

## **Knowledge of Chronic Energy Deficiency and Stunting and Their Relationship with Nutritional Status Among Adolescent Girls in SMAN 19 Surabaya**

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### **ABSTRACT**

Chronic Energy Deficiency (CED) is a nutritional problem among adolescents that increases the risk of giving birth to babies with low birth weight and stunting. This study aims to describe the knowledge level of adolescent girls about CED and stunting, as well as their nutritional status based on Mid-Upper Arm Circumference (MUAC) measurements at SMAN 19 Surabaya. This descriptive observational study used a simple random sampling technique with informed consent from respondents. Data were collected through interviews using questionnaires to assess knowledge, and MUAC measurements to evaluate nutritional status. The data were then analyzed using cross-tabulation. The results showed that most respondents had sufficient knowledge about CED (47.2%) but poor knowledge about stunting (52.8%), with the majority categorized as non-CED based on MUAC. Cross-tabulation indicated that knowledge is not always directly associated with nutritional status, particularly regarding stunting. These findings highlight the need for integrated school-based nutrition education programs to mitigate the intergenerational impact of malnutrition and stunting.

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## **INTRODUCTION**

Nutrition issues are complex issues that need to be addressed through various approaches because they are influenced by various factors. One of the nutritional problems is Chronic Energy Deficiency (CED), a condition due to an imbalance in energy and protein intake, which is characterized by an Upper Arm Circumference (MUAC) of less than 23.5 cm<sup>1</sup>. Adolescent girls are the most vulnerable group to CEDs, the cause of nutritional problems in adolescents lies in improper diets, especially the imbalance between food intake and essential nutritional needs<sup>2</sup>. Adolescent girls often have unhealthy eating habits such as skipping breakfast, eating fast food, not being active in exercise, avoiding drinking water, and tend to snack because they want to have a perfect body, so that their intake of carbohydrates, proteins, vitamins, and minerals is forgotten<sup>3</sup>. If this state continues, it can affect the reproductive health and nutritional status of adolescents, and as a mother-to-be, you should prepare well<sup>4</sup>.

According to Riskesdas data in 2018, the prevalence of the risk of Chronic Energy Deficiency (CED) in women of childbearing age (WUS) who are not pregnant aged 15-19 years in Indonesia is 36.3%. Meanwhile, the prevalence of CED risk in non-pregnant WUS aged 15-19 years in East Java province is 37.73%<sup>5</sup>. Based on the 2021 Indonesian Nutrition Status Survey (SSGI), the stunting rate in Indonesia in 2021 was 24.4%<sup>6</sup>. Based on this data, this condition needs to be a top priority to prevent nutritional problems and attention is also needed to prioritize health status in adolescence and in the first 1000 days of life (HPK)<sup>7</sup>.

Adolescent girls are at risk of anemia, suboptimal organ development, and stunted growth, which may impair future maternal outcomes<sup>8</sup>. In addition, CEDs increase the risk of giving birth to babies with low birth weight (BBLR), premature birth, infant death, and are risk factors for stunting in children under the age of five. Stunting can be prevented from adolescence because nutritional status during pregnancy is influenced by the condition when becoming a WUS<sup>9</sup>. CEDs in adolescent girls can continue until pregnancy and increase the risk of stunting in the next generation<sup>10</sup>.

Based on a preliminary study conducted on class X students at SMAN 19 Surabaya, as many as 18 students measured their nutritional status using the Upper Arm Circumference (MUAC) parameter. The measurement results showed that 50% of female students were in the category of Chronic Energy Deficiency (CED). This figure is higher than Riskesdas data in 2018, where the prevalence of CED in women of childbearing age in East Java Province was 37.73%. These findings show the need for further studies related to adolescent girls' knowledge about CEDs and stunting, considering that the two are interrelated. Adolescent girls who experience CEDs are at risk of giving birth to babies with low birth weight (BBLR), low birth length (PBLR <48 cm), and stunting<sup>11</sup>. Therefore, it is important to explore the level of understanding of adolescent girls as a preventive effort in reducing the incidence of CED and stunting in the future<sup>12</sup>. This study was conducted to find out the overview of young women's knowledge about CED and stunting at SMA Negeri 19 Surabaya. Despite the known risks, little is known about the actual knowledge levels of adolescent girls regarding CED and stunting, particularly in urban high school settings such as SMAN 19 Surabaya.

## **MATERIALS AND METHODS**

This study is a descriptive observational study that uses simple random sampling techniques accompanied by informed consent from respondents. This data was collected using 53 respondents grade XI girls of SMAN 19 Surabaya in 2023. Data collection was carried out through interviews using questionnaires to assess the level of knowledge of adolescent girls about Chronic Energy Deficiency (CED) and stunting. In addition, the nutritional status of respondents was evaluated through Upper

Arm Circumference (MUAC) measurements using standard tape measure. The data obtained was then analyzed using cross-tabulation to see the relationship between the level of knowledge and the nutritional status of the respondent.

## RESULT

SMAN 19 is one of the State High Schools located in North Surabaya and is located at Jl. Kedung Cowek No.390, Tanah Kali Kedinding, Kec. The boundaries of SMAN 19 Surabaya include:

- a. Northern Boundary : Kali Kedinding Land Market
- b. Eastern Boundary : Jalan Kedung Cowek
- c. Southern Boundary : Elberlah Road
- d. Western Boundary : Kenjeran Police Station

SMA Negeri 19 Surabaya has competent teachers according to their fields, the total number of teachers at SMA Negeri 19 is 65 people. SMA Negeri 19 Surabaya has 18 extracurriculars and 36 classrooms.

### CED Knowledge

The distribution of the frequency of knowledge about CEDs in adolescent girls is presented in the following table:

**Table 1 CED Knowledge in Grade XI Girls of SMAN 19 Surabaya in 2023**

<b>CED Knowledge</b>	<b>n</b>	<b>%</b>
Good ( 76-100%)	21	39,6
Enough (56-75%)	25	47,2
Less (<56%)	7	13,2
<b>Total</b>	<b>53</b>	<b>100</b>

Source : Primary Data in 2023

Based on the data above, it can be concluded that most of the participants have an adequate understanding of CEDs, with a total of 25 students (47.2%), then as many as 21 students (39.6%) in the knowledge category of good and only 7 students (13.3%) have a poor category. Most young women have a sufficient level of knowledge about Chronic Energy Deficiency (CED), although there are still some who have good knowledge and a small number who have a relatively low knowledge.

### Stunting Knowledge

The distribution of respondent frequency based on knowledge about *stunting* in adolescent girls in grade XI of SMAN 19 Surabaya in 2023 can be seen in table 2 as follows:

**Table 2 Stunting Knowledge in Grade XI Adolescent Girls of SMAN 19 Surabaya in 2023**

<b>Stunting Knowledge</b>	<b>n</b>	<b>%</b>
Good ( 76-100%)	0	0
Enough (56-75%)	25	47,2
Less (<56%)	28	52,8
<b>Total</b>	<b>53</b>	<b>100</b>

Source : Primary Data in 2023

Based on the data in the table above, it can be concluded that most of the study participants have relatively little knowledge about stunting. The number of students included in this category was 28 students, or

around 52.8% of the total respondents, then as many as 25 students (47.2%) in the knowledge category was sufficient. Most adolescent girls have little knowledge about stunting, indicating their low understanding of chronic nutritional problems that have long-term impacts.

### Nutritional Status

The frequency distribution of Nutritional Conditions in adolescent girls with the MUAC (Upper Arm Circumference) parameter is shown in the following table:

**Table 3 Nutritional Status in Adolescent Girls in Class XI of SMAN 19 Surabaya in 2023**

Nutritional Status	n	%
CED	23	43,4
Non CED	30	56,6
<b>Total</b>	<b>53</b>	<b>100</b>

Source : Primary Data in 2023

Based on the data in the table above, it can be seen that most of the respondents have nutritional status based on MUAC (Upper Arm Circumference) with the Non-CED category of 30 female students with a percentage of 56.6% and with the CED category as many as 23 female students with a percentage of 43.4%. Most of the young women have a good nutritional status based on MUAC measurements, with the majority being in the non-CED category, although the proportion of respondents who are classified as CEDs is still quite high and needs attention.

### CED Knowledge Level and MUAC Nutritional Status

Cross-tabulation between knowledge about CEDs and nutritional conditions based on MUAC (Upper Arm Circumference) in young women of SMA Negeri 19 Surabaya can be seen in the following table:

**Table 4 Cross-tabulation of Knowledge Level with Nutritional Status in Adolescent Girls in Class XI of SMAN 19 Surabaya in 2023**

No	CED Knowledge	Nutritional Status				Total	
		CED		Non-CED			
		n	%	n	%	n	%
1	Good	9	42,8	12	57,2	21	100
2	Enough	12	48	13	52	25	100
3	Less	2	28,6	5	71,4	7	100
Total		23		30			

Source : Primary Data in 2023

Based on the table above, it can be seen that the nutritional status of female students in the non-CED category has good knowledge as many as 12 students with a percentage of 57.2% compared to the nutritional status of 9 students with a percentage of 42.8%. Although in general, respondents with good and sufficient knowledge tend to have better nutritional status (not CED), there are variations in each category of knowledge. This shows that the level of knowledge about CEDs is not always directly correlated with nutritional status.

### Stunting Knowledge Level and MUAC Nutritional Status

Cross-tabulation between the level of knowledge about *stunting* and nutritional status based on MUAC (Upper Arm Circumference) in young girls of SMA Negeri 19 Surabaya can be found in the following table:

**Table 5 Cross-tabulation of Knowledge Level with Nutritional Status in Adolescent Girls in Class XI of SMAN 19 Surabaya in 2023**

No	Stunting Knowledge	Nutritional Status				Total	
		CED		Non-CED			
		n	%	n	%	n	%
1	Good	0	0	0	0	0	0
2	Enough	11	44	14	66	25	100
3	Less	12	42,9	16	57,1	28	100
Total		23		30			

Source : Primary Data in 2023

Based on the table above, it can be seen that the nutritional status of female students in the non-CED category has a lack of knowledge as many as 16 students with a percentage of 57.1% compared to the nutritional status of 12 students with a percentage of 42.9%. Most students with non-CED nutritional status actually have less knowledge, showing that knowledge is not always in line with nutritional status.

## DISCUSSION

### CED Knowledge

The level of knowledge of respondents regarding Chronic Energy Shortage (CED) at SMA Negeri 19 Surabaya shows that the category of sufficient knowledge (47.2%) is more dominant than the category of good knowledge (39.6%). These findings indicate that students' understanding of CEDs is still not optimal. This condition is in line with the results of previous research which stated that the low level of knowledge can be caused by the lack of information received by respondents regarding CED<sup>13</sup>. Nutritional knowledge can be improved through various sources such as formal education, books, mass media, social media, culture, and the environment around<sup>14</sup>. Therefore, more intensive and targeted educational efforts are needed to increase the knowledge of young women about CEDs. This is important considering that adolescent girls are a vulnerable group that is the main target in nutrition intervention programs, as they have a crucial role in determining the quality of health of the next generation<sup>15</sup>.

### Stunting Knowledge

The results showed that most of the students of SMA Negeri 19 Surabaya had a level of knowledge about stunting in the poor category, which was 52.8%, and none of the respondents were in the good knowledge category. These findings indicate that students' understanding of stunting issues is still low. Most of the respondents admitted that they had not received much information from various sources about stunting, and had not realized the importance of stunting prevention since adolescence.

This condition shows that education about stunting needs to be provided from a young age, especially to young women as mothers-to-be, so that they understand the importance of maintaining optimal nutritional status before and during pregnancy<sup>16</sup>. Adequate knowledge can help in preventing malnutrition that has an impact on fetal health and the risk of stunting in children<sup>17</sup>. Nutrition education

has an important role in increasing public knowledge and awareness. Through education, the goals of improving health status, disease prevention, and health restoration can be achieved effectively, including in efforts to prevent stunting<sup>18</sup>.

### **Nutritional Status**

The nutritional status of adolescent girls can be determined through Upper Arm Circumference (MUAC) measurement, where a MUAC value of < 23.5 cm indicates a condition of Chronic Energy Deficiency (CED). Based on the results of the study, of the 53 respondents of class XI students at SMA Negeri 19 Surabaya, as many as 23 students (43.4%) were included in the CED category, while 30 students (56.6%) were in the non-CED category. These findings show that the proportion of female students who experience CED in the school is higher than Riskesdas data in 2018, which recorded the prevalence of CED risk in women of childbearing age (WUS) aged 15-19 years in East Java Province at 37.73%.

The high number of CED in adolescent girls is an important issue because it can have a long-term impact, especially when they enter pregnancy<sup>19</sup>. CED in adolescents may increase the risk of pregnancy complications, including low birth weight and stunting in future offspring. If not treated appropriately through nutrition interventions and ongoing education, this condition can degrade the quality of maternal and child health in the future<sup>20</sup>.

According to Achadi et al. (2020), chronic energy deficiency in expectant mothers has a significant impact on fetal growth and development, especially if accompanied by an unbalanced diet. Therefore, prevention efforts are needed from adolescence through increasing nutritional knowledge, regular monitoring of nutritional status, and health interventions focused on adolescent age group<sup>8</sup>.

### **CED Knowledge Level and Nutritional Status**

In Table 4 knowledge of CEDs with nutritional status by students of SMA Negeri 19 Surabaya, this study found that adolescent girls with non-CED-based nutritional status had an average knowledge in the good category higher as many as 12 female students 57.2% compared to adolescent girls with a CED nutritional status of 42.8%. These findings show that adolescent girls with normal nutritional status tend to have a better level of knowledge compared to those who experience CEDs.

Nutritional status reflects the quality of daily food consumption and plays an important role in maintaining a degree of health, where adolescents with good nutritional status generally have a better ability to choose nutritious foods<sup>21</sup>. Adequate nutritional knowledge, especially related to CEDs, contributes to healthy consumption behavior and is important for young women to have as mothers-to-be, because lack of knowledge can increase the risk of CEDs that continue into pregnancy and potentially cause stunted babies. Therefore, nutrition education is needed as a preventive effort to reduce the prevalence of CED<sup>22</sup>.

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## Stunting Knowledge Level and Nutritional Status

Based on the tabulation between knowledge about stunting and nutritional status, this study found that both adolescent girls with nutritional status in CED and not CED mostly had less knowledge, namely as many as 28 female students, and none of them had knowledge in the good category. Interestingly, more students with non-CED nutritional status have less knowledge (57.1%) compared to students with CED status (42.9%). These findings suggest that the low knowledge of adolescent girls about stunting can be caused by limited access to adequate information and educational resources. This lack of information can have a long-term impact, especially when they enter pregnancy and have children, because stunting is closely related to the nutritional status of mothers<sup>23</sup>.

Therefore, it is important to provide education about stunting from adolescence, especially in the group of Women of Childbearing Age (WUS), so that they are able to choose the right food and understand the importance of balanced nutrition. Increasing knowledge through counseling has proven to be effective as a preventive step in preventing stunting and increasing awareness of the importance of nutrition from a young age<sup>24,25</sup>.

This research has several limitations that need to be observed. First, the descriptive research design and cross-sectional approach do not allow to identify causal relationships between knowledge and nutritional status. Second, the number of respondents was limited to only one school, namely SMAN 19 Surabaya, so the results of the study could not be generalized to the entire population of young women in other cities or provinces. Third, the knowledge aspect was assessed only through questionnaires without advanced psychometric validity tests, and was not accompanied by observations of real practices or daily nutritional behaviors. Therefore, follow-up research with mixed methods and wider coverage of areas is recommended to reinforce these findings.

The possibility of bias in this study mainly lies in information bias, because data on respondents' knowledge was obtained through self-reported questionnaires that are prone to expected social answers (social desirability bias). In addition, selection bias may occur because purposive sampling techniques are used, so students who are more active or cooperative are more likely to be involved in the research, which can affect the representativeness of the sample. The limitations of nutritional status measurement instruments that only use MUAC (without weight and height measurement) can also lead to under- or over-estimation of adolescent nutritional status.

## CONCLUSION

This study found that while knowledge about CED among female students at SMAN 19 Surabaya is moderate, their understanding of stunting remains low. Nearly half were identified as experiencing CED based on MUAC. The findings underline that improving nutritional knowledge,

particularly about stunting, is critical to breaking the intergenerational cycle of malnutrition. Strengthening school-based nutrition education can be a strategic step toward preventing stunting.

## SUGGESTION

The school should collaborate with local health centers to implement routine nutrition counseling and MUAC screening. Teachers and school health units (UKS) should integrate nutrition topics into the curriculum, emphasizing the impact of adolescent health on future offspring. Peer education and digital media campaigns should also be developed to make nutrition education more engaging. Researchers should conduct follow-up studies using intervention models and assess behavior change outcomes.

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