ANALISYS OF NUTRIENT INTAKE ON CHRONIC ENERGY DEFICIENCY IN ADOLECENTS GIRLS: ASYSTEMATIC LITERATURE REVIEW (SLR)

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ABSTRACT

Nutritional problems that commonly occur in adolescent girls are due to lack of nutritional intake which results in Chronic Energy Deficiency . One way to prevent SEZs is to eat nutritious and balanced food. Food consumption is influenced by adolescent eating behavior which is inseparable from the level of knowledge, attitudes and actions about balanced nutrition. Good knowledge of balanced nutrition will make teenagers choose foods that are in accordance with the rules of balanced nutrition. This study aims to identify and analyze nutritional intake factors in adolescents based on the latest research. Method: This is a systematic review of the literature. Article searches were conducted from a number of electronic databases including ProQuest, EBSCO, PubMed, Springer Link, Science Direct. The researcher used the PRISMA method to. Results: Fourteen studies were included in the final analysis (observational analysis design with comparative, cross-sectional, secondary analysis, statistical analysis, literature review approach). Conclusion: Factors that affect poor nutrition in SEZs include lack of parental knowledge about food ingredients that contain a lot of nutrients, food habits or taboos that still occur in rural areas, limited family income, diseases, and food consumption patterns.

*Keywords***:** adolescent girls, nutritional intake ; nutritional status

INTRODUCTIONS

Adolescence is a transition period from childhood to adulthood. The Ministry of Health (Kemenkes) states that adolescents are in the age group of 10 – 18 years, while according to the *World Health Organization* (WHO) the age limit for adolescents is 10 – 19 years. Ardiansyah (2022) said that adolescence begins at the age of 10-13 years and ends at the age of 18-22 years. In adolescence, especially in adolescent girls, they are a vulnerable group to nutritional problems. The increase in the adolescent population is the reason why this age group needs to be a concern because it will be followed by an increase in nutritional problems, along with increasing attention to physical appearance (Sarwono in. Nutritional problems that commonly occur in adolescent girls are due to lack of nutritional intake which results in Chronic Energy Deficiency.

Chronic Energy Deficiency (SEZ) is one of the common nutritional problems in women of childbearing age (WUS) and pregnant women (Dea Ananda Nur Aeni et al., 2023) . To find out if adolescent girls experience Chronic Energy Deficiency, measure the Upper Arm Circumference (LILA) with a LILA ribbon. If the LILA measurement results ≤ 23.5 cm, the teenager is at risk of suffering from Chronic Energy Deficiency and if the measurement > 23.5 cm, there is no risk of suffering from Chronic Energy Deficiency. Based on the 2023 Indonesian Health Survey, there is 62.8% of the incidence rate of SEZ in adolescent girls aged 10-14 years reaching 71% and those aged 15-19 years reaching 41.9%. This figure has increased from the results of Basic Health Research (Riskesdas) in 2018 which stated that the prevalence of SEZs in women of childbearing age in the age group of 15-19 years reached 14.5%.

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Chronic Energy Deficiency (SEZ) can have a bad impact on adolescents until the next phase of life. Health disorders that can be caused by Chronic Energy Deficiency if suffered by adolescent girls are iron deficiency with the impact of anemia, calcium deficiency with the impact of osteoporosis, and malnutrition with the impact of disturbed adolescent growth process (Jaelani & Sitawati , 2024) . Alvi (2021) explained that adolescents who experience Chronic Energy Deficiency during pregnancy will have a negative impact on their fetuses, the impacts that occur include miscarriage, neonatal death, and congenital death caused by the Chronic Energy Deficiency . Other impacts that arise are premature birth, bleeding, and the risk of stunting in children as long-term impacts of mothers who experience Chronic Energy Deficiency.

The problem of SEZs is influenced by many internal and external factors. According to several research results, there are many cases that affect Chronic Energy Deficiency problems in women of childbearing age (WUS), including adolescents. Internal factors that affect the problem of Chronic Energy Deficiency are genetics of food intake, infectious diseases, Body Mass Index (BMI), and others. External factors include the environment, family income, knowledge level, attitudes, education, and health services (Jaelani & Sitawati , 2024) . Factors that affect poor nutrition in SEZs include a lack of parental knowledge about food ingredients that contain a lot of nutrients, food habits or taboos that still occur in rural areas, limited family income, diseases, and food consumption patterns. In addition, the nutritional status of adolescent girls is influenced by hereditary factors, *lifestyle* and environmental factors. Eating habits and lifestyle such as body image and physical activity will affect the amount of food and nutrient intake. Energy intake less than needed in a certain period of time will cause a decrease in nutritional status. Undernutrition experienced in adolescence before pregnancy is very risky for the growth and development of the fetus to be born such as the occurrence of prematurity and the incidence of low birth weight (BBLR). (Telisa & Eliza, 2020).

RESEARCH METHODOLOGY

Design

Systematic Literature Review

Eligibility Criteria

The research questions in this systematic literature review are determined using the PICOS framework.
P (Population) :   Adolescent girls
I (Intervention) :   Nutritional Intake
C(Comparison) :   Rural Or Urban
O (Outcome)   :   Nutritional Status of Chronic Energy Deficiency
S (Study)   :   Observational analytics design with comparative, cross-sectional, and secondary

analysis study approaches
The inclusion criteria for this study were freely accessible full-text articles in English, published between 2019 and 2024, as well as articles with randomized controlled trials (RCTs), systematic reviews, mixed methods, and cross-sectional research designs. Exclusion criteria for literature reviews and paid article journals.

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Search Strategy

The search strategy is carried out with the PICOS framework. Researchers used the following search strategy on each database with the keywords "nutrient intake" AND "nutritional status" AND "adolescent girls"

Source
The data sources in this study are articles contained in electronic databases such as ProQuest, Google Scholer, PubMed, Springer Link, Science Direct covering the period from October 2019 to October 2024.

Study Selection
The first step is to filter the title, abstract and full text of the article for eligibility by researchers. If the above keyword indication is found in all abstracts, then the entire article is taken. References to selected articles are reviewed and confirmed for each new article that qualifies in the second stage. Articles are assessed by authors at this step by considering inclusion and exclusion criteria. Full-text articles are assessed for further analysis in the third step.

Data Analisys

The researcher uses the Preferred Reporting Items for Systematic Review and Meta-analyses Statement (PRISMA) method by following the correct research stages or protocols, as presented in Figure 1. Based on the search strategy and selection criteria above, out of a total of 48868 in total, 492 studies were fully reviewed. Finally only 12 studies have been analyzed to the end. The selection process of these 12 studies has been presented in Figure 1.

RESULT

Characteristics of research articles

Tabel. Attributes of Summary of Articles Nutrient Intake and Nutritions Status of adolescent girls systematic review

No	Author(s)/ Year	Article	Result
1	Dea Ananda, Nur Aeni (2023)	Differences between the nutritional status of SEZ and protein intake in adolescent girls in coastal and non-coastal areas	The results showed that in the coastal group, most of them had protein consumption tended to be severely deficient with a percentage of 56.1%. Meanwhile, in the coastal group, most of them tend to have a heavy deficit protein intake with a percentage of 63.9%. This shows that adolescent girls who experience SEZs in non-coastal areas have a higher consumption of weight deficit protein than adolescent girls who experience SEZs in coastal areas.
2	Amelia Meike Putri (2024)	The relationship between dietary patterns and SEZ status in adolescent girls at Madrasah Aliyah, Makassar	The results showed that the sample had a poor diet as many as 44 people (56.4%), the good diet category as many as 34 people (43.6%), the sample had the nutritional status of SEZ as many as 57 people (73.1%) and the normal category as many as 21 people (26.9%). The results of the statistical test showed that there was a significant relationship

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No	Author(s)/ Year	Article	Result
			between diet and the incidence of chronic energy deficiency (p value = 0.048)
3	Actors Stefano Sugino (2021)	Micronutrient Adequacy in the Diet of Reproductive-Aged Adolescent Girls and Adult Women	In this study, the magnitude of inadequate food diversity among adolescent girls was 62.6% [95% CI: 57.5–66.5]. Living with more than five family members (AOR = 1.8, 95% CI: 1.16–3.44), consumption of sugary foods/beverages (AOR = 2.2, 95% CI: 1.07–3.41), poor nutritional knowledge (AOR = 2.5, 95% CI: 1.48–3.89), and poor household wealth (AOR = 2.8, 95% CI: 1.44–5.12) were significantly associated with adequate dietary diversity.
4	Rachmayani, ct received Kuswari (2019)	Poor food intake is a common cause of nutritional problems in adolescents	The results of the calculation showed that the distribution of nutritional status from 150 respondents was a maximum of 107 out of 150 respondents with normal nutritional status (71.3%). This shows that most of the respondents are nutritional status. There were 27 respondents with underweight nutritional status (18%) and seven respondents with overweight nutritional status (4.7%) and nine respondents with obese nutritional status (6%).
5	Anwar K (2024)	Protein, vit C and iron intake affect nutritional status and anemia in adolescent girls	As many as 27.3% were undernourished, 54.5% were well nourished, and 18.2% were overnourished and obese. A total of 45.5% of subjects experienced anemia, 63.6% lacked protein intake, 69.1% lacked vitamin C intake, and 74.5% lacked iron intake. The results of the analysis of protein intake (p = 0.001), vitamin C (p = 0.003) and iron (p = 0.000) with nutritional status showed a significant relationship. The results of the analysis of protein intake (p = 0.000), vitamin C (p = 0.005) and iron (p = 0.001) with anemia showed a significant relationship
6	Kaoutar Ateilah (2024)	Nutrition and socioeconomic determinants of cognitive satatus and self-esteem among children in urban schools from Kenya (Morocco)	Neurocognitive abilities showed significant correlations with gender, mathematical performance, nutritional status, and maternal education level. On the contrary, self-esteem shows a correlation with the level of education of parents and the presence of malnutrition.
7	Gebrehiwot Hadush (2021)	Factors related to the nutritional status of adolescent girls in Ethiopia	This study revealed that the prevalence of underweight and stunting was 15.8% (95% CI 13.3–18.5%) and 26.6% (95% CI 23.5–29.9%), respectively. Being in early adolescence (AOR = 2.89, 95% CI 1.23–6.81) was associated with

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No	Author(s)/ Year	Article	Result
			underweight, while being in early adolescence (AOR = 1.96, 95% CI 1.02–3.74), household food insecurity (AOR = 2.88, 95% CI 1.15–7.21), menstrual status (AOR = 2.42, 95% CI 1.03–5.71), and availability of latrines at home (AOR = 3.26, 95% CI 1.15–4.42) were independent predictors of stunting in adolescent girls.
8.	Abeza Mitiku Kera (2022)	Food insecurity in western Ethiopia among adolescent girls	In this study, the magnitude of dietary diversity deficiency among adolescent girls was 62.6% [95% CI: 57.5–66.5]. Living with more than five family members (AOR = 1.8, 95% CI: 1.16–3.44), consumption of sugary foods/beverages (AOR = 2.2, 95% CI: 1.07–3.41), poor nutritional knowledge (AOR = 2.5, 95% CI: 1.48–3.89), and low household wealth class (AOR = 2.8, 95% CI: 1.44–5.12) were significantly associated with dietary diversity deficiency.
9.	Joyce Asare (2024)	Low Dietary Diversity and Low Hemoglobin Status in Female High School and Boarding School Students in Ghana: A Cross-Sectional Study	There are significant differences in DDS between boarding students and day students. Only 22% of boarding students have adequate dietary diversity, while 64% of day students have adequate dietary diversity. The proportion of boarding students who consumed nuts and seeds, dairy products, meat, eggs, vegetables and fruits rich in vitamin A, other vegetables, and other fruits was much smaller compared to day students ($p < 0.05$, all). No significant difference ($p = 0.925$) was found in the mean ($\pm$SD) concentration of Hb between boarding students (11.9 ± 1.1 g/dL) and day students (11.9 ± 1.1 g/dL). In addition, no significant correlation was recorded between the mean DDS and Hb concentration ($p = 0.997$). Using Hb < 12 g/dL as a determinant of anemia, 55.1% of boarding students and 57.8% of daily students experienced anemia.
10.	Sabrina Egg (2020)	The relationship between nutritional knowledge, education and other determinants of food intake and lifestyle habits among urban and rural high school adolescents in Tyrol, Western Austria	Higher nutrition knowledge was significantly associated with attending rural schools ($P = 0.001$), having no migratory background ($P < 0.001$), (very) good physical activity behavior ($P = 0.040$), untrained teachers ($P = 0.006$), but with a higher number of hours of nutrition education ($P = 0.013$). Regression models showed that higher nutritional knowledge was independently associated with lower meat and iced tea intakes and higher vegetable and vegetable oil intakes. Higher amounts of nutrition education (hours/week) were significantly associated with higher intake of black bread (whole grain bread), lower meat intake, and intake of sweetened energy drinks.
11	Imelda Telisa	Macronutrient	The results showed that there was a significant

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No	Author(s)/ Year	Article	Result
	(2020)	intake, iron intake, haemoglobin levels and risk of chronic energy deficiency in adolescent girls	relationship between the intake of macronutrients (p=0.004), protein (p=0.004), fat (p=0.031) and iron intake (p=0.000) with the risk of SEZ in adolescent girls.
12	Anggih C. Ardianto (2024)	Chronic Energy Deficiency Associated with Body Mass Index of Adolescent Girls in Poka-Rumah Tiga Village, Ambon	Of the 441 adolescent girls who participated in this study, 45.80% were found to have SEZ. The likelihood of developing SEZ was lower in adolescent girls with a normal BMI (18.5 to 22.9 kg/m²) (OR=0.09; 95%CI: 0.05-0.15; p<0.001) and overweight (≥23 kg/m²) (OR=0.01; 95%CI: 0.00-0.07; p<0.001) compared to those who were underweight (BMI<18.5 kg/m²)

Based on Table 1, there is one study that uses observational analysis design with a comparative study approach (1), nine studies using cross-sectional design (2,4,5,6,8,9,10,11,12), one study using secondary analysis (3), and two studies using statistical analysis (7

Based on a review of 12 studies focusing on nutritional intake, various determinants have been identified. As a study conducted by Dea Ananda, Nur Aeni (2023) differences in protein consumption in adolescent girls who experience SEZs aged 15-19 years in coastal and non-coastal areas. Protein intake in adolescent girls who experience SEZs in non-coastal areas has a higher weight deficit protein consumption than adolescent women who experience SEZs in coastal areas. Adolescents experience an increase in muscle mass, an increase in body fat tissue, and hormonal changes that can affect their nutritional needs. Research conducted on adolescent girls at Madarasah Aliyah, Makassar stated that there was a significant relationship between diet and the incidence of chronic lack of energy in adolescent girls with a value of p = 0.048. Inadequate diets among adolescent girls lead to anatomical and physiological disorders that will contribute to a vicious cycle of intergenerational malnutrition (Akter Hiroaki Sugino 2021). Therefore, multi-sectorally focused nutrition interventions to improve the nutritional status of disadvantaged adolescent girls are highly recommended. This includes the provision of comprehensive nutrition assessment and counselling services at the community level (Gebrehiwot Hadush 2021). Nutritional needs that can be met from food intake that are quite useful for carrying out physical activities of adolescents who are greatly increased. SEZs have a bad impact on adolescence and later life phases. The adverse effects of Chronic Energy Deficiency in adolescence are anemia, suboptimal organ development, lack of physical growth, and affect their work productivity. Adolescents who experience Chronic Energy Deficiency up to the pregnant phase can have a bad effect on the fetus, such as miscarriage, stillbirth, neonatal death, congenital defects, anemia in infants, and low birth weight babies, while during childbirth can result in difficult and long labor, premature delivery, and bleeding.

DISCUSSION

Several studies were reviewed, including those conducted by Dea Ananda, Nur Aeni (2023), Amelia Meike Putri (2024) and Rachmayani, Siti Andina Kuswari (2019) the causes of Chronic Energy Deficiency in adolescent girls are lack of energy intake, protein intake, and carbohydrate intake in adolescent girls. lack of nutrient intake. The prevalence of underweight and stunting is above an important threshold for public health. Therefore, multi-sectorally focused nutrition interventions to improve the nutritional status of disadvantaged adolescent girls are highly recommended. This includes providing comprehensive nutrition assessment and counselling

services at the community, school, and health facility levels, as well as creating income-generating activities in households before they reach gestational age, to break the intergenerational cycle of malnutrition.

Measurement of LILA in Women of Childbearing Age (WUS) is one of the easy early detection methods that can be carried out by the general public, to find out the risk group of Chronic Energy Deficiency. But LILA measurements cannot be used to monitor changes in nutritional status in the short term. There are also a few things that need attention, especially if it is used as a single choice for the nutritional status index. So to find out the nutritional status of adolescents in addition to using LILA, it is necessary to be equipped with other anthropometric measurement techniques that can be used to find out changes in a person's nutritional status in the short term.

LIMITATIONS

This study has several limitations, both variability in the included research methodology and limited ability to generalize results due to differences in cultural and social contexts between countries.

CONCLUSIONS

The conclusion of this study is that nutritional intake greatly affects malnutrition in adolescent girls. Poor nutritional intake can be influenced by a lack of parental knowledge about foods that contain a lot of nutrients, food habits or taboos that still occur in rural areas, limited family income, diseases, and food consumption patterns. In addition, the nutritional intake of adolescent girls is influenced by hereditary factors, *lifestyle* and environmental factors. Eating habits and lifestyle such as body image and physical activity will affect the amount of food and nutrient intake. Energy intake less than needed in a certain period of time will cause a decrease in nutritional status.

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CONFLICT OF INTEREST

The authors declarate that they have no competing interest.

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