evaluation, appearance orientation, body area satisfaction, overweight preoccupation, and self-classified weight. Before data collection, all research instruments underwent validity and reliability testing among respondents with characteristics similar to those of the study sample. All questionnaire items were declared valid. For the body image instrument, all items demonstrated correlation coefficients exceeding the critical value ($r = 0.632$), and the reliability test yielded a Cronbach's alpha coefficient of 0.949, indicating excellent internal consistency.

Data were analyzed using univariate and bivariate analyses. Univariate analysis was performed to describe respondents' characteristics and the distribution of each study variable. Bivariate analysis was conducted using the Chi-square test to examine the relationships between the independent variables and the incidence of CED. The assumptions of the Chi-square test were assessed based on the expected cell counts, and Fisher's Exact Test was applied when these assumptions were not satisfied. The results were presented as Odds Ratios (ORs), 95% Confidence Intervals (95% CIs), and p-values, with statistical significance set at $\alpha = 0.05$.

This study received ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Tanjungkarang (Approval No. 108/KEPK-TJK/IV/2025). Permission to conduct the study was also obtained from SMA Negeri 6 Metro

City. Prior to data collection, all respondents received an explanation regarding the study objectives and procedures. Written informed consent was obtained from all participants, while parental or guardian consent was additionally obtained for respondents under 18 years of age. The confidentiality of participants' identities was ensured by assigning identification codes to each questionnaire, and all collected data were used solely for research purposes.

RESEARCH RESULTS

Respondent Characteristics

A total of 124 adolescent girls participated in this study. The respondents' characteristics were described based on body mass index (BMI), history of disease, and dietary restrictions.

Table 1
Distribution of the Characteristics of Adolescent Girl Respondents at SMA Negeri 6 Metro City, 2025

Karakteristik	n	%
Usia		
≤16 Years	73	58,9
≥17 Years	51	41,1
Makanan Pantangan		
None	117	94,4
Present	7	5,6
History Of Disease		
None	104	83,9
Present	20	16,1

Based on Table 1, the majority of respondents were aged ≤16 years (58.9%), while 41.1% were aged ≥17 years. Most respondents reported having no dietary restrictions (94.4%), whereas only 5.6% reported having dietary restrictions. Regarding disease history, the majority of respondents had no history of disease (83.9%), while 16.1% reported having a history of disease.

Univariate Analysis

Table 2
Distribution of Chronic Energy Deficiency (CED) Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Chronic Energy Deficiency (CED)	n	(%)
CED	60	48,4
No-CED	64	51,6

Based on Table 2, of the 124 respondents, 48.4% were classified as having Chronic Energy Deficiency (CED), while 51.6% were classified as non-CED.

Table 3
Distribution of Knowledge Regarding Chronic Energy Deficiency (CED) Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Knowledge	n	(%)
Poor	35	28,2
Good	89	71,8

Based on Table 3, the majority of respondents had good knowledge regarding Chronic Energy Deficiency (CED) (71.8%), while 28.2% had poor knowledge..

Table 4
Distribution of Physical Activity Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Physical Activity	n	%
Low	84	67,7
Adequate	40	32,3

Based on Table 4, the majority of respondents had low physical activity (67.7%), whereas 32.3% had adequate physical activity.

Table 6
The Relationship Between Knowledge of Chronic Energy Deficiency (CED) and Chronic Energy Deficiency (CED) Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Knowledge of CED	Kejadian KEK						<i>P value</i>	<i>POR (95% CI)</i>
	CED		Non-CED		Total			
	n	%	n	%	n	%		
Poor	23	65,7	12	34,3	35	100	0,015	2,694 (1,192-6,088)
Good	37	41,6	52	58,4	89	100		

Table 7
The Relationship Between Physical Activity and the Incidence of Chronic Energy Deficiency (CED) Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Physical Activity	Kejadian KEK						<i>P value</i>	<i>POR (95% CI)</i>
	CED		Non-CED		Total			
	n	%	n	%	n	%		
Low	46	54,7	38	45,3	84	100	0,040	2,248 (1,032-4,899)
Adequate	14	35	26	65	40	100		

Berdasarkan tabel 7 sebanyak 46 responden (54,7%) mengalami KEK dan 38 responden (45,3%)

Table 5
Distribution of Body Image Perception Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Body image	n	%
Negative	11	8,9
Positive	113	91,1

Based on Table 5, the majority of respondents had a positive body image perception (91.1%), while 8.9% had a negative body image perception.

Bivariate Analysis

Based on Table 6, among the 35 respondents with poor knowledge of Chronic Energy Deficiency (CED), 23 respondents (65.7%) had CED, while 12 respondents (34.3%) did not have CED. In contrast, among the 89 respondents with good knowledge, 37 respondents (41.6%) had CED, whereas 52 respondents (58.4%) did not.

The Chi-square test showed a statistically significant association between knowledge of Chronic Energy Deficiency (CED) and the incidence of CED among adolescent girls ($p = 0.015$). The Prevalence Odds Ratio (POR) was 2.694 (95% CI: 1.192–6.088), indicating that respondents with poor knowledge had 2.694 times higher odds of experiencing CED than those with good knowledge.

Based on Table 7, among the 84 respondents with low physical activity, 46 respondents (54.7%)

had Chronic Energy Deficiency (CED), while 38 respondents (45.3%) did not have CED. Among the 40 respondents with adequate physical activity, 14 respondents (35.0%) had CED, whereas 26 respondents (65.0%) did not. The Chi-square test demonstrated a statistically significant association

between physical activity and the incidence of CED among adolescent girls ($p = 0.040$). The Prevalence Odds Ratio (POR) was 2.248 (95% CI: 1.032–4.899), indicating that respondents with low physical activity had 2.248 times higher odds of experiencing CED than those with adequate physical activity.

Table 8
The Relationship Between Body Image Perception and the Incidence of Chronic Energy Deficiency (CED) Among Adolescent Girls at SMA Negeri 6 Metro City, 2025

Body Image Perception	Kejadian KEK						P value	POR (95% CI)
	CED		Non-CED		Total			
	n	%	n	%	n	%		
Negative	9	81,8	2	18,2	11	100	0,020	5,471 (1,131-26,462)
Positive	51	45,1	62	54,9	113	100		

Based on Table 8, among the 11 respondents with a negative body image perception, 9 respondents (81.8%) had Chronic Energy Deficiency (CED), while 2 respondents (18.2%) did not have CED. Among the 113 respondents with a positive body image perception, 51 respondents (45.1%) had CED, whereas 62 respondents (54.9%) did not. The Pearson Chi-square test demonstrated a statistically significant association between body image perception and the incidence of CED among adolescent girls ($p = 0.020$). The Prevalence Odds Ratio (POR) was 5.471 (95% CI: 1.131–26.462), indicating that respondents with a negative body image perception had 5.471 times higher odds of experiencing CED than those with a positive body image perception.

DISCUSSION

Prevalence of Chronic Energy Deficiency (CED) Among Adolescent Girls

The findings of this study showed that the prevalence of Chronic Energy Deficiency (CED) among adolescent girls at SMA Negeri 6 Metro City was 48.4%. This prevalence was lower than that reported by Munawara et al. (2023a), who found a CED prevalence of 56.2% among adolescent girls at SMK Negeri 4 Pinrang. However, the present findings were comparable to those of Ana et al. (2023), who reported a prevalence of 52.4% among adolescent girls in Semarang City. Differences in the prevalence of CED across studies may be attributed to variations in respondent characteristics, socioeconomic conditions, dietary patterns, and study settings. Although the prevalence observed in this study was relatively lower than that reported in previous studies, nearly half of the adolescent girls at SMA Negeri 6 Metro City experienced CED,

indicating that CED remains an important nutritional problem requiring attention.

Knowledge of Chronic Energy Deficiency Among Adolescent Girls

This study found that 28.2% of adolescent girls had poor knowledge regarding Chronic Energy Deficiency (CED). This proportion was lower than that reported by Basari and Mulyani (2025), who found that 75.0% of respondents had poor knowledge, and was comparable to the findings of Dewi and Martini (2021), who reported a prevalence of poor knowledge of 30.2%. Variations in knowledge levels across studies may be influenced by differences in respondent characteristics, access to health information, educational background, and the implementation of nutrition education programs in each study area. Although the proportion of respondents with poor knowledge was relatively lower in the present study, nearly one-third of the respondents still demonstrated insufficient knowledge, highlighting the need for continuous nutrition education among adolescent girls.

Physical Activity Among Adolescent Girls

The results showed that the majority of adolescent girls (67.7%) had low levels of physical activity. This finding was comparable to that reported by Wahdaniyah et al. (2021), who found that 73.8% of respondents had low physical activity, but was higher than the prevalence reported by Widyanti et al. (2023), which was 20.7%. Differences in physical activity levels among studies may be explained by variations in respondent characteristics, school environments, exercise habits, and daily activities. The high proportion of respondents with low physical activity observed in this study indicates that many adolescent girls have

not yet achieved adequate levels of physical activity to maintain optimal health.

Body Image Perception Among Adolescent Girls

The present study found that 8.9% of adolescent girls had a negative body image perception. This proportion was lower than that reported by Wahdaniyah et al. (2021), who found a prevalence of 51.7%, and by Apriyani et al. (2024), who reported a prevalence of 28.0%. Differences in body image perception across studies may be associated with variations in respondent characteristics, social environment, media exposure, and individual perceptions of body shape. Although the prevalence of negative body image perception was relatively low in this study, a proportion of adolescent girls still perceived their body image negatively, indicating the need for health promotion programs aimed at fostering positive body image among adolescents.

Relationship Between Knowledge of Chronic Energy Deficiency (CED) and the Incidence of Chronic Energy Deficiency Among Adolescent Girls

The results of this study demonstrated a statistically significant association between knowledge of Chronic Energy Deficiency (CED) and the incidence of CED among adolescent girls at SMA Negeri 6 Metro City ($p = 0.015$). The Prevalence Odds Ratio (POR) of 2.694 (95% CI: 1.192–6.088) indicates that adolescent girls with poor knowledge had 2.694 times higher odds of experiencing CED than those with good knowledge.

These findings are consistent with those reported by Basari and Mulyani (2025), who found a significant association between knowledge of CED and the incidence of CED among adolescent girls ($p = 0.03$). Similarly, Dewi (2022) reported a significant relationship between knowledge level and the incidence of CED among adolescent girls. The consistency of these findings suggests that knowledge is one of the factors associated with the nutritional status of adolescents, although the magnitude of the association may vary across different study populations.

From a theoretical perspective, adequate knowledge of nutrition and CED enables adolescents to understand the importance of meeting their nutritional requirements, selecting healthier foods, and adopting healthier dietary behaviors. Knowledge is considered a predisposing factor that influences the development of health-related behaviors, including food consumption practices. However, adequate knowledge does not always translate into healthy eating practices, as

dietary behavior is also influenced by food availability, socioeconomic conditions, family support, eating habits, and access to health information.

Relationship Between Physical Activity and the Incidence of Chronic Energy Deficiency Among Adolescent Girls

The results showed a statistically significant association between physical activity and the incidence of CED among adolescent girls at SMA Negeri 6 Metro City ($p = 0.040$). The Prevalence Odds Ratio (POR) of 2.248 (95% CI: 1.032–4.899) indicates that adolescent girls with low physical activity had 2.248 times higher odds of experiencing CED than those with adequate physical activity.

These findings are consistent with previous studies by Suarjana (2020), Hidayati (2023), and Mahmudah (2022), all of which reported a significant association between physical activity and the incidence of CED. This consistency suggests that physical activity is an important factor associated with the nutritional status of adolescent girls, although the strength of the association may differ across populations.

Theoretically, physical activity influences energy balance through the amount of energy expended during daily activities. Adolescents with higher levels of physical activity require greater energy intake to maintain energy balance. Conversely, when energy expenditure is not compensated by adequate dietary intake, an energy deficit may occur, which over time may increase the risk of CED. Therefore, the relationship between physical activity and CED is influenced not only by the level of physical activity but also by energy intake, dietary quality, and individual health status.

Relationship Between Body Image Perception and the Incidence of Chronic Energy Deficiency Among Adolescent Girls

The findings of this study demonstrated a statistically significant association between body image perception and the incidence of CED among adolescent girls at SMA Negeri 6 Metro City ($p = 0.020$). The Prevalence Odds Ratio (POR) of 5.471 (95% CI: 1.131–26.462) indicates that adolescent girls with a negative body image perception had 5.471 times higher odds of experiencing CED than those with a positive body image perception.

These findings are consistent with those reported by Sari et al. (2023) and Suarjana (2020), both of which identified a significant association between body image perception and the incidence of CED among adolescent girls. The consistency of

these findings suggests that body image perception is one of the factors associated with adolescents' nutritional status, although the strength of the association may vary across different study populations.

Theoretically, body image perception refers to an individual's perception, evaluation, and feelings about their own body shape and appearance. Adolescent girls with a negative body image perception tend to place greater emphasis on physical appearance, which may lead to restrictive eating behaviors, inappropriate dieting practices, or changes in dietary patterns aimed at achieving an ideal body shape. Such behaviors may reduce adequate energy intake and, over time, increase the risk of CED when nutritional requirements are not sufficiently met. Nevertheless, body image perception is not the sole factor associated with CED, as nutritional status is also influenced by energy intake, physical activity, health status, socioeconomic conditions, and other related factors.

This study has several limitations that should be considered when interpreting its findings. First, the cross-sectional design does not allow causal relationships between knowledge, physical activity, body image perception, and Chronic Energy Deficiency (CED) to be established. Second, the study was conducted in only one senior high school, namely SMA Negeri 6 Metro City, which may limit the generalizability of the findings to adolescent girls in other settings. Third, physical activity and body image perception were assessed using self-administered questionnaires, which may have introduced information bias due to differences in respondents' understanding or the accuracy of their self-reported responses. Fourth, this study did not assess other potential determinants of CED, such as energy intake, dietary patterns, socioeconomic status, or menstrual status. In addition, multivariable analysis was not performed to control for potential confounding factors. Therefore, future studies are recommended to employ research designs that can assess temporal relationships, include more diverse study populations, and incorporate additional relevant variables to provide a more comprehensive understanding of the relationships between knowledge, physical activity, body image perception, and Chronic Energy Deficiency among adolescent girls.

CONCLUSION

The findings of this study indicate that knowledge, physical activity, and body image perception were significantly associated with the incidence of Chronic Energy Deficiency (CED)

among adolescent girls at SMA Negeri 6 Metro City. Adolescent girls with poor knowledge, low physical activity, and a negative body image perception had a higher proportion of CED compared with their counterparts. However, because this study employed a cross-sectional design, the findings demonstrate associations rather than causal relationships.

RECOMMENDATIONS

Schools are encouraged to strengthen nutrition education programs that promote balanced nutrition, encourage regular physical activity, and foster positive body image perception as part of health promotion and CED prevention strategies for adolescent girls. Future research should employ more robust study designs, involve larger and more diverse populations, and include additional variables, such as energy intake, dietary patterns, socioeconomic status, and menstrual status, to provide a more comprehensive understanding of the factors associated with Chronic Energy Deficiency among adolescent girls.

REFERENCES

- Ana, V., Setyawati, V., Yuniastuti, A., Woro, O., Handayani, K., Farida, E., Widowati, E., Doktor, P., Masyarakat, K., & Kedokteran, F. (2023). Faktor Risiko Kekurangan Energi Kronik pada Remaja Putri di Kota Semarang. *Universitas Negeri Semarang*, 1(3), 875–882.
- Anggreni, D. (2022). *Buku Ajar Metodologi Penelitian Kesehatan*. STIKes Majapahit Mojokerto.
- Apriyani, M., Aulawi, T., & Syuryadi, N. (2024). Body Image, Perilaku Makan Dan Status Gizi Remaja di SMA Negeri 9 Kota Pekanbaru. *Jurnal Kesehatan Tambusai*, 5, 111.
- Ariyani, D. E., Achadi, E. L., & Irawati, A. (2012). Validitas Lingkar Lengan Atas Mendeteksi Risiko Kekurangan Energi Kronis pada Wanita Indonesia. *Kesmas: National Public Health Journal*, 7(2), 83. <https://doi.org/10.21109/kesmas.v7i2.67>
- Basari, N. G., & Mulyani, E. (2025). Hubungan Tingkat Pengetahuan Tentang Gizi Dengan Kejadian Kekurangan Energi Kronik Pada Remaja. *Journal of Midwifery and Health Administration Research*, 4(2), 2023.
- Denich, A. U., & Ildil, I. (2015). Konsep Body Image Remaja Putri. *Jurnal Konseling Dan Pendidikan*, 3(2), 55–61. <https://doi.org/10.29210/116500>
- Dewi, L. A. K. S., Suarjana, I. M., & Padmiari, I. A. E. (2022). Hubungan Tingkat Pengetahuan Dan

- Asupan Energi Dengan (Kek) Pada Siswi Smpn 1 Sidemen. *Journal of Nutrition Science*, 11(3), 174–178.
- Dewi, R. K., & Martini, S. (2021). Hubungan Tingkat Pengetahuan Remaja Putri Tentang Gizi Dengan Kejadian Kekurangan Energi Kronik (Kek) Pada Usia Remaja. *Coping: Community of Publishing in Nursing*, 9(3), 273. <https://doi.org/10.24843/coping.2021.v09.i03.p05>
- Fakhriyah, Noor, meitria syahadatina, Setiawan, muhammad irwan, Putri, andini octaviana, & Lasari, hadrianti hd. (2021). *Buku Ajar Kekurangan Energi Kronik (KEK)* (C. Mine (ed.); Vol. 1).
- FAO/WHO/UNU. (2001). *Kebutuhan energi manusia*. <https://openknowledge.fao.org/server/api/core/bitstreams/62ae7aeb-9536-4e43-b2d0-55120e662824/content>
- Halim, A. L., & Syumarti. (2023). Perbandingan Dua Proporsi Uji Chi Square X2. *Pusat Mata Nasional, Rumah Sakit Mata CICENDO*, 1–19.
- Henny, S. ;Amil : J. A. (2021). *Penelitian Kesehatan* (Aurora Hawa Nadana (ed.); Kota Malan). Ahlimedia Press.
- Hidayati, A., Prastia, T. N., & Anggraini, S. (2023). Faktor-Faktor yang Berhubungan dengan Kejadian Kurang Energi Kronik (KEK) pada Remaja Putri di SMPN 01 Pagedangan Tahun 2021. *PROMOTOR*. <https://ejournal2.uika-bogor.ac.id/index.php/PROMOTOR/article/view/207>.
- Kemenkes RI. (2023). Survei Kesehatan Indonesia(SKI). In *Ministry of Health*.
- Mahmudah, A., Masrikhiyah, R., & ... (2022). Hubungan Pengetahuan Gizi, Aktivitas Fisik, dan Asupan Makanan Dengan Kejadian KEK Pada Calon Pengantin di Wilayah Kerja KUA Tarub. *Jurnal Ilmiah Gizi* <http://jurnal.umus.ac.id/index.php/JIGK/article/view/787>
- Munawara, M., Umar, F., Anggraeny, R., & Majid, M. (2023a). Analisis Faktor-Faktor yang Berhubungan dengan Kejadian Kekurangan Energi Kronis Pada Remaja Putri. *Jurnal Gizi Kerja Dan Produktivitas*, 4(2), 98–108. <https://doi.org/10.52742/jgkp.v4i2.152>
- Notoatmodjo, S. (2018). *Metodologi Penelitian Kesehatan*. PT Rineka Cipta.
- Rukmana, E., Fransiari, E. M., Damananik, Y. K., & Nurfazriah, R. L. (2023). Penilaian Pengetahuan, Sikap dan Perilaku Gizi Seimbang serta Status Gizi pada Remaja di Sekolah Menengah Atas (SMA) Yayasan Bandung, Kabupaten Deli Serdang. *Amerta Nutrition*, 7(2SP), 178–183. <https://doi.org/10.20473/amnt.v7i2SP.2023.17>
- Sari, N., Kelana, D., & Sopiah, P. (2023). Hubungan Citra Tubuh (Body Image) Dengan Status Gizi Kek Pada Siswi Smkn Sukasari. *Jurnal* <https://journal.universitaspahlawan.ac.id/index.php/jkt/article/view/15085>
- Sarwono, A. E., & Handayani, A. (2021). Metode Kuantitatif. In *Metode Kuantitatif* (Issue 1940310019). Unisri PRESS.
- Suarjana, I. I., Nursantoyo, H., & Dewi, N. nyoman astika. (2020). Kurang Energi Kronik (KEK) Remaja Putri Pelajar SMU/SMK di Kabupaten Karangasem Propinsi Bali. *Jurnal Sehat Mandiri*, 15(1), 41–51. <https://doi.org/10.33761/jsm.v15i1.106>
- Sukmawati, S., Mustamin, M., Adam, A., & Ningsih, A. P. (2024). Hubungan Perilaku Makan Dengan Kejadian Kurang Energi Kronik (KEK) Pada Remaja Putri. *Media Kesehatan Politeknik Kesehatan Makassar*, 19(1), 84–90. <https://doi.org/10.32382/medkes.v19i1.492>
- Wahdaniyah, Ningsi, N. wilda, Justyulfah, & Febriyanti, N. (2021). Faktor Risiko Kekurangan Energi Kronik (Kek) Pada Remaja Putri Di Sekolah Menengah Atas Negeri (Sman) Kelurahan Lembang Majene. *Jurnal Kesehatan Edisi*, 12(2), 2021. <https://ejurnal.biges.ac.id/index.php/kesehatan/>
- WHO. (2024b). *Kesehatan Remaja*. https://www.who.int/health-topics/adolescent-health#tab=tab_1
- Widyanthi, N. P. T., Ambartana, I. W., & Dewantari, N. M. (2023). Hubungan aktivitas fisik dan tingkat konsumsi energi dengan kejadian kurang energi kronis pada remaja putri di Desa Pemecutan Klod, Denpasar Barat. *Intisari Sains Medis*, 14(2), 595–600. <https://doi.org/10.15562/ism.v14i2.1739>