Jurnal Kesehatan
Vol. 15, No. 2, August 2024
ISSN 2086-7751 (*Print*), ISSN 2548-5695 (*Online*)
http://ejurnal.poltekkes-tjk.ac.id/index.php/JK

Nutritional Knowledge, Physical Activity, and The Incidence of Chronic Energy Deficiency in Female Students

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ARTICLE INFO

Article history

Received date
2 Aug 2024

Revised date
26 Aug 2024

Accepted date
30 Aug 2024

Keywords:

Adolescents;
Daily life;
Upper arm circumference.

ABSTRACT

Female students aged 18-20, categorized as late teens, often suffer from chronic energy deficiency (CED), as indicated by upper arm circumference measurements. This condition can lead to anemia, impaired organ development, stunted physical growth, and reduced work productivity.This study investigates the relationship between nutritional knowledge, physical activity, and the incidence of CED among students at the Nutrition Department, Politeknik Kesehatan Kemenkes Bengkulu. An observational cross-sectional study was conducted with 92 participants. Nutritional knowledge was assessed using a self-administered questionnaire (Ques CA), physical activity was measured with the Baecky Physical Activity Questionnaire (BPAQ), and CED was determined by measuring upper arm circumference. The chi-square test analysis revealed no significant relationship between nutritional knowledge and CED (p-value=0.868). However, a significant relationship was found between physical activity and CED (p-value=0.001). Despite having good nutritional knowledge, many adolescents still experience CED due to its lack of application in daily life. Efforts are needed to enhance attitudes and behaviors toward better knowledge application. Additionally, upper arm circumference measurements indicate that physical activity may influence subcutaneous fat mass.

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INTRODUCTION

Nutritional problems that often occur in adolescents are experiencing long-lasting or chronic malnutrition, known as Chronic Energy Deficiency (CED). In Southeast Asia and Africa, a large number of adolescent girls suffer from chronic undernutrition and anemia, which adversely impact their health and development, as well as their offspring, contributing to an intergenerational cycle of malnutrition (Halala Handiso et al., 2020). Based on the results of the Indonesian Health Survey (IHS) in 2023, the incidence of CED in Indonesia in non-pregnant adolescent girls is 41.9% higher than in pregnant adolescent mothers (26.2%) (Survei Kesehatan Indonesia, 2023). Based on data from the Bengkulu City Health Office in 2019, the number of adolescent girls aged 15-19 years who suffered from CED with upper arm circumference (UAC) <90% of the standard upper arm circumference based on age was 78 people. (Bengkulu City Health Office, 2019) .

Chronic Energy Deficiency (CED) has a devastating impact on adolescent girls, both during adolescence and later in life. As a result, they often experience anemia, impaired organ development, stunted physical growth, and decreased work productivity. CED can also lead to immune system issues, making the body more susceptible to infectious diseases. Furthermore, it can interfere with concentration, negatively affecting learning outcomes (Khayatunnisa & Sari, 2021).

Chronic Energy Deficiency is a condition caused by an imbalance between the energy intake needed by the body and the energy intake consumed. Based on a study, Hidayati et al. (2023) concluded that the prevalence of CED among adolescent girls reached (58.6%). In line with the research by Sari (2024), it was concluded that the prevalence of FMD in adolescent girls reached (30.1%).

Additionally, engaging in heavy physical activity without adequate food intake can increase the risk of CED. Adolescents who regularly participate in strenuous physical activities are particularly vulnerable if their energy consumption is insufficient (Widyanthi & Dewantari, 2023). This aligns with Munawara's et al. (2023) findings which indicated that 58.5% of adolescent girls with heavy physical activity experience CED. Supporting this, Suarjana et al. (2020) reported that 20.1% of adolescent girls with light physical activity also suffer from CED.

An initial survey conducted in October 2023 at Politeknik Kesehatan Kemenkes Bengkulu measured the upper arm circumference of 48 female students aged 18-20. Results showed that 43.75% (21 students) were at risk of CED, with an upper arm circumference of less than 90%. These findings prompt further investigation into the relationship between nutritional knowledge, physical activity, and the incidence of CED among female students at Politeknik Kesehatan Kemenkes Bengkulu.

METHOD

This study used a cross-sectional design to observe the relationship between two variables. The research subjects were 92 Level I Nutrition STR students who met the criteria aged 18-20 and still active in the Nutrition Department. The data collected used primary and secondary data such as the number of female students of the Nutrition Department, Level 1, Nutrition and Dietetics STR Study Program. The data was taken on female students still registered in the Nutrition Department in 2024, totaling 92 people. Primary data comes from the answers to the nutrition knowledge questionnaire, *Ques CA*, which covers general questions about nutrition and food diversity. *Ques CA* is an adaptation of the adolescent nutrition knowledge questionnaire used in Europe, with some modifications. Total items were 20 questions; each item in the questionnaire was given a score of 1 if the respondent's answer was correct and a score of 0 if the answer was incorrect. Nutritional knowledge can be poor if the score is ≤50, and good nutritional knowledge if the score is >50. The physical activity questionnaire consists of 16 questions, categorized into three categories: work activity index, sports activity index, and leisure time activity index. Physical activity can be considered light if the score is <5.6, moderate activity if the score is 5.6 - <7.9, and heavy activity if the score is ≥7.9. Data analysis using univariate and bivariate analysis with chi-square test ($p<0.05$). The chi-square 2x2 analysis showed that (46,1%) of female students with poor knowledge experienced CED, while (39.2%) of female students with good knowledge experienced CED.

This study was conducted with ethical approval No: KEPK.BKL/189/04/2024 from the Health Research Ethics Committee Politeknik Kesehatan Kemenkes Bengkulu.

RESULTS

A total of 92 female students aged 18-20 were selected for this study. Nutritional knowledge data was taken from the answers to the nutritional knowledge questionnaire (*Ques CA*), physical activity data using the BPAQ questionnaire, and CED data from the results of UAC measurements on female students**.**

Table 1. Nutrition knowledge, physical activity, and CED

Variables	n	%
Nutrition knowledge		
Less	13	14.1
Good	79	85.9
Physical activity		
Low	15	16.3
Medium	41	44.6
Weight	36	39.1
Occurrence of CED		
CED	37	40.2
No CED	55	59.8

Table 1 shows that nutritional knowledge is categorized into 2, namely, lack of nutritional knowledge and good nutritional knowledge. Of 92 female students, as many as (85.9%) have good nutritional knowledge; from 20 question items, students already know a lot about the consumption of food diversity. Physical activity is categorized into 3: light physical activity, moderate physical activity, and heavy physical activity; out of 92 female students, as many as (44.6%) have moderate physical activity. Chronic Energy Deficiency is categorized into experiencing CED and not experiencing CED with 92 female students, as many as (40.2%) experiencing CED.

Table 2. Relationship between nutritional knowledge and the incidence of CED

Nutrition Knowledge	Occurrence of CED				Total		p-value
	CED		No CED				
	n	%	n	%	n	%	
Less	6	46.1	7	53.9	13	100	0.868
Good	31	39.2	48	60.8	79	100	
Total	37	40.2	55	59.8	92	100	

Based on Table 2, the chi-square statistical testing results (p-value=0.868), it can be concluded that there is no relationship between nutritional knowledge and the incidence of CED.

Table 3. Relationship between physical activity and the incidence of CED

Physical Activity	Occurrence of CED				Total		p-value
	CED		No CED				
	n	%	n	%	n	%	
Low	10	66.7	5	33.3	15	100	
Medium	8	19.5	33	80.5	41	100	0.001
Weight	19	52.8	17	47.2	36	100	
Total	37	40.2	55	59.8	92	100	

The results of statistical testing of chi-square with a 3x2 table showed that (66.7%) of female students with light physical activity experienced CED, (19.5%) of female students with moderate physical activity experienced CED, (and 52.8%) of female students with heavy activity experienced CED. The results of the data analysis concluded that there was a relationship between physical activity and the incidence of CED in female students of the Politeknik Kesehatan Kemenkes Bengkulu, as evidenced by the results of the Chi-Square statistical test, namely p-value = 0.001.

DISCUSSION

Overview of nutrition knowledge, physical activity, CED in female students

Based on the study's results most of female students have good nutritional knowledge. They have mastered much nutritional knowledge about food diversity because they have studied nutrition science; with easy access to the internet, young women can now get more and varied nutritional information apart from college through existing social media platforms. Some female students still need help remembering and understanding nutrition concepts despite taking nutrition courses. As a result, their ability to apply this knowledge in their daily food choices is limited.

This result is consistent with the study by Dewi and Martini (2021), who concluded that 69.8% of adolescent girls have good knowledge. People with good nutritional knowledge tend to organize their diet in a balanced manner, ensuring that nutritional intake is met without overdoing it.

This finding is also supported by research by Dwitami (2024), who concluded that 78.7% of adolescent girls have good knowledge. The direct causes of nutritional problems are inadequate food intake and infectious diseases, while knowledge about nutrition indirectly affects a person's nutritional status. An inappropriate and unbalanced diet can result in unmet nutritional needs in adolescents.

This study results that students have moderate physical activity. Judging from the results of the light physical activity questionnaire that female students often do, such as sitting, watching television, playing games, and only exercising 1-3 months a year, while young women who have heavy physical activity daily often feel tired, sweat easily, are active in sports activities such as gymnastics, cycling, and jogging. The average duration of physical activity is 1-3 hours/ week.

These results are consistent with Munawara's research (2023), which concluded that 58.5% of adolescent girls have heavy physical activity. Many heavy physical activities adolescent girls carry are sports, walking, shopping, and cycling (Munawara et al., 2023). This finding is also supported by research by Irawati et al. (2021), concluding that 71% of adolescent girls have heavy physical activity. Most teenagers do many activities, such as walking, climbing stairs, and jogging. Therefore, many respondents experience CED and must be balanced with adequate food consumption . Research by Suarjana et al. (2020) concluded that 20,1% of adolescent girls had light physical activity. Besides heavy physical activity, light physical activity is also a contributing factor to the occurrence of CED.

Based on the study results that most of female students experienced CED. This figure is lower than the Indonesian Health Survey (IHS) 2023 results, which showed that adolescents who experienced CED were (41.9%) (Survei Kesehatan Indonesia, 2023). Young women aged 18-18.9 have a standard upper arm circumference of 25.8cm, while those aged 19-24.9 have a standard upper arm circumference of 26.5cm. Young women can be considered severe if the % upper arm circumference from the measured upper arm circumference divided by the standard

upper arm circumference multiplied by 100% gets a result <90%.

This result is consistent with the research results of Hidayati et al. (2023), who concluded that the prevalence rate of CED among adolescent girls reached (58.6%). Chronic Energy Deficiency occurs when the body does not receive enough energy from the food consumed. As a result, the body lacks the essential nutrients it needs to function correctly. Chronic Energy Deficiency is when a person experiences a prolonged lack of macronutrient intake (Hidayati et al., 2023).

This finding is also supported by research by Sari (2024), concluding that the prevalence rate of CED in adolescent girls reached (30 . 1%). The risk of adolescent girls experiencing CED increases if their diet is not balanced. Adolescents need a higher food intake because they are experiencing a growth period. A balanced diet is essential for adolescent girls to grow optimally and have good health.

Relationship between nutritional knowledge and the incidence of CED

The knowledge questionnaire score showed that female students with good knowledge still suffer from CED. This is because young women have not applied their knowledge in their daily lives. Adolescent girls still eat their favorite foods, such as sweet drinks and very spicy foods. Adolescent girls often skip meals because they want to have a slim body.

These results are consistent with those of Dewi and Martini's research, which concluded that there was no relationship between nutritional knowledge and the incidence of CED in adolescent girls. Even though adolescent girls have good nutritional knowledge, it does not necessarily mean they will avoid CED (Dewi & Martini, 2021).

This finding is also supported by Sari's research, which concluded that there was no relationship between nutritional knowledge and the incidence of CED in adolescent girls. Knowledge about nutrition significantly influences a person's decision to choose food, but eating habits and purchasing power are often obstacles to choosing nutritionally balanced food. (Sari., 2024).

Chronic Energy Deficiency (CED) is caused by multiple factors, such as the level of knowledge often associated with the incidence of CED. Despite good nutrition knowledge, a person may only sometimes apply it daily. CED is a condition where a person does not get enough energy from the food consumed for a long time (Hafiza et al., 2020).

Relationship between physical activity and the incidence of CED in female students

The results of this study showed that most of female students had heavy activity and experienced CED. This was due to young women doing a lot of physical activity, such as walking, jogging, and cycling. Several respondents participated in extracurricular activities on campus, such as dancing and volleyball, with an average duration of physical activity of 1-3 hours/week.

These results are consistent with Putu's research, which concluded that there is a relationship between the level of physical activity and the incidence of CED in adolescent girls. This is because the higher the level of physical activity of the respondent, the smaller the fat mass under the skin of the respondent, as measured by the respondent's upper arm circumference (Putu et al., 2023).

This finding is also supported by research conducted by Irawati stating that the higher the activity carried out by adolescent girls, if they do not consume a balanced diet, it can cause CED. Physical activity is essential to adolescents' nutritional status (Irawati et al., 2021).

CONCLUSION

Female students have good knowledge but still experience CED because they still eat their favorite foods, such as sweet drinks and very spicy foods. Female students also often skip meals because they want to have a slim body. Excessive physical activity can cause CED. The more active students are in physical activity, the more energy is expended. Balanced physical activity is good for health.

Female students are expected to apply nutritional knowledge in their daily lives in accordance with their existing knowledge of food diversity. Students are also expected to exercise regularly to avoid the occurrence of CED.

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