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CONTRIBUTING FACTORS OF CHRONIC ENERGY DEFICIENCY IN ADOLESCENT GIRLS: SCOPING REVIEW

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ABSTRACT

Background: Chronic energy deficiency is a condition that occurs due to the deficiency of energy and protein intake to the needs over a long period of time. Chronic energy deficiency often occurs in adolescence, especially adolescent girls. Chronic energy deficiency can be caused by many factors including lack of energy intake, protein intake and body image. The purpose of study was to examine the relationship energy intake, protein intake, and body image with the prevalence of chronic energy deficiency in adolescent girls.
Methods: The method used was a scoping review approach. Research used as a source for scoping review by collecting research articles from various sources through the google scholar database, Pubmed / Medline, and Scopus. Article selection using PRISMA-Scr. Then then selected using inclusion and exclusion criteria. Keywords used are energy intake, protein intake, chronic energy deficiency, adolescents.
Results: The results of the search obtained 12 articles that fit the criteria. The results of the analysis obtained relationship factors (energy intake, protein intake and body image) that are most correlated with chronic energy deficiency in adolescent girls.
Conclusion: Based on 12 articles, it can be concluded that the causes of chronic energy deficiency in adolescents can be caused by energy intake, protein intake and body image. In addition, it is also found that there are other factors that can cause chronic energy deficiency in adolescent girls such as fat intake, nutritional knowledge, physical activity, pocket money and infectious diseases.

Keywords: Energy Intake, Protein Intake, Chronic Energy Deficiency, Adolescents

INTRODUCTION

Based on the regulation of the Ministry of Health of the Republic of Indonesia Number 25 of 2014, adolescence is classified in the range of 10-18 years (Ministry of Health of the Republic of Indonesia, 2014). Adolescence is a period when a person experiences growth and development both physically, cognitively and psychologically (Widhiyanti et al., 2020). According to Putri, adolescents experience a period of growth spurth which means experiencing rapid development so that the nutrients needed also increase (F. M. Putri et al., 2022).

In process Growth spurt, it is not uncommon for adolescents to experience various nutritional problems such as anemia, undernutrition, obesity and CED (Yuningsih, 2023). Nutritional problems that often occur, especially in adolescent girls, currently and still require special attention, namely chronic energy deficiency (CED) because it can cause problems in the future (Yulianasari et al., 2019).

Chronic Energy Deficiency (CED) is a condition in adolescent girls or women of childbearing age who experience nutrition deficiency especially energy and protein intake and lasts for a long time or years (Fibrila & Ridwan, 2022). Chronic Energy

Deficiency (CED) can occur due to an imbalance in nutrient intake with the nutritional needs required by the body (Retni & Arfianti, 2023). The indicator commonly used to detect someone affected by chronic energy deficiency (CED) is by measuring the upper arm circumference (MUAC). The results of measuring upper arm circumference if <23.5 can be said that someone has chronic energy deficiency (Fakhriyah et al., 2021).

WHO said chronic energy deficiency (CED) is still a global problem because it has increased from 2015 to 777 million and 2018 to 815 million or around 60% (WHO, 2018). Based on RISKESDAS in 2018, the prevalence of chronic energy deficiency in non-pregnant women is highest in the age range of 15-19 years, which is 36.6% (RISKESDAS, 2018).

Chronic energy deficiency (CED) caused by many factors which are divided into two, namely direct and indirect factors. Direct factors include intake (macronutrients and micronutrients) and infectious diseases (Dagne et al., 2021). While indirect factors include body image, money, nutrition knowledge, physical activity, family socioeconomics and so on (F. M. Putri et al., 2022).

Direct factors that are often associated with chronic energy deficiency (CED) are energy intake and protein intake. Low energy intake and protein intake as macronutrients can contribute to low micronutrient intake (Telisa & Eliza, 2020). Energy and protein intake are useful for metabolic processes used to support growth and development (Zaki & Sari, 2019). While indirect factors that are often associated with the incidence of chronic energy deficiency (CED) in adolescents are body image.

Body image data can be divided into two, namely positive and negative body image. A positive body image is someone who can accept their body shape, while a negative body image is someone who cannot accept their body shape (Wahyuni & Auriella, 2021). Adolescents who have a negative body image are likely to limit food intake and follow certain diets so that they can experience chronic energy deficiency (CED) (Yulia et al., 2024).

The impacts caused when adolescents experience chronic energy deficiency (CED) include anemia, suboptimal development and growth, decreased learning concentration, and can reduce the body's resistance (Retni & Arfianti, 2023). Chronic energy deficiency (CED) in adolescents if it lasts until pregnancy will cause impacts such as low birth weight, prematurity, disability, fetal anemia, and bleeding (Falentina et al., 2023).

Thus, the author wants to examine the relationship between energy intake, protein intake and body image with the incidence of chronic energy deficiency (CED) in adolescent girls through a scoping review approach from various existing studies and sources.

METHODS

The method used for this research is scoping review. Scoping review using the PEOS method (population, exposure, outcome, study design). The population to be studied is adolescent girls, exposure is the factor to be studied, namely energy intake, protein intake and body image, outcome refers to the results, namely there is a relationship between energy intake, protein intake and body image with the incidence of chronic energy deficiency in adolescent girls, and study design refers to the type of research to be used, namely cohort, case control, and cross sectional.

The types of articles selected were articles relevant to the research theme using several electronic databases, namely Google Scholar, PubMed/Medline, and Scopus. The inclusion criteria used to select research articles are articles within the last 5 years (2019-2024), research results that show the relationship, influence or risk factors of chronic energy

deficiency and research samples in adolescent girls. The exclusion criteria used are research articles whose research methods are literature review, systematic review, paid article reports, books, irrelevant research samples (pregnant women and adolescent boys), research results there is no relationship, influence or risk factors of chronic energy deficiency on adolescent girls. Article selection process used in the scoping review using flowchart Figure 1.

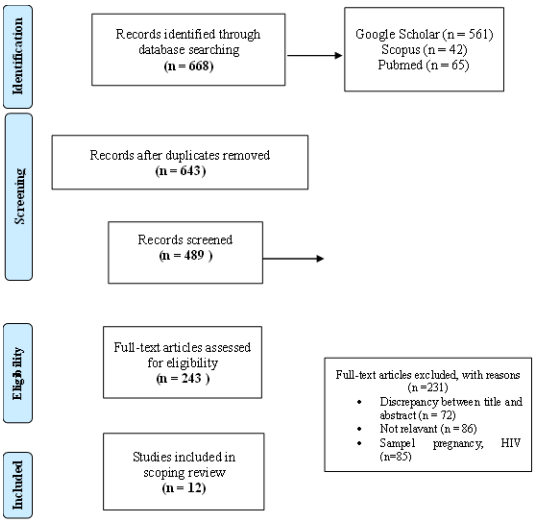

Figure 1. PRISMA Flowchart

RESULTS AND DISCUSSION

Table 1 shows 7 articles on energy intake and protein intake with chronic energy deficiency. Table 2 shows 5 articles about body image with chronic energy deficiency.

Energy Intake and Protein Intake with the Incidence of Chronic Energy Deficiency

Table 1 consists of articles that show the relationship between energy and protein intake and the incidence of chronic energy deficiency. The results of research conducted by (Swari et al., 2023) that adolescent girls who experience chronic energy deficiency are caused by a lack of frequency of eating, namely only 1-2x a day as seen from the results of SQ-FFQ. Apart from frequency, it is also caused by food portions and variations that are not meet the daily needs in a day according to the AKG that has been determined according to age. This results in a person experiencing an energy deficit and experiencing chronic energy deficiency.

This research is supported by research (Widhiyanti et al., 2020) that the cause of energy deficits in adolescent girls who only consume 1-2x meals a day due to the busy activities at school or in dormitories as students. This resulted in female students choosing to rest and skip meals. In addition, to replace meals they only eat simple snacks and do not pay attention to the amount. In addition, adolescents often replace it with high consumption of fast food, high consumption of processed sugar, skipping breakfast and low consumption of vegetables and fruits (Nuryani, 2019).

Energy intake in a day is very important to fulfill because it is used for the body's metabolic processes, growth and development. Adolescence requires sufficient energy because during this period they experience growth spurt, which means they experience rapid growth and development. Many adolescents do not pay attention to the amount of intake in a day so that their energy are deficit. If the energy intake needs are inadequate, the fat reserves in the body will be broken down and used to meet the energy deficiency. If it continues for a long time, the reserves will be depleted and experience nutritional problems, one of which is chronic energy deficiency (CED) (N. A. Putri et al., 2023).

Research conducted by (N. A. Putri et al., 2023) is in line with research (Telisa & Eliza, 2020) that energy reserves can be stored in the form of fat reserves under the skin. In addition, the results showed that someone experiencing less energy intake was 4.9 times more likely to experience chronic energy deficiency (CED) than someone who did not experience less energy intake. The results of research (Suarjana et al., 2020) also found that high school / vocational high school adolescents who experience less energy intake will be 2 times more likely than high school / vocational high school adolescents whose energy intake is sufficient.

Table 1. Energy Intake and Protein Intake with the Incidence of Chronic Energy Deficiency

Title and Author	Methods	Results
Correlation Level of Energy Consumption Level of Protein and Body Image Prevalency CED in Shafta High School Surabaya (Swari et al., 2023)	Design: cross sectional obeservational Subjects: 51 female students in class X and XI aged 13-18. Data collection: SQ-FFQ questionnaire, BSQ-34 questionnaire and MUAC measurement. Data analysis: Spearman test	The results showed that female students who experienced energy deficits were (52.9%) and protein deficits were 41.2%. Based on bivariate analysis, it was found that there was a significant relationship between energy intake and protein intake with the incidence of chronic energy deficiency at Shafta High School in Surabaya with a p value of (0.001) and (0.001).
Path Analysis on the Fad Diets and other Factors Affectingthe Risk of Chronic Energy Deficiency among Adolescent Females at the Boarding School (Widhiyanti et al., 2020)	Design: Observational, cross-sectional Subjects: 200 adolescent girls Data collection: MUAC tape, digital weight scale, microtoise, and questionnaire Data analysis: cross tabulation and path analysis	Based on bivariate analysis, relevant results were obtained that there was a relationship between energy intake (p = <0.001) and protein intake (p = 0.021) with CED. while the results of path analysis obtained the results of energy intake (0.005) and protein intake (0.020).
The Relationship Between Macronutrient And Micronutrient Intake On CED In Adolescent Girls In Man 1 Aceh Barat (Aulia et al., 2024)	Design: Cross sectional Subjects: 261 female students Data collection: LILA Tape, and SQ-FFQ questionnaire. Data analysis: Chi Square Test and Logistic Regression.	The results of bivariate analysis of protein intake with the results of p=0.000 which means that there is a significant relationship between protein intake and the incidence of chronic energy deficiency in female students. While the multivariate results obtained p=0.008 and OR value 6.486
Analysis of Determinants of Chronic Energy Deficiency (CED) among Adolescents in Pekon Pasir Ukir Pagelaran District, Pringsewu Regency (N. A. Putri et al., 2023)	Design: Cross sectional Subjects: 30 adolescents aged 13-18 years Data collection: LILA measurement, 1x24 hour food recall questionnaire Data analysis: Frequency analysis	Based on the research, the results showed that out of 30 adolescents there are 10 children (33%) experiencing CED, the level of nutritional knowledge is not good (46%), the average energy intake (1,387 kcal) and protein (49 g), and the level of energy adequacy (70%) and protein (63%). So it can be concluded that the determinants of SEZ are energy intake, protein and level of nutritional knowledge.
Macronutrient Intake, Iron Intake, Haemoglobin Level and Risk of Chronic Energy Deficiency in Adolescent Girls (Telisa & Eliza, 2020)	Design: Case control Subjects: 72 female students Data collection: using the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ), Haemoglobin using the quick check method, and measurement (MUAC). Data analysis: chi-square test	The results showed that there was a significant relationship between energy intake (p = 0.004), fat (p = 0.031), protein (p = 0.004) and iron p = 0.000 with the incidence of chronic energy deficiency (CHD) in high school students.
Chronic Energy Deficiency (CED) of Adolescent Girls of SMU/SMK Students In Karangasem Regency, Bali Province (Suarjana et al., 2020)	Design: Observational, cross sectional Subjects: 298 female students Data collection: using questionnaire and MUAC measurement Data analysis: chi square Mantel Haentzel	The results of the research conducted obtained 8 of the 15 variables studied, namely there is a significant relationship in energy consumption (p = 0.008, OR = 2.1), protein consumption (p = 0.000, OR = 2.5), nutritional perceptions (p = 0.007 OR = 1.9), physical activity (p = 0.018, OR = 1.8) and body image perceptions (p = 0.014, OR = 1.86) with the incidence of chronic energy deficiency in female students.
Analysis of Factors Associated with The Incidence of Chronic Energy Deficiency in Adolescent Girls (Munawara et al., 2023)	Design: quantitative cross sectional Subjects: 118 female students of class X and XI Data collection: MUAC measurement, knowledge questionnaire interview, physical activity (GPAQ), 24-hour recall form and food frequency. Data analysis: chi-square test	There is a significant relationship between energy intake (p=0.028), carbohydrate intake (p=0.032), fat intake (p=0.018) and there is no relationship between protein intake (p=0.272), physical activity (p=0.411), and socioeconomics (0.429) with the incidence of chronic energy deficiency in female students of SMK Negeri 1 Pinrang.

Another factor that causes chronic energy deficiency is lack of protein intake. Based on research (Widhiyanti et al., 2020) it was found that there was a significant relationship between lack of protein intake and the incidence of chronic energy deficiency (CHD). The study explained that the smaller the protein intake, the greater the chance of experiencing KEK and vice versa. The intake of protein consumed depends on the diet. If someone in a day often consumes animal protein rather than vegetable protein, the protein needs will be fulfilled because animal protein has better bioavailability than plant source protein.

Research conducted (Aulia et al., 2024) is in line with the theory that lack of protein intake can cause chronic energy deficiency with the results of p = 0000. Someone with less protein intake has a 4.7 times greater chance of experiencing KEK than someone with sufficient protein intake. Adolescents

who consume more protein than needed will have a protective effect having a 0.4 times lower risk of suffering from chronic energy deficiency (CED) than those whose intake is less (Suarjana et al., 2020).

Protein is a macronutrient that is useful as a source of energy and body building substances, especially muscles. If protein intake is sufficient, muscle mass will be formed and nutritional status will be good including LILA size. Conversely, if the intake is insufficient, muscle depletion will occur and cause the upper arm circumference to shrink and experience chronic energy deficiency (CED (Telisa & Eliza, 2020).

Body Image with Chronic Energy Deficiency

Table 2 contains several research articles on body image and chronic energy deficiency. Body image is divided into two, namely positive body image and negative body image.

Tabel 2. Body Image with Chronic Energy Deficiency

Title and Author	Methods	Results
Reflections of well-being: navigating body image, chronic energy deficiency, and nutritional intake among urban and rural adolescents (Yulia et al., 2024)	Design: cross sectional obeservational Subjects: 387 adolescents aged 13-15 years Data collection : FRS (Figure Rating Scale) questionnaire, 2x24 hour recall questionnaire and LILA measurement. Data analysis: chi square	The results showed that 54% of adolescents in urban areas and 61.7% were at risk of developing chronic energy deficiency and there was a significant relationship between body image and the incidence of chronic energy deficiency with a value of p=0.007.
Relationship between Nutrition Knowledge Level and Body Image with Chronic Energy Deficiency of Adolescent Girls at SMAN 2 Pringsewu (B. P. Sari et al., 2024)	Design: Cross sectional Subjects: 153 adolescent girls aged 15-19 years Data collection: questionnaire and MUAC measurement Data analysis: chi-square	The results showed that there was a significant relationship between body image and the incidence of chronic energy deficiency in adolescent girls at SMAN 2 Pringsewu (p=0.008).
The Role of Body Image, Socioeconomic Factors, Food Consumption Quality and Its Relationship with the Incidence of Kek in Women of Fertile Age in Menes District, Pandeglang Regency (Fauziah & Ashari, 2024)	Design: Cross sectional Subjects: 261 female students Data collection: MUAC Tape, and SQ-FFQ questionnaire. Data analysis: Chi Square Test and Logistic Regression.	The results of bivariate analysis of protein intake with the results of p=0.000 which means that there is a significant relationship between protein intake and the incidence of chronic energy deficiency in female students. While the multivariate results obtained p=0.008 and OR value 6.486
The Relationship between Body Image and Nutritional Status in Students of SMKN Sukasari (N. Sari et al., 2023)	Design: Cross sectional Subjects: 105 class X,XI and XII Data collection: MUAC measurement and questionnaire Data analysis: Pearson Chi Square	The results showed that there was a significant relationship between body image variables and chronic energy deficiency (CED) nutritional status with a p value = 0.001.
The Correlation Between Body Image and Diet with Chronic Energy Deficiency (CED) on Female Adolescents in SMAN in West Java (Wardhani et al., 2020)	Design: Cross sectional Subjects: 189 Data collection: MUAC measurement and questionnaire Data analysis: Chi Square	The results of the study was a relationship between body image (appereance evaluation p = 0.000, appereance orientation p = 0.006, body satisfaction p = 0.015, overweight preoccupation p = 0.003, self-classified weight p = 0.000) and eating patterns (eating frequency p = 0.000 and type of diet p = 0.000) with chronic energy deficiency (KEK)

Research conducted by (B. P. Sari et al., 2024) found that most respondents had a negative body image. At the age of adolescence where it has begun to pay attention to its body shape. The impact of someone having a negative body image can result in limiting food intake because to maintain their body shape. Many ways will be done to have an ideal body shape or following their idols, including dieting, limiting intake or even skipping breakfast so that the body shape is maintained. If this happens on a daily basis, it will result in adolescents experiencing chronic energy deficiency (CED).

This is in line with research (Yulia et al., 2024) that negative body image is one of the causes of adolescents experiencing chronic

energy deficiency (CED). Teenagers who are in villages and cities mostly have a negative body image of their body shape. In addition, negative body image can also arise because someone has an idol or culture circulating in Indonesia.

Negative body image is very influential on nutritional status because someone cannot accept the shape of the body that is owned. so that it will make efforts so that the body shape matches the desired goals considering the ideal weight (Fauziah & Ashari, 2024). If a teenager has an idol or public figure, the teenager will try to follow his habits and behaviour so that it can create a negative body image on themselves.

Negative body image can also arise due to the influence of the environment, namely peers, at the age of adolescence will be more easily influenced by their peers. In addition, adolescents will compare their body shape with the body shape of their friends if they are not satisfied with their body shape, then a negative body image appears.

The research conducted by (N. Sari et al., 2023) also supports the previous results, namely that there is a significant relationship between body image and the incidence of chronic energy deficiency, especially in students of SMKN Sukasari. These results show that many experience a negative body image so that the number who experience chronic energy deficiency is also high. Efforts must be made to reduce having a negative body image, namely building self-confidence, the importance of healthy living and optimistic thinking. This can be done to reduce the number of chronic energy deficiency in adolescents.

CONCLUSION

This study concluded that the factors causing chronic lack of energy in adolescent girls from 12 articles showed that there was a significant relationship between energy intake, protein intake and body image with the incidence of chronic lack of energy, apart from that it could also be caused by fat intake, nutritional knowledge, physical activity, pocket money and infectious diseases.

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CONFLICT OF INTEREST

There is no conflict of interest in the preparation of this article.

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