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## **PSYCHOSOCIAL STRESS, ENERGY AND CALCIUM INTAKE ARE ASSOCIATED WITH NUTRITIONAL STATUS OF FEMALE ADOLESCENTS**

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### **ABSTRACT**

Female adolescents are at risk of nutrient deficiency. Adolescents can experience stress due to social environmental factor called psychosocial stress. The purpose of this study was to determine the relationship between psychosocial stress, energy intake, calcium and the nutritional status of female adolescents. This study used observational analytic with cross-sectional design. Sample of this study was comprised of 166 students from 2 junior high schools in Surakarta City. Psychosocial stress was measured using Psychosocial Stress Assessment Instrument (IPSP). Then energy intake and calcium were collected using 2x24-hour-recall questionnaire and nutrisurvey, while nutritional status data were collected using measurements of body weight (kg) and height (m). Data were then analyzed using chi square test. Results showed that there were relationships between psychosocial stress, energy intake, calcium and nutritional status of the female adolescents ( $p=0.000$ ;  $p=0.031$ ,  $p=0.044$  respectively).

Keywords : Calcium, energy intake, female adolescent, nutritional status, psychosocial stress

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### **ABSTRAK**

Remaja putri beresiko kekurangan zat gizi. Stres remaja dapat timbul dikarenakan faktor lingkungan sosial yang disebut stres psikososial. Tujuan dari penelitian ini yaitu untuk mengetahui hubungan antara stres psikososial, asupan energi, kalsium dengan status gizi pada remaja putri di Surakarta. Desain penelitian menggunakan observasional analitik, dengan rancangan *cross sectional*. Sampel penelitian ini berjumlah 166 siswi dari 2 Sekolah Menengah Pertama yang ada di Kota Surakarta. Pengumpulan data stres psikososial menggunakan kuesioner Instrumen Penilaian Stres Psikososial (IPSP), data asupan energi, kalsium menggunakan kuisisioner recall 2x24 jam dan nutrisurvey, serta data status gizi menggunakan pengukuran berat badan (kg) dan tinggi badan (m). Analisa data menggunakan uji Chi Square. Hasil penelitian menunjukkan terdapat hubungan antara stres psikososial, asupan energi, kalsium dengan status gizi pada remaja putri di Surakarta (masing-masing  $p=0.000$ ;  $p=0.031$ ,  $p=0.044$ ).

Kata Kunci : Kalsium, asupan energi, remaja putri, status gizi, stres psikososial

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## BACKGROUND

Indonesia, through the participation of all elements of society, has sought various ways for health development. It is expected that awareness and willingness from individuals and also ability to live healthy can indirectly improve health status of the people. It is expected that human resources become productive, both in terms of social and economic aspects (Kemenkes, 2015). Health development is an inseparable part of national development. As a response to change of health problem in national and international level, the government renewed the national health system (SKN) in 2009, which aims to regulate the implementation of fair, equitable, affordable and quality health service (Retnaningsih, 2013).

Nutrition is an important part of human development, which has contribution in creating qualified human resources (Baliwati, Khomsan, & Dwiriani, 2004). Nutrition is an important health sector component and it needs serious attention from the government. Nutritional problems, such as lack of nutrition or excessive nutrition, could lead to various problems, including growth, development, intellectual, and productivity problems. Beside, individual with deficient in nutrients are susceptible to infection and illness, whereas those who are excess in nutrients are at risk of degenerative diseases (Almatsier, 2001).

The number of adolescents worldwide is approximately 1.2 billion or 18% of the global population. In Indonesia, according 2010 population census, the 10-19 year age group reached 43.5 million (18% of total population) (Kemenkes, 2015). Female adolescents reached 21.489.600 or 18.11% of total women population. It was projected that in 2035, the number would increase up to 22,481,900 or 14.72% of the total women population. The proportion will slightly decrease, but the number is still relatively large (BKKBN, 2016).

The large number of adolescents means that they will be nation's assets in the future. Government should pay

attention so that they can grow and develop well (Kemenkes, 2014). Health and nutrition for adolescents need attention (Tika, 2016). Female adolescents are at risk of nutrient deficiency due to strict diet program, economic conditions, poor eating habits, and minimal nutritional knowledge (Haq & Murbawani 2014). Female adolescents are the prospective mothers. Nutritional status during adolescence period has effect on pregnancy and the baby (Irdiana & Nindya, 2017).

Adolescence experiences changes in many aspects, including psychological, physical and social changes (Pedro et al., 2016). During adolescence period, individual experiences hormonal changes result in physical and psychological changes (Istiany & Rusilanti, 2014). Individuals are also more vulnerable for stress during this time (Putri, 2014). Stress often happens when there is a gap between expectation and reality (Aryani 2016). Adolescents can experience stress due to social environmental factor which is called psychosocial stress. The increased body weight in adolescents was found to have a relationship with psychosocial stress (Harding et al., 2013).

Higher nutritional needs are required by adolescent to adapt with the changes (Almatsier, Soetardjo, & Soekarti, 2011). Certain amount of energy should be met to support the growth and for activities (Suyanto, 2010). Intake is necessary for metabolism, activities, physical growth and sexual maturity (Istiany & Rusilanti, 2014). Balance of energy production and consumption results in normal nutritional status, but the imbalance leads to nutritional problems, both lacking and over nutritional status (Qamariyah & Nindya, 2018).

A study on food consumption patterns in adolescent showed that female adolescents had higher risk of calcium intake deficiency than males (Harnack, Stang, & Story, 1999; Johnson, Pamily, & Wang, 1998). Calcium is needed by female adolescents to decrease pain during menstruation. Calcium deficit can cause muscle cramps because of

disruption in relaxation and contraction process (Sophia, Muda, & Jemadi, 2013). Female adolescents who have less nutritional status are at risk for stomach cramps during menstruation (Winkjosastro, 2006).

Riset Kesehatan Dasar (Riskesdas) in 2010 showed proportion of nutritional status in adolescent aged 13-15 years old as follows: 2.7% are very thin, 7.4% are thin, 87.4 are normal, and 2.5% are obese. While in 2013, proportion for very thin, thin, normal and obese are 3.3%, 7.8%, 78% and 7.8% respectively.

## METHOD

This was an observational analytic research with cross-sectional approach. Population of this study was 627 female adolescents aged 11-13 years old in SMP Negeri 1 and SMP Negeri 4 Surakarta. They were seventh- and eighth-grade students. A total of 166 respondents participated in this study. They were selected using simple random sampling, with inclusion criteria were (1) active students, (2) not on certain diet programs, and (3) agreed to involve. The exclusion criteria were (1) had history of chronic and infectious disease in the past year, (2) undergoing treatment, (3) not present at the time of the research, and (3) resigning during nutritional status measurement.

Variables examined in this study were psychosocial stress, energy intake, calcium, and nutritional status. The psychosocial stress data were collected using a Psychosocial Stress Assessment Instrument (IPSP) containing 35 events or feelings experienced during the past 6 months and 1 additional empty item (item 36) if there were events other than items 1-35. The assessment of each item of event or feeling was scored 0 if it was not disturbed, 1 if disturbed, and 2 if it was severely disturbed by the event. Then the

severity of the stressors were assessed (Table 1). The score of each item of events was obtained by multiplying and summing the events or feelings with the weight of psychosocial stressors, and categorizing them into four: not experiencing stress (0), experiencing low stress (1-8), mild stress (9-16), moderate stress (17-24), high stress (25-33), very high stress (34-40) and burnout (> 41).

**Tabel 1. Psychosocial stress weight**

Items	Weight
1-5	1
6-10	2
11-15	3
16-20	4
21-30	5
31-35	6

The energy and calcium intake data were obtained using interview method with 2x24-hour-recall questionnaire and nutrisurvey. The data were then averaged and compared with the Nutrient Adequacy Ratio (NAR) of the Health Department (1990) according to the age of each subject and categorized into four according to the Health Department (1990) definitions which are deficit if < 70% AKG, less if < 70% - 80% RDA, adequate if < 80% - 99% RDA, and good if > 100% RDA.

The nutritional status data were obtained from body weight measurement using a stepping scale and height using Microtoise. The measurement carried out twice to avoid bias. The nutritional status of the subjects was calculated based on the Body Mass Index per Age (BMI/Age) which was interpreted into 5 categories of adolescent nutritional status (Table 2). This research protocol has been approved by the medical research ethics committee of FK UNS No. 95 / UN27.6 / KEPK / 2018.

**Tabel 2. Categories and thresholds for child nutritional status based on Body Mass Index (BMI/age) of children aged 5-18 Years**

Nutritional Status Categories	Thresholds (Z-Scores)
Very Thin	<-3 SD
Thin	-3 SD to <-2 SD
Normal	-2 SD to 1 SD
Overweight	>1 SD to 2 SD
Obese	> 2SD

Source: Kemenkes RI (2011)

Bivariate analysis to determine the relationship between independent variables (psychosocial stress, energy intake, calcium) and dependent (nutritional status) variable used Chi-Square test, with significance value of 0.05.

**RESULT**

Table 3 shows more than half of respondents aged 12 years (51.2%).

Almost two third of them experienced very low stress (62%). The majority of respondents were in adequate and good category of energy intake (40.5% and 28.6% respectively). Almost half of respondents had calcium intake deficiency (45.8%). Most of respondents had normal nutritional status (71.1%), but almost one third of them were overweight (28.9%).

**Tabel 3. Age, psychosocial stress, energy, calcium, and nutritional status of the respondents (n=166)**

Variables	n	%
<b>Age (in years)</b>		
11	3	1.8
12	85	51.2
13	74	44.6
14	4	2.4
<b>Psychosocial Stress</b>		
No stress	35	21.1
Very low	103	62
Mild	21	12.7
Moderate	7	4.2
<b>Energy Intake</b>		
Less	50	29.8
Adequate	68	40.5
Good	48	28.6
<b>Calcium Intake</b>		
Deficiency	77	45.8
Less	31	18.5
Adequate	36	21.4
Good	22	13.1
<b>Nutritional Status</b>		
Normal	118	71.1
Overweight	48	28.9

Table 4 shows the result of bivariate analysis using Chi-Square. The analysis showed that there were significant relationships between

nutritional status and psychosocial stress (p=0.000), energy intake (p=0.031) and calcium intake (p=0.044).

**Tabel 4. Bivariate analysis**

Variabel	Nutritional Status		p
	Normal, f(%)	Overweight, f(%)	
<b>Psychosocial Stress</b>			
No stress	18 (15.3)	17 (35.4)	0.005
Very low stress	88 (74.6)	15 (31.3)	
Mild	12 (10.2)	9 (18.8)	
Moderate	0 (0)	7 (14.6)	
<b>Energy Intake</b>			
Less	47 (39.8)	9 (18.8)	0.031
Adequate	39 (33.1)	23 (47.9)	
Good	32 (27.1)	16 (33.3)	
<b>Calcium Intake</b>			
Deficiency	61 (51.7)	16 (33.3)	0.044
Less	21 (17.8)	10 (20.8)	
Adequate	22 (18.6)	18 (37.5)	
Good	14 (11.9)	4 (8.3)	

## DISCUSSION

This study showed that most of students of experienced very low stress (62%). Similarly, a study by Putri (2014) found that most of adolescents experienced mild psychosocial stress (51.8%). Female aged 10-21 years are susceptible to high stressors (Goodyer, Bacon, Ban, Croudace, & Herbert, 2009; Thapar, Collishaw, Pine, & Thapar, 2012). Lack of support was identified as one of factors causing stress in adolescents Putri, 2014).

Stress could be influenced by biological factors (including hereditary, body constitution, physical condition, neurophysiological and neurohormonal) and psychoeducative or socio-cultural factors (personality development and experience). Individual capacity to adapt with stress was influenced by nature of stress and individual's character (Sunaryo, 2013). Psychosocial stress can interfere adolescents' development. Stress should be managed properly to prevent depression (Putri, 2014).

Result showed that less than half of respondents had adequate energy intake (36.9%). A study by Wawointana, Malonda, & Punuh (2016) found 57% of respondents had adequate energy intake. Inadequate energy intake in adolescents causes disruptions in metabolism process, level of activities, physical growth, and sexual maturity (Istiany and Rusilanti, 2014). Energy is needed for metabolic

processes, physical activity, concentration, growth, development and process of waste disposal. Energy is also useful for thinking and it requires 20-30% of the total energy (Devi, 2010).

Result showed that 45.8% of the respondents had deficit calcium intake. Differently, a previous research by Rosvita, Widajanti, & Dina (2018) showed that most of subjects had adequate calcium intake (82.7%). But, a study by Doustmohammadian et al (2013) in female adolescents in Iran showed that most of respondents experienced deficit calcium intake (70.7%).

Calcium is important for muscles contraction. (Yuliarti, 2009). Calcium is also important to prevent pain during menstruation in female adolescents. Calcium deficiency leads to disruption in relaxation-contraction process, resulting in muscle cramps (Sophia et al., 2013). Women have the ability to absorb greater calcium during fertile years, but it decreases after menopause (Brown, 2005).

The present study showed that there was relationship between psychosocial stress and nutritional status (p=0.000). The results showed that 74.6% of students experienced very low stress with normal nutritional status.

The results of this research are in accordance with research conducted by Harding et al (2014) which found respondents with high stress showed a

significant higher increase in body weight compared to those with mild level of stress. Psychosocial stress was identified to be one of factors causing weight gain in adolescents. According to Putri (2014), psychosocial stress in adolescent could be influenced by internal and external factors. Internal factors are such as age, gender, level of education, personality, and genetics, while external factors are such as living condition, school environment, learning burden, family economic status, relationships with other, unplanned events, and habits.

Study showed that there was relationship between energy intake and nutritional status (0.031). Thirty nine point eight percent of respondents were in less energy intake category with overweight nutritional status.

The results of this research was supported by Rokhmah, Muniroh, & Nindya (2016) that found relationship between level of energy adequacy and nutritional status ( $p=0.049$ ). Wawointana et al (2016) found similar result that energy intake was associated to nutritional status ( $p=0.048$ )

Energy intake should be balanced with energy consumption. The imbalance leads to nutritional problem. To maintain optimum nutritional status, individual is suggested to consume variety of foods and use the food pyramid as guidance (Emilia, 2009; Devi, 2010).

This study also showed that calcium intake was correlated to nutritional status ( $p=0,044$ ). About 51.7% of respondents had calcium intake deficiency with normal nutritional status. The result of this research was in accordance to Yamborisut et al (2015) which found calcium intake was correlated to body weight ( $p=0.01$ ) and Body Mass Index ( $p=0.025$ ). Calcium is needed by teenagers for bone growth and reducing pain during menstruation. Calcium consumption can affect permeability of the nerve membrane (Departemen Gizi dan Kesehatan Masyarakat Fakultas Kesehatan Masyarakat Universitas Indonesia, 2013). During adolescence period, absorption rate of calcium and food reaches 75% (Mulyani, 2009). Thus, it is

important to maximize calcium intake.

## CONCLUSION

From this study, it can be concluded that psychosocial stress, energy intake and calcium intake were correlated with nutritional status in female adolescents. Female adolescent should maintain adequate intake of energy and calcium for optimal nutritional status. They also should manage psychosocial stress properly.

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