**Literature Study: Decreased Productivity in Adolescents Due to Undernutrition**

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**ABSTRACT**

Malnutrition is a nutritional deficiency, and lack of nutritional intake due to low consumption of energy and protein in food so it does not meet nutritional intake needs. Problems that can arise from malnutrition are stunting, wasting, and underweight. The purpose of this study was to determine the relationship between adolescent productivity and malnutrition. The method used in this research is a literature review using databases in PubMed/NCBI, Google Scholar, ScienceDirect, ResearchGate, and BMC Research Notes, with keywords using English and Indonesian. Five journals were obtained with details of two international journals and three national journals, which discussed malnutrition in adolescents which affected productivity in the academic, physical, mental, nutritional intake, and social environment. The nutritional status of adolescents can be influenced by several factors, one of which is diet. Erratic eating patterns can lead to undernutrition which results in a lack of nutrition knowledge. The importance of following health education and nutrition education to increase knowledge about balanced nutrition.

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**INTRODUCTION**

Adolescence is an age that is vulnerable to nutritional disorders and mental health disorders. Adolescence is the transition from childhood to adulthood. World Health Organization (WHO) states that adolescent age ranges from 10 to 19 years. Results of National Basic Health Research (Riskerdas, 2018) The nutritional status of adolescents aged 13 to 15 years nationally in 2013 and 2018 ranged from very underweight 3.3% to 1.9%, underweight 7.8% to 6.8%, and obese 8.3% to 11.2%, while obese 2.5% to 4.8%. At this age, there are many physical and mental changes. This period is the most important period for everyone because it will determine how it develops at a later stage. One of the psychic aspects of adolescence is paying attention to the shape of the body and rarely forming its body characteristics. Adolescents also experience rapid physical growth and development, both in terms of height and weight. According to (IN, 2014), young women are more likely to experience this condition than boys.

Young women will pay attention to their body shape and try to look attractive because of attraction to the opposite sex. Many efforts are made by young women to maintain their body shape by reducing weight by limiting food portions, this incident will affect medical conditions such as poor nutritional status, Chronic Energy Deficiency (SEZ), inhibited reproduction, stunted growth and development, experience anemia and...
deficiency micronutrients Other (Normate et al., 2017). More than 20% of height and 50% of bone mass will grow in adolescence, so young women try to reduce their food intake to achieve an ideal body and eventually experience undernutrition. Adolescent age is very important to maintain a good nutritional status so that during pregnancy is not at risk of experiencing undernutrition. Women who have a height of less than 145 cm are at risk of experiencing difficulties during childbirth and women weighing less than 45 kg are at risk of giving birth prematurely, with children who experience Low Birth Weight (BBLR) and are at risk of experiencing stunting (Cahyaning et al., 2019).

Undernutrition is malnutrition, a lack of nutritional intake due to low consumption of energy and protein in eating food that does not meet the needs of nutritional intake. (Noviyanti & Marfuah, 2017). The nutritional status of adolescents can be influenced by several factors, one of which is diet. A diet that consumes energy (calories) in small amounts compared to the daily nutritional needs of adolescents can result in a decrease in calories. Teenagers who experience calorie deficiency will feel weak, easily sick, and decreased productivity if they follow unhealthy eating habits. Underweight (underweight), stunting, and Wasting are all nutritional status issues that can arise from a long-term calorie deficit. (Joseph et al., 2022).

Based on the description above, researchers are interested in the decrease in productivity in adolescents due to undernutrition. The purpose of this study was to determine the relationship between adolescent productivity and undernutrition. The benefit of this study is that it broadens our understanding of how to prevent undernutrition. Another benefit for the community is information about undernutrition related to nutritional status that can affect adolescent productivity.

METHOD

The method used in this study is literature review or literature review by reviewing research obtained from official research such as journals or books on the research topic (Cahyono et al., 2019). This literature review search is carried out nationally and internationally using databases PubMed/NCBI, Google Scholar, ScienceDirect, ResearchGate, and BMC Research Notes by including keywords in Indonesian such as undernutrition in adolescents, underweight in adolescents, nutritional status in adolescents, decreased academic achievement due to malnutrition, the relationship between stunting and exercise, and the relationship of nutritional status to diet, while in English undernutrition in adolescents, underweight in adolescents, nutritional status in adolescents, and the relationship between nutritional status and diet, decreased academic achievement due to malnutrition, and relationship between nutritional status and diet.

Literature Identification Flow

<table>
<thead>
<tr>
<th>Literature Identifyed through Google Scholar (N= 1,850)</th>
<th>Literature identified through NCBI, ScienceDirect, ResearchGate (N= 1,283)</th>
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<tr>
<td>Keywords: undernutrition in adolescents, underweight in adolescents, nutritional status in adolescents, and the relationship of nutritional status with diet,</td>
<td>Keyword: undernutrition in adolescents, underweight in adolescents, nutritional status in adolescents, and the relationship between nutritional status and diet</td>
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The literature obtained was identified through Google Scholar and NCBI (N= 3,133)

Feasibility check was carried out on the literature (N = 126 )

(relation to abstract literature)

Screening on literature titles (N=967)

Literature that meets the criteria (N=30)

(relation to the purpose of literature study)

Literature that meets inclusion criteria (N= 5)
<table>
<thead>
<tr>
<th>No</th>
<th>Research Title</th>
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<td>1</td>
<td>The Relationship of <em>Eating Disorders</em> with Nutritional Status in Adolescents at Semarang Modeling Agency (Syarafina; Probosari, 2014)</td>
<td>Observational study with <em>cross-sectional design</em> housed at the City Modeling Agency Semarang. The sample amounted to 59 subjects who were young women members of modeling agencies aged 15-19 years and were selected using the <em>consecutive sampling method</em>. Nutritional status assessment using percent body fat with <em>Bioelectrical Impedance Analysis</em> (BIA). Assessment of eating behavior deviations using questionnaires <em>Eating Disorder Diagnostic Scale</em> (EDDS). The data were analyzed using the <em>chi-square test</em>.</td>
<td>A total of 40 subjects (67.8%) experienced <em>eating disorders</em> with 11 subjects (27.5%) under fat and 19 subjects (32.2%) did not experience <em>eating disorders</em> with normal nutritional status. There is a meaningful connection between <em>eating disorders</em> By nutritional status, the value (<em>p</em> = 0.01; <em>p</em> &lt; 0.05). Eating disorder has a significant relationship with nutritional status in adolescent daughters.</td>
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<td>2</td>
<td>The relationship between nutritional status and stress with the incidence of pre-menstrual syndrome in students majoring in midwifery at Tanjungkarang Poltekkes (Rudiyanti; Nurchairina, 2015)</td>
<td>This research is analytical with a <em>cross-sectional approach</em>, conducted in September – October 2014, the population is 157 students, the sample is the total population, and the data collection tool is a questionnaire with questionnaire techniques. Data analysis was univariate, and bivariate using <em>Chi-square</em>.</td>
<td>A total of 157 respondents, the nutritional status of students is within normal limits of 54.8%, respondents have stress of 76.4%, and respondents who experience PMS are 68.2%. There was a significant relationship between nutritional status and PMS (P-value = 0.014 and OR = 2.562). There was a significant association between stress and PMS (P-value=0.000 and OR=11.387). Many respondents had good nutritional status based on Body Mass Index (BMI) which was 54.8%, and more respondents experienced stress at 76.4% and more respondents experienced PMS at 68.2%. There was a significant relationship between nutritional status and PMS (p-value = 0.014 and OR = 2.562). There was a significant relationship between stress and PMS (p-value = 0.000 and OR=11.387).</td>
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### Knitting Table of Literature Data Search Results

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<td>3</td>
<td>Associated factors of adolescents malnutrition in Junior High School Student</td>
<td>Nuryani &amp;; Paramata, 2020</td>
<td>Cross-sectional study research design held at MTS Negeri Model 1 Limboto. Sampling using accidental sampling technique of 251 adolescents. The variables of the study were adolescent nutritional status, socioeconomic status, knowledge, attitudes, and nutritional behavior in adolescents. Analysis of the relationship between variables using the chi-square test with a value of α = 0.05.</td>
<td>The results showed that as many as 10.0% of adolescents were stunted, 23.5% of adolescents were obese, 72.5% of nutritional knowledge was lacking, 41.8% of negative balanced nutrition attitudes, and 45.4% of poor balanced nutrition behaviors. Chi-square test analysis showed that paternal education was associated with the incidence of stunting in adolescents (p = 0.001), but socioeconomic analysis with the incidence of stunting and obesity in adolescents respectively paternal education (p = 0.051 and p = 0.647), maternal occupation (p = 0.385 and p = 0.206), family income (p = 1.000 and p = 0.061), parenting history (p = 0.496 and p = 0.525), The number of siblings (p = 0.131 and p = 0.903), gender (p = 0.298 and p = 1.000), knowledge (p = 0.767 and p = 0.447), attitudes (p = 0.656 and p = 0.805) and nutritional behaviors (p = 1.000 and p = 0.268) were not associated with the incidence of stunting and obesity in adolescents.</td>
<td>Analysis of the chi-square test showed that paternal education has an association with the incidence of stunting in adolescents. Socioeconomic factors, namely education, income, and father's work, are significantly related to the incidence of stunting in adolescents.</td>
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| 4  | Nutritional status and correlation with academic performance among primary school children, northwest Ethiopia | Asmare et al., 2018 | The study was conducted at the primary school of the city of Debre Markos school. In the city, there are a total of 7473 inhabitants. Of these, 3831 are women studying in the school having 15 public elementary schools and 8 private elementary schools. Study and population design: Institutionally-based, cross-sectional studies employed in elementary schools in the town of Debre Markos. | The prevalence of stunting, underweight, and wasting was 27.5% (95% CI 23.2–31.9%), 20.4% (95% CI 16.5–24.3%), and 8.7% (95% CI 6.2–11.5%), respectively. In multivariable logistic regression, the child’s age (Adjusted Odds Ratio (AOR)=0.177, 95% CI 0.07, 0.4), monthly income less than <1000.00 birr (AOR=0.05, 95% CI 0.02, 0.15), short children (AOR=0.21, 95% CI 0.10, 0.43) and underweight (AOR=0.63, 95% CI 0.26, 0.84) were associated with academic achievement. | The study revealed indicators of malnutrition among elementary school children of the city of Debre Markos. Age, income, HAZ, and WAZ scores were shown to be significantly associated with academic achievement. |
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<td>5</td>
<td>Stunting and Physical Fitness. The Peruvian Health Optimist Growth Study (Santos et al., 2020)</td>
<td>The study was conducted between 2009 and 2010 in which participants were randomly sampled from schools in three geographical regions in the central region of Peru: Barranco 58 m, Amazon (La Merced and San Ramon 751 m), and highlands (Junín 4107 m). We sampled 7,918 children and adolescents (4388 girls and 3,530 boys aged 6-15 years), with complete data on PF tests. The percentage of missing data varied from 4% to 10% in PF tests and did not differ significantly (p &gt;0.05) from those considered in this paper. The sample included only children and adolescents with complete data on all variables, and who were also natives of their respective areas.</td>
<td>The results showed that the prevalence of stunting increased with age in both sexes from 6% at age 6 to 18.4% at age 15 (girls), and from 9.3% at age 6 to 16.4% at age 15 years (boys). In the Amazon region (25.3%), followed by the highlands (24.3%) and sea level (8.1%). The prevalence of stunting is 11% in Peruvian children and adolescents aged 6 to 15 years, with a significant increase with age in both sexes, as well as a higher prevalence in boys than girls. Stunting has an overall negative impact on the stature of girls and boys.</td>
<td>Stunting significantly affects the Physical Fitness (PF) levels of Peruvian adolescents, specifically for gender, age, and PF tests. Stunting has an overall negative impact on the stature of girls and boys. Furthermore, the interaction of age with stunting was statistically significant for both sexes, and significant height differences varied to some degree across ages. The stunted children were poor at hand grip and long jump, but outperformed their normal-growing peers in running back and forth (boys only), in a 12-minute run.</td>
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RESULTS AND DISCUSSION

Adolescence is a very important period in the formation of behavior related to health and nutrition where if not handled properly and as early as possible, nutritional problems in adolescents will cause various chronic diseases in the future. (Anita, 2022). Based on the results of a literature review of the five journals analyzed, undernutrition in adolescents occurs due to erratic eating patterns, changes in psychosocial factors characterized by changes from childhood to adulthood, and eating disorders due to reduced portions of food. Undernutrition can result from a lack of knowledge about nutrition and an erratic diet. Undernutrition that occurs in adolescents results in decreased body immunity to disease, increased disease rates (morbidity), abnormal growth (short), reduced intelligence levels, low productivity, and stunted growth of reproductive organs (Sazani, 2016). These factors become problems that are often overlooked so that they can cause undernutrition especially for young women as mothers-to-be to prevent the occurrence of undernutrition like stunting in future generations.

(Syarafina & Probosari, 2014), Perform an analysis of the relationship between eating disorders (eating disorders) with nutritional status in adolescent girls. The results of the analysis were 40 respondents (67.8%) experienced eating disorders 11 respondents (27.5%) were underweight (overfat) and 19 respondents (32.2%) had normal nutritional status and had not experienced eating disorders. Nutritional status is closely related to the incidence of eating disorders (p=0.01; p<0.05). This is because someone who is not satisfied with his body shape due to views negative Against body image (body image) can influence the actions of adolescents to reduce portions of food or make an inappropriate diet, to form the desired appearance.

This is in line with research (Alivia Norma Yusintha &: Adiryanoto Adiryanoto, 2018) which states that some young women worry about their appearance compared to the food they should consume. This wrong view of eating behavior will make young women limit food intake because they feel their body appearance is not as desired. In addition, doing a diet that is polluted, teenage activities such as going to school, participating in extracurriculars, doing homework, and tutoring are some of the reasons teenagers leave meal times such as breakfast. This will cause undernutrition in adolescents due to lack of nutritional intake, and over time it will affect the future.

This study did not explain the impact of eating disorders on adolescent girls and the factors that influence eating disorders in adolescents. The negative impact of eating disorders on adolescents will experience underweight, resulting in the intake of nutrients consumed not by the needs of adolescents. Eating disorder is one of the factors that affect body image in adolescents. The relationship between eating disorders with body image is caused by factors of insecurity in adolescents. For teenage girls, having a slim body is the perfect body shape. In research (Rahmayanti et al., 2021), thin adolescent girls are not viewed by their environment because of the view that beauty is seen by physical appearance. This causes young women to be dissatisfied with the appearance of their bodies, so they go on a diet to gain weight but do not understand the diet. If done for a long time, not getting the ideal body, but becoming undernourished. Eating disorders that are usually experienced in adolescents are anorexia nervosa and bulimia nervosa. An eating disorder is a psychiatric syndrome characterized by deviant eating patterns associated with psychological characteristics related to diet, body shape, and weight.

Based on research (RudiyanScotti &; Nurchairina, 2015) analyzed the relationship between nutritional status and stress with the incidence of premenstrual syndrome (PMS) for students in the midwifery department of the Tanjungkarang Ministry of Health in 2014. In the analysis, 157 participants had normal nutritional status which was 54.8%, participants who experienced stress were 76.4%, and participants who experienced PMS were 68.2%. Nutritional status was significantly associated with PMS incidence (P-value=0.014 and OR=2.562). There was a meaningful association between stress and PMS (P-value = 0.000 and OR = 11.387). The relationship between stress and PMS is very related because of psychological factors related to stress. The factors that cause the incidence of PMS are still uncertain. In addition, there are some opinions stating that the incidence is closely related to nutritional status and stress in women. Other causes due to an imbalance of progesterone and estrogen hormones, psychological, and social problems, undernutrition, and impaired serotonin function. According to research (Choudhary et al., 2014) shows that the percentage of adolescents aged 16-18 years who experience a lack of macronutrient intake is 35.6%. This is due to many adolescents who experience a lack of nutritional intake which can cause undernutrition, If it lasts long enough it will inhibit the development and growth of tissues, physical weakness and mental disorders, and cause anemia.

The problems posed by STDs are disturbances to women themselves and the surrounding environment, and disturbances in the fields of education, industry, and commerce. The problem is related to falling productivity. A teenager sometimes experiences stress in carrying out daily activities that can affect his health condition and concentration in learning. Stress factors can also aggravate PMS disorders. This is in line with research (Rodiani & Rusfiana, 2016) Nutritional status is one of the important elements to achieve optimal health. Nutritional status is influenced by the balance of intake and the amount of nutrients in the body. In young women who have their first period (menarche) Urgently need enough nutrients. When experiencing

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menstruation for the first time, many young women experience discomfort. During menstruation, young women need enough iron to replace lost blood. If iron intake is less then an imbalance occurs (imbalance) nutrients in the body will cause undernutrition.

Research (Nuryani & Paramata, 2020), aims to analyze several factors that influence the incidence of malnutrition in adolescents. From the results of the analysis, 10.0% of adolescents experienced: stunting, 23.5% of adolescents were obese, 72.5% lacked nutrition knowledge, 41.8% had a balanced nutrition attitude and 45.4% had poor balanced nutrition behavior. Test analysis chi-square It was found that the father's knowledge was related to events stunting in adolescents (p = 0.001), but socioeconomic analysis related to the incidence of stunting and obesity in adolescents from maternal education (p = 0.051 and p = 0.051), = 0.647), mother's occupation (p = 0.385 and p = 0.206), family income (p = 1.000 and p = 0.061), parenting history (p = 0.496 and p = 0.525), number of siblings (p = 0.131 and p = 0.903), gender (p = 0.298 and p = 1.000), knowledge (p = 0.767 and p = 0.447), attitudes (p = 0.656 and p = 0.805) and nutritional behaviors (p = 1.000 and p = 0.268) were not associated with stunting and obesity in adolescents. Socioeconomic influence, i.e. the level of knowledge of parents has a meaningful relationship with the problem of stunting in adolescents. This research is also in line with research (Arage et al., 2019) It is explained that sociodemographic factors and economic factors including adolescent age, eating habits, place of residence, education level, parental income, and cultural factors are related to adolescent nutritional status. This is mainly due to nutritional, epidemiological, and socio-demographic transitions around the world. Family economic factors greatly affect the nutritional status of adolescents, especially adolescent girls, due to insufficient food needs in the family so that it occurs undernutrition Both his parents and his child.

One of the causes of undernutrition is stunting. Stunting is the result of chronic malnutrition. Performance of the child's nervous system stunting Often decreases which has implications for low intelligence of children, and inhibition of getting a job in adulthood. This argument is supported by research (Yadika et al., 2019) Poor nutrition that occurs in childhood can cause changes in brain tissue if it occurs in the golden age of the child, that is, the first thousand days of life. Stunting At risk of reducing the ability to think and learn patterns in children, causing achievement, both academic and physical, to decrease. Stunting It also affects the process of brain neurons so it disrupts brain tissue and structure. It can cause damage to cognitive development. In adulthood, teenagers who are stunted will be difficult to find a job because it physically tends to be short so the selection of the type of work is increasingly difficult.

Based on research (Asmare et al., 2018) analyzed the relationship between nutritional status and academic achievement of primary school children in Debre Markos Town, northwest Ethiopia. From the results of prevalence research analysis stunting, underweight, and Wasting were 27.5% (95% CI 23.2–31.9%), 20.4% (95% CI 16.5–24.3%), and 8.7% (95% CI 6.2–11.5%). Low levels of education were significantly higher (p <0.05) in children who experienced stunting, underweight, and wasting compared to normal children. In this study, underweight, malnutrition, and stunting factors associated with good academic performance among school-age children. This is in line with research (Suhud et al., 2021) The group of school-age children experienced changes both physically, cognitively, and psychologically. Adolescence begins at the age of 10-12 years and ends at the age of 18-19 years. When entering early adolescence, brain development occurs very rapidly.

A factor influencing the incidence is the presence of a strong association between academic achievement and socioeconomic status because nutritional intake is necessary for biological functions that affect brain function such as cognitive function related to academic performance. Stunting What happens at an early age affects children's comprehension ability in following academic lessons and affects learning achievement outcomes that will have an impact on their future. Low economic factors also affect adolescent learning achievement due to food insecurity and environmental quality problems. According to research (Rompas et al., 2016) Poverty and malnutrition are interrelated phenomena, so the nutritional status of the community is closely related to efforts to improve the economy. Socioeconomic status is also greatly influenced by the level of family income, if food access at the household level is disrupted mainly due to poverty, then malnutrition will inevitably arise.

Research conducted (by Santos et al., 2020) aims to describe the prevalence of stunting in Peruvian youth living in three geographical regions and determine differences in height and Physical Fitness (PF) or physical fitness among children who stunting and children with normal growth in age and sex. The study sampled 7918 subjects (7074 of normal growth and 844 stunting), aged 6-15 years, from sea level, the Amazon, and the Peruvian highlands. PF is assessed with standardized tests, and stunting is calculated following WHO standards. The results of the study showed that the prevalence of stunting increased with age in both sexes from 6% at age 6 to 18.4% at age 15 (girls), and from 9.3% at age 6 to 16.4% at age 15 (boys). In the Amazon region (25.3%), followed by the highlands (24.3%) and sea level (8.1%). The prevalence of stunting is 11% in Peruvian children and adolescents aged 6 to 15 years, with a significant increase with age in both sexes, as well as a higher prevalence in boys than girls.
According to research (Sanjiwani, 2019) Stunting is the result of long-lasting malnutrition (chronic malnutrition) which will lead to delays in mental development, low academic ability, and decreased intellectual ability. In addition to having an impact on children's cognitive, and stunting It also has an impact on children's physical endurance and the risk of metabolic disorders that lead to the onset of non-communicable diseases as adults. Stunting is undernutrition which causes a decrease in the productivity of children and adolescents, to prevent this, it is necessary to get used to applying balanced nutrition for both parents who want to have children and those who still do not have children. Research (Baroroh, 2022) Bring Health Education, Adolescent Nutrition Fulfillment, and Education stunting For adolescents, they will be able to form a good understanding of students, especially adolescents, who are expected to be able to form nutrition-conscious behavior for prevention of undernutrition. Include underweight, stunting and wasting. Community service activities are useful for increasing adolescent knowledge about health education for the fulfillment of adolescent nutrition and education for the prevention of undernutrition.

CONCLUSION
Adolescents are an age that is vulnerable to nutritional disorders and mental health disorders. The nutritional status of adolescents can be influenced by several factors, one of which is diet. Erratic eating patterns can lead to undernutrition resulting from a lack of nutrition knowledge. Malnutrition in adolescents results in decreased body resistance to disease, increased disease rates (morbidity), abnormal growth (short), low intelligence, low productivity, and stunted growth of reproductive organs. If those who experience undernutrition are adolescent girls, then when entering the age of carrying children who are in the womb will be at risk of undernutrition. To prevent this, today's adolescents must be smart about the importance of balanced nutrition by participating in health education and nutrition education organized by health services.

REFERENCES