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The Relationship between Nutrition Knowledge Level and Diet with the Incidence of Chronic Energy Deficiency (CED) in Adolescent Girls at MTsN 3 Surabaya

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ABSTRACT

Chronic Energy Deficiency (CED) in adolescent girls is characterized by long-term low energy intake that impacts growth and reproductive health. This study aims to analyze the relationship between the level of nutritional knowledge and diet and the incidence of CED in adolescent girls in MTsN 3 Surabaya. The design of this study is an observational analysis with a cross-sectional approach involving 60 respondents, selected using proportional random sampling techniques. Data were collected through nutritional knowledge questionnaires, diet recall, and Upper Arm Circumference measurements. The results showed that most of the respondents had a level of nutritional knowledge in the category of adequate (61.7%) and poor diet (83.3%). As many as 46.7% of respondents experienced CED. The Chi-Square test showed a significant relationship between the level of nutritional knowledge and the incidence of CED (p = 0.003), as well as between diet and the incidence of CED (p = 0.001). It can be concluded that the level of nutritional knowledge and diet has a significant effect on the incidence of CED in adolescent girls. Therefore, educational efforts and improvement of consumption patterns are needed to prevent CED from adolescence.

INTRODUCTION

Chronic Energy Deficiency (CED) is a form of nutritional disorder that is common in adolescent girls, characterized by chronic or prolonged low energy and protein intake. This condition causes the body to not get enough nutrients to meet basic metabolic and growth needs. One of the indicators of CED status is the measurement of the Middle Upper Arm Circumference with a size below 23.5 cm indicating the risk of CED[1].

Young Women is a group that is very vulnerable to nutritional problems, especially at the age of 12-15 years when they start menstruating and are in a rapid growth spurt. In addition to physiological changes, other factors such as puberty, snacking habits, social pressures on appearance, and imbalances between nutritional needs and intake can worsen nutritional conditions[3]. The factors that cause CED are not only limited to lack of food intake, but are also influenced by lifestyle, socioeconomic level, physical activity, history of disease, and level of knowledge and diet[6].

Adolescents who maintain regularity in nutritional intake and meal portions tend to experience more optimal growth compared to adolescents whose diet and nutritional intake are irregular. The condition of CED in adolescence not only has short-term impacts, such as anemia and growth stunts,

but also affects the future of reproduction. CED can increase the risk of problematic pregnancies, low birth weight miscarriage, and complications in the baby such as birth defects and neonatal mortality[4]. Therefore, efforts to overcome these nutritional problems are to increase understanding and implement a healthy lifestyle[5].

One of the important aspects in the prevention of CED is knowledge about balanced nutrition. Adolescents with good nutritional knowledge tend to have healthier attitudes and eating habits, so that their daily nutritional intake can be met[7]. Conversely, low knowledge has the potential to lead to inappropriate food selection, which contributes to the risk of CED. Diet also plays an important role in nutritional status. This can be realized through the principle of balanced nutrition, for example by consuming various types of food. An unbalanced diet can lead to deficiencies in micronutrients such as vitamins and minerals, as well as macronutrients such as carbohydrates, proteins, and fats[8]. The imbalance between energy intake and expenditure also has a significant effect on the risk of CED. Therefore, the implementation of a balanced diet is an important step in the prevention of CED[9].

The incidence of CED in adolescents is not only due to the problem of not consuming enough food but also the result of the influence of lifestyle[10]. Data from the 2023 Indonesian Health Survey shows that the prevalence of CED in Indonesia reaches 20.6%, and 19.7% in East Java Province. Even in adolescent girls aged 15–19 years who were not pregnant, the prevalence increased to 41.9%[2]. The results of initial data collection by researchers on 30 grade 9 students at MTsN 3 Surabaya showed that as many as 63% experienced CED based on Upper Arm Circumference measurements. This figure indicates a significant nutritional problem among adolescent girls, which requires special attention. Therefore, looking at the high number of CED and various factors that affect it, this study aims to analyze the relationship between the level of nutritional knowledge and diet and the incidence of CED in adolescent girls in MTsN 3 Surabaya.

MATERIALS AND METHODS

This study is an observational analytical study with a cross-sectional design. The research was carried out at MTsN 3 Surabaya in the period September 2024 to February 2025. The research population was all female students at MTsN 3 Surabaya as many as 483 people, with a selected sample of 60 respondents using the proportional random sampling technique.

This study involved some female students at MTsN 3 Surabaya who met the inclusion criteria, namely aged 12–21 years, female, and registered as female students. The exclusion criteria include sick conditions, unwillingness to be a respondent, and having communication barriers. Data collection was carried out through filling out informed consent, measuring Upper Arm Circumference to determine the status of CED, filling out nutritional knowledge questionnaires, and interviews using the

SQ-FFQ method to assess diet.

This study applied a cross-sectional design, which allows the collection of data on various variables simultaneously at a single point in time to identify relationships between variables. The data analyzed is ordinal scale, so the chi-square test is used to test the relationship between variables. If there are cells with low expected frequency, then the analysis is continued with the alternative Fisher's Exact Test. The entire process of data processing and analysis is carried out using the SPSS application.

RESULTS

Table 1. Frequency Distribution of Characteristic Respondent in Adolescent Girls in MTsN 3 Surabaya

Class	**Sum**	
	n	**%**
Grade 7	22	36,7
Grade 8	20	33,3
Grade 9	18	30
Total	**60**	**100,0**
Age	**Sum**	
	n	**%**
13 years	29	48,3
14 years	19	31,7
15 years	7	11,7
16 years	5	8,3
Total	**60**	**100,0**

Source: Primary Data, 2025

This study involved as many as 60 young women who are active students at MTsN 3 Surabaya. Respondents consisted of three grade levels, namely grades 7, 8, and 9, each of which represented the junior high school level. Based on class distribution, the majority of respondents came from grade 7, which was 22 people (36.7%). This shows that the involvement of grade 7 students in the study is quite dominant, possibly because the number of students at that level is higher than other classes or because of the availability and ease of the data collection process. Furthermore, there were 20 respondents (33.3%) from grade 8 and 18 respondents (30.0%) from grade 9.

Based on the table, most of the respondents were 13 years old, which was 29 people (48.3%). Respondents aged 14 were 19 (31.7%), followed by 7 (11.7%) aged 15, and only 5 people (8.3%) aged 16. This age variation reflects the diversity of early to mid-stage development of adolescent girls, which is important to note because age factors can affect the nutritional needs, knowledge levels, and diets of respondents.

Tabel 2. Frequency Distribution of Nutrition Knowledge Level in Adolescent Girls at MTsN 3 Surabaya

Nutrition Knowledge Level	Sum	
	n	%
Low	1	1,7
Enough	37	61,7
Good	22	36,7
Total	**60**	**100,0**
Variabel	**Value**	
	Mean	**Minimum**	**Maximum**
Nutrition knowledge level	75,42	55	90

Source: Primary Data, 2025

Most of the respondents had a nutrition knowledge level in the sufficient category (61.7%), followed by good (36.7%), and low (1.7%) categories. The nutritional knowledge score ranges from 55 to 90, with an average score of 75.42 which is classified as sufficient. This shows that most young women have an adequate understanding of nutrition, although improvement is still needed to achieve the good category more evenly.

Tabel 3. Frequency Distribution of Diet in Adolescent Girls in MTsN 3 Surabaya

Variabel	Sum	
	n	%
Total Calorie Intake		
Heavy Deficit	36	60
Moderate Deficit	7	11,7
Mild Deficit	2	3,3
Good	15	25
Types of Food		
Less	50	83,3
Good	10	16,7
Feeding Frequency		
Less good	32	53,3
Good	28	46,7
Pola Makan		
Less	50	83,3
Good	10	16,7
Total	**60**	**100,0**
Variabel	**Value**	
	Mean	**Minumum**	**Maximum**
Total Calorie Intake	1.284	675	2.407
Types of Food	1,42	0	4
Feeding Frequency	2,47	1	4

Source: Primary Data, 2025

The majority of respondents in this study had a relatively poor diet (83.3%) because they did not meet three important indicators, namely the amount of calorie intake which on average was still in the weight deficit category (60%), the type of food consumed which generally did not include the four main food groups (83.3%), and the frequency of meals that were not in accordance with the recommendations (an average of 2.47 times per day). which as a whole reflects low nutritional

wareness and potential imbalances in macro and micronutrient intake which play a role in the risk of Chronic Energy Deficiency (CED) in adolescent girls.

Tabel 4. Frequency Distribution of CED Incidence in Adolescent Girls in MTsN 3 Surabaya

CED	Sum	
	n	%
CED	28	46,7
Non CED	32	53,3
Total	**60**	**100,0**

Source: Primary Data, 2025

Based on the results of the data presentation in the table above, it is known that as many as 28 adolescent girls (46.7%) experienced CED, while 32 adolescent girls (53.3%) did not experience CED. These findings show that almost half of the total respondents are in a condition of Chronic Energy Deficiency, which indicates that there is a serious nutritional problem among adolescent girls. This condition needs attention, considering that the impact of CED not only affects current growth and health, but also has the potential to pose long-term risks to reproductive health and quality of life in the future.

Tabel 5. The Relationship between Nutrition Knowledge Level and the Incidence of CED in Adolescent Girls in MTsN 3 Surabaya

Nutrition Knowledge Level	CED		Non CED		Total	%	P-value
	n	%	n	%			
Low	1	100	0	0	1	100	0,003
Enough	23	62,2	14	37,8	37	100	
Good	4	18,2	18	81,8	22	100	
Total	**28**	**46,7**	**32**	**53,3**	**60**	**100**	

Source: Primary Data, 2025

Most respondents with sufficient nutritional knowledge (62.2%) experienced CED, while respondents with good knowledge were more likely to experience CED (81.8%). The results of bivariate analysis using the Chi-Square test showed a significant relationship between the nutrition knowledge level and the incidence of CED (p = 0.003).

Tabel 6. The Relationship between Diet and the Incidence of CED in Adolescent Girls in MTsN 3 Surabaya

Diet	CED		Non CED		Total	%	P-value
	n	%	n	%			
Less	28	56	22	44	50	100	0,001
Good	0	0	10	100	10	100	
Total	**28**	**46,7**	**32**	**53,3**	**60**	**100**	

Source: Primary Data, 2025

All respondents with a good diet did not experience CED, while most respondents with a poor diet (56%) experienced CED. The results of the analysis also showed a significant relationship between diet and the incidence of CED (p = 0.001).

DISCUSSION

This study involved 60 young women in MTsN 3 Surabaya with the majority of respondents aged 13 years (48.3%). Adolescence is a crucial period characterized by rapid growth and increased nutrient needs, as well as changes in diet and lifestyle that can trigger the risk of malnutrition, especially in women[11]. The results showed that most of the respondents had a level of nutritional knowledge in the adequate category (61.7%), but this understanding has not been fully applied in their daily diet. Good nutritional knowledge plays an important role in determining food consumption choices, but it needs to be supported by appropriate eating behaviors to effectively prevent malnutrition[12]. Because a person's level of nutritional understanding influences views and habits in determining food consumption choices, which in the long run can contribute to the condition of an individual's nutritional status[13].

The majority of adolescent girls (83.3%) showed a poor diet, as shown by an average energy intake of 1,284 kcal per day which was classified as a moderate deficit. The type of food consumed is generally incomplete, and the frequency of the main meal is only twice a day. These factors indicate a low quality of nutritional intak[14]. As many as 46.7% of respondents experienced CED, a condition caused by low food intake in the long term and characterized by an upper arm circumference of < 23.5 cm[8]. CED have a negative impact on learning ability, immunity, and reproductive health, and can cause pregnancy disorders and babies born with weight[15,16,17]. A diverse diet has important health benefits, as it can affect a person's nutritional status. Therefore, adequate nutritional intake is a priority to support immune function, while still following diet guidelines related to eating frequency, portions, and types of food[18].

Statistical tests showed a significant relationship between the nutrition knowledge level and the incidence of CED ($p = 0.003$), as well as between diet and CED ($p = 0.001$). There is a harmonious study showing that knowledge and diet are significant factors for CED[19,20]. Adolescents with sufficient knowledge and poor diets tend to be more at risk of developing CED than those with good knowledge and diet. This emphasizes that knowledge needs to be accompanied by the application of appropriate consumption practices, as well as motivational and environmental support[21,22]. Various studies state that the higher a person is in education, the better an individual's understanding of nutrition tends to be[23]. In addition, eating habits that have minimal variation, low nutrient consumption, and low consumption of vegetables and fruits also trigger the risk of CED[24,20]. Because one of the causes of this condition is the lack of nutrients that enter through daily food consumption, and the lack of quality in the food consumed, or it is also caused by the lack of absorption of nutrients in the body and the imbalance between the intake needed and the energy expenditure expended[25].

This study has the potential to experience recall bias and social desirability bias because data is collected through questionnaires and interviews. In addition, the SQ-FFQ method has limitations in the accuracy of food consumption estimates. The cross-sectional design limits cause-and-effect conclusions, and the study location that includes only one school with a limited sample limits the generalization of the results. Further research with a wider scope and methods is recommended.

CONCLUSION

Based on the results of a study conducted on 60 young women at MTsN 3 Surabaya, it is known that most of the respondents are in the age group of 13 years (48.3%), while the lowest proportion is found at the age of 16 years (8.3%). The majority of respondents' level of nutritional knowledge was in the medium category (61.7%), while the lowest proportion was in the low category (1.7%). In terms of diet, the majority of respondents (83.3%) had a poor diet, and only a small percentage (16.7%) showed a good diet. The incidence of Chronic Energy Deficiency (CED) was found in 46.7% of respondents, while the other 53.3% did not experience CED (non-CED).

Analysis of the relationship between variables showed that there was a significant relationship between the Nutrition Knowledge Level and the incidence of CED, as evidenced by the p-value of 0.003. In addition, diet also has a significant relationship with the incidence of CED, with a p-value of 0.001. The research recommendations include the importance of improving nutrition education for adolescent girls, the active role of schools in supporting healthy eating habits to prevent CED from adolescence.

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