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NUTRITIONAL STATUS, ENERGY INTAKE AND CALORIE DRINKS AMONG INDONESIA ADOLESCENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Adolescents often experience an imbalance between intake and energy expenditure, resulting in the problem of excess nutrition. Unbalanced energy intake and expenditure and lack of nutritional knowledge are the main factors causing over nutrition. The results of research on National Ministry data showed that the nutritional status of adolescents aged 12-18 years who were over-nourished was 19.1% and obesity was 31%. However, the nutritional status of over-nutrition at the provincial level in Banten was 20.9% and obesity was 30%. **Purpose:** The purpose of this study is to determine the relationship between energy intake, macronutrients, calorie drinks and nutritional knowledge on the nutritional status of adolescents aged 15-18 years in Sukabakti Sub district, Tangerang Regency. **Methods:** Sample was taken by using Proportional Random Sampling technique as many as 97 samples. The variables studied were energy intake, macronutrients, calorie drinks and nutritional knowledge on adolescent nutritional status. This type of research used quantitative research with Chi-Square analysis test. **Results:** In this study, there was no significant (P > 0.05) between energy intake (P = 0.827), protein intake (P = 468), fat intake (P = 0.849), carbohydrate intake (P = 0.449), calorie drinks (P = 0.227), and no relationship between nutritional knowledge and nutritional status (P = 0.231). **Conclusion:** Since adolescent nutritional status is influenced by several factors. not only intake and knowledge, but also influenced by physical activity, infectious diseases, attitudes, parents, environment and many more.

Keywords: calorie drink, energy intake, nutritional status

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INTRODUCTION

Adolescents often experience an imbalance between intake and energy expenditure, resulting in the problem of excess nutrition. Intake of energy and macronutrients that exceeds (≥110% of 2 RDA/Needs) is one of the direct causes of over nutrition (Kemenkes RI, 2014). The need for macro and micronutrients is essential for the growth and development of adolescents (Arisman, 2010). Macronutrients (carbohydrates, protein, and fat) are nutrients that produce energy and calories. Besides that, they are also needed for growth, metabolism, and other needs (Santoso *et al*., 2019).

The research results on data from the National Ministry showed that the nutritional status of adolescents aged 12-18 years who are overweight is 19.1%, and obesity is 31%. This percentage showed that the nutritional status of adolescents in Banten province was still above the national average percentage of nutritional status, which was 19.1%, which means that there were still many adolescents with more nutritional status (Kemenkes RI, 2018). In contrast, the nutritional status is over nutrition at the provincial level in Banten, 20.9%, and obesity, 30%.

Adolescents often experience an imbalance between intake and energy expenditure, resulting in the problem of excess nutrition. Intake of energy and macronutrients that exceeds (≥110% of 2 RDA/Needs) is one of the direct causes of over nutrition (Kemenkes RI, 2014). The need for macro and micronutrients is essential for the growth and development of adolescents (Arisman, 2010). Macronutrients (carbohydrates, protein, and fat) are nutrients that produce energy and calories. Besides that, they are also needed for growth, metabolism, and other needs (Santoso *et al*., 2019).

In addition to energy intake obtained from food, calorie drinks can also contribute a large amount of energy, resulting in weight gain and obesity. Calorie drinks are beverages with a significant high energy contributor compared to other drinks. In the last decade, worldwide consumption of calorie-dense drinks has increased by more than 40% from 1990 to 2016 (Chazelas *et al*., 2019). The age group in America that consumes high-calorie drinks is in their teens (Barquera *et al*., 2016). In Indonesia, in several regions, namely Jakarta, Java, and Sulawesi, the contribution of consumption of calorie drinks to energy intake in adolescents is 21.2% (Febriyani *et al*., 2012) when compared to the percentage of other countries. It is the same as Mexico, which 20.1% of its contribution to calorie drinks (Barquera *et al*., 2016). Drinks that contain high calories such as juices with sugar, soda drinks, energy drinks, alcoholic and syrups.

Knowledge of nutrition is also one of the causes of nutritional problems because it plays a significant role in choosing food and drinks to be consumed (Labban, 2015). Because of good nutritional knowledge, adolescents will have good nutrition if the choice of food and drink is good in quantity and type (Labban, 2015). Knowledge results from the information being observed understood, and remembered. Information can be obtained from various sources, such as daily conversations, life experiences, magazines, newspapers, radio, and TV (Notoatmodjo, 2013).

Based on the above background, over nutrition in adolescents is increasing. Researchers are interested in researching the relationship between energy intake & macronutrients, consumption of calorie drinks, and nutritional knowledge in adolescents in Sukabakti Sub district, Curug District, Tangerang Regency, Banten. Generally, research on the nutritional status of adolescents in Indonesia has been carried out quite a lot. However, the nutritional status associated with energy intake and macronutrients, consumption of calorie drinks, and nutritional knowledge among adolescents in Sukabakti Sub district, Sukabakti Sub-district, Curug District, Tangerang Banten Regency, has never been carried out. Related to nutritional status and based on researchers' observations, many sell high-calorie drinks in the local area. She examined the relationship between Energy and Macro Nutrient Intake with Nutritional Status in Students and researcher Febriyani with the title Calorie Drinks and Its Contribution to Total Energy Intake in adolescents.

The purpose of this study is to determine the relationship between energy intake, macronutrients, calorie drinks and nutritional knowledge on the nutritional status of adolescents aged 15-18 years in Sukabakti Sub district, Tangerang Regency.

METHOD

Study Design

This research was quantitative, with a cross-sectional approach and univariate and bivariate analysis methods.

Population and Sample

The research was conducted in August - October 2020 in Sukabakti Sub district, Curug District, Tangerang Regency, Banten. The population of this study was adolescents aged 15-18 years in Sukabakti Sub district, Curug District, Tangerang Banten Regency. It was obtained 97 samples using the Proportional Random Sampling technique.

Data Collection and Measurement

Data collection techniques were conducted using profile questionnaires, nutritional knowledge questionnaires from food recall 2x24 hours, and a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). The profile questionnaire contains the respondent's identity data in the form of full name, parents' names, address, date of birth, sex, pocket money, and measurements of height and weight to see nutritional status using a Z-score (BMI/Age) which was categorized into thin, regular and obese. In the nutritional knowledge questionnaire in the form of questions related to energy intake, carbohydrates, protein, fat, and calorie drinks, the results will be categorized into less, good and more knowledge to facilitate analysis. Furthermore, it will be categorized into less intake (≤ 80%), good intake (80-110%), and excess intake (≥ 110%) based on the Nutrition Adequacy Rate (RDA). SQ-FFQ to see the contribution of calorie drinks in a day was categorized as low intake (<100 Cal), moderate (100-200 Cal), and high (>200 Cal). From food recalls, 2x24 hours contained all records of what was eaten during the whole day on weekdays and weekends.

Ethical Clearance

This research protocol has been declared ethically feasible by the Health Research Ethics Commission at Universitas Muhammadiyah Prof. Dr. HAMKA, based on certificate no. 03/20.08/0621. Informed consent was taken from adolescent subjects who had been approved by the subject and their parents.

RESULT

The research results showed that the sex characteristics of females were 60.1% more than 38.1% of males, as shown in Table 1.

Table 1. Distribution of Respondents Characteristics

Variable	n	%
Sex		
Male	37	38,1
Female	60	61,9
Age		
15 years old	35	36,1
16 years old	17	17,5
17 years old	29	29,9
18 years old	16	16,5
Allowance		
≤ IDR 10.000,-	67	59,1
> IDR 10.000,-	30	30,9
Nutrition Status		
Thin	9	9,3
Normal	80	82,3
Fat	8	8,2

Table 1 shows that at the respondents age in the range of 15-18 years, the highest proportion was at the age of 15 years, 36.1%, and respondents at the age of 18 years, at least 16.5%. Meanwhile, most of the respondents have pocket money less than IDR 10,000.- which was 69.1% and more than Rp.10,000.- was 30.9%. In the nutritional status based on BMI/U, most of the respondents have a normal category of 82.5%, while the fat category is at least 8.2%.

Table 2. Distribution of Energy Intake, Macronutrients, Calorie Drinks and Nutrition Knowledge

Variable	N	%
Energy Intake		
Less	53	54,6
Good	40	41,2
Over	4	4,1
Macronutrients		
Protein Intake		
Less	48	49,5
Good	40	41,2
Over	9	9,3
Fat Intake		
Less	60	61,9
Good	33	34,0
Over	4	4,1
Carbohydrate Intake		
Less	44	45,9
Good	49	50,5
Over	4	4,1
Calorie Drinks		
Low	67	61,9
Sufficient	26	26,8
High	4	4,1
Nutrition Knowledge		
Good	2	2,1
Sufficient	31	32,0
Poor	64	66,0

Table 2 shows that energy intake was more or less when compared to more energy intake. Based on the average intake of macronutrients, only carbohydrate intake was in the good intake category. The distribution of calorie-drinking beverages in this study, most of the respondents had low-calorie drink intakes as much as 61.9%, compared to the high-calorie beverage intake category 4.1 %. Meanwhile, on the nutritional knowledge from the questionnaire test results, most of the respondents had nutritional knowledge in the less category of 66.0%, compared to the good knowledge category of 2.1%.

Table 3. Relationship of Energy Intake, Macro Nutrients, Calorie Drinks and Nutrition Knowledge

Variable	Nutrition Status IMT/U						Total		*P -Value*
	Thin		Normal		Fat		n	%	
	n	%	n	%	n	%			
Energy Intake									
Less	5	9,4	44	83,0	4	7,5	53	100	0,827
Good – Over	4	3,6	36	81,0	4	9,1	44	100	
Macro nutrition									
Protein Intake									
Less	6	12,2	39	79,6	4	8,2	49	100	0,468
Good – Over	3	6,3	41	85,4	4	8,3	48	100	
Fat Intake									
Less	6	10,0	49	81,7	5	8,3	60	100	0,849
Good – Over	3	8,1	31	83,8	3	8,1	37	100	
Carbohydrate Intake									
Less	5	11,6	35	81,4	3	7,0	43	100	0,449
Good – Over	4	7,4	45	83,3	5	9,3	54	100	
Calorie Drinks									
Low	8	11,9	54	80,6	5	7,5	67	100	0,227
Sufficient – High	1	3,3	26	86,7	3	10,3	30	100	
Nutrition Knowledge									
Less	8	12,5	51	79,7	5	7,8	64	100	0,231
Sufficient-Good	1	3,0	29	87,9	3	9,1	33	100	

Based on Table 3, the results of statistical tests showed that there was no relationship between energy intake, intake of macronutrients in calorie drinks and nutritional knowledge on the nutritional status of adolescents because p> 0.05.

DISCUSSION

People's energy needs are food consumed to produce energy, which has been adjusted to energy expenditure, physical activity, body size and composition (Almatsier, 2016). Based on Table 3, there is no relationship between energy intake and nutritional status (P = 0.827), not only in this study, but the previous research also conducted by Irdiana (2017), regarding energy intake and nutritional status which stated that there was no significant relationship (P-Value = 0.811). In addition, which stated that there was no significant relationship between energy intake and nutritional status in students at JHS 13 Manado City in Atika's (2015) study.

However, if it was viewed from the data on average energy intake, energy intake is less than the need. This can be seen from the description of the food in the 2x24 hour recall, the number of respondents consuming less variety of foods and the frequency of the same food in one day. Besides that, according to research conducted by Irdiana (2017), if the need for carbohydrate intake is not fulfilled, the chances of malnutrition are even greater. This will also affect the intake of other nutrients such as protein, fat, and carbohydrates. The body requires energy for daily activities and metabolic processes (carbohydrates, proteins, and fats). Lack of nutrient intake will result in an imbalance of metabolism in the body which causes malnutrition. Adolescents should eat diverse and nutritionally balanced foods, so that nutrient intake plays an optimal role to meet their growth. (Merryana & Wirjatmadi, 2012).

The role of protein is very important and needs to be considered in the body such as, the formation of essential compounds, building blocks, detoxification of toxins, repair, regulating body systems, carriers of nutrients, energy providers and others (Atma, 2018). Based on this study, the relationship between protein intake and nutritional status was not significant (P = 0.468). This is the same as research conducted by Agustina (2015) that the relationship between protein intake and nutritional status of BMI/Age is not significant. This study is in line with Nurwulan (2017) that the nutritional status of adolescent students was not related between protein intake and nutritional status. However, it was viewed from the data on average protein intake, most of the respondents had protein intake that was less than the requirement, and judging from the results of the 2x24 hour recall. Most of the respondents consumed low-fat and moderate-fat protein. Types of protein consumed are fish, chicken, eggs and meatballs.

Fat serves as a substitute energy source after carbohydrates and proteins are used up, gives a feeling of satiety and deliciousness, lubricants, body cushion, body warmer, a source of essential fatty acids, a means of transporting fat soluble vitamins (vitamins A, D, E, K). (Almatsier, 2016). Based on this study, there was no relationship between fat intake and nutritional status (P = 0.849). Similar to the research conducted by Wulandari (2017) regarding the insignificant relationship between fat intake and nutritional status (P-Value = 0.355), and in line with the research conducted by Ruhmayanti (2018), which the insignificant relationship between fat intake and nutritional status in adolescents in JHS 1 Kabila Gorontalo. However, when viewed from the average intake of fat has less intake. This is because based on the results of the 2x24 recall, it shows that the cooking process by means of sautéing and frying is not carried out consecutively and the food menus eaten are mostly low-fat and moderate.

Carbohydrates are the main source of energy in the body, which functions as a protein saver, regulates metabolism and fat expenditure, and gives food a sweet taste (Almatsier, 2016). Based on this study, there was no significant relationship between carbohydrate intake and nutritional status (P = 0.449). This is supported by the previous research conducted by Atika (2015), regarding carbohydrate intake with nutritional status which stated that there was no significant relationship (P-Value = 1,000), and the same as research by Rahmawati (2017), which is an insignificant relationship between carbohydrate intake and nutritional status of 3rd semester nutrition students of STIKES PKU Muhamadiyah Surakarta. The results of the statistical test in table 3, some of the

respondents have an average carbohydrate intake in the category of less or better or more, the proportion is more in normal nutritional status than thin or fat. This is because respondents have more normal nutritional status and are in line with adequate carbohydrate intake.

Calorie drinks are drinks that contain sugar, drinks that contain sugar including fizzy and carbonated drinks, juice-based drinks, 100% juices, and flavored milk. Great emphasis is placed on soft drinks, and beverages sweetened with high fructose corn syrup (HFCS) (Drewnowski, 2014).

Based on this study, the relationship between calorie drinks and adolescent nutritional status was not significant (P = 0.227). This is supported by the research by Cempaka (2014), regarding the intake of calorie drinks with nutritional status, the results of which are not related (P-Value = 0.149). In addition, research from Parinduri (2018) stated that there is no relationship between calorie drink intake and the incidence of nutritional status in children in Syafana Islamic South Tangerang.

The results of the statistical test in table 3 show that some respondents have an average consumption of low-calorie drinks 50 grams/day, where the number of calories in calorie drinks does not contribute much to energy intake. Based on the SQ-FFQ the frequency of calorie in the calorie drinks for most respondents is only 1-2x/week and the types of drinks that are often consumed are packaged drinks, orange juice, packaged tea and soft drinks. In addition, not all respondents consume calorie drinks. In the interview results, many respondents admitted that, during the COVID-19 pandemic, respondents were often at home and to buy reduced-calorie drinks, in contrast to respondents at school who often bought calorie drinks during breaks and after school.

Knowledge of nutrition is also one of the causes of nutritional problems because it plays a very important role in choosing food and drinks to be eaten. A teenager will have good nutrition if the choice of food and drink is good in terms of quantity and type because of good nutritional knowledge (Labban, 2015).

Based on this study, there was no significant relationship between nutritional knowledge and adolescent nutritional status (P = 231). This is supported by previous research conducted by Noviyanti (2017), regarding nutritional knowledge with insignificant nutritional status (P-Value = 0,147). In addition, in Sutrio's research (2017), there is no significant relationship between nutritional knowledge and nutritional status in female students at Global Madani Senior High School, Bandar Lampung City. The results of statistical tests in Table 3 mostly have poor nutritional knowledge. This is because, at the time of the interview, most of the teenagers had never received education about nutrition. This lack of nutritional knowledge can affect inadequate intake, this is in line with the data on the intake of respondents, most of whom have an average intake of less.

Research Limitation

At the time of the research, it was very difficult to convince respondents to participate, this happened because there were some teenagers who were not willing to be respondents who thought this research was related to the state of the COVID-19 pandemic, even though the researcher had previously explained the aims and objectives of this study which had nothing to do with COVID-19.

In the 24-hour recall interview process using a food photo book, most of the respondents forgot what they ate for the past 24 hours. Therefore, the researcher suggested to the respondents to record what they ate for 24 hours for the 2nd recall on the weekend. At the time of the second recall, the researchers used video calls via WhatsApp due to the limited circumstances during the COVID-19 pandemic, the researchers met face-to-face with the respondents.

CONCLUSION

Based on the research "Relationship of Energy Intake, Macro Nutrients, Calorie Drinks and Nutritional Knowledge with Nutritional Status of Adolescents in Sukabakti Sub district, Tangerang Regency" it can be concluded that energy intake and macronutrient intake are mostly in the category less than the recommended RDA. nutritional knowledge of respondents, most of whom have less knowledge. Some respondents have an average

consumption of low-calorie drinks 50 grams/day, where the number of calories in calorie drinks does not contribute much to energy intake.

The results of statistical tests in Table 3, the variables of energy intake, protein intake, fat intake, carbohydrate intake, calorie drinks, and nutritional knowledge in this study did not have a significant relationship, because the nutritional status of adolescents was influenced by several factors. Not only intake and knowledge, but also influenced by physical activity, infectious diseases, attitudes, parents, environment and many more.

SUGGESTION

For adolescents, it can increase nutritional knowledge in order to improve their nutritional status, because adolescents need good intake for their growth.

For other researchers, it can be expected to further develop this research to be better and to dig deeper into theories and add other variables such as physical activity, infectious diseases, attitudes, parents, environment and many more that better describe the nutritional status of adolescents.

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CONFLICT OF INTEREST

The authors have no conflict of interest.

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AUTHOR CONTRIBUTION

Author Wilda Siti Yulyani as Data Collection, Data Analysis, Data Processing, Manuscript Writing, Reference. Author Debby Endayani Safitri as Editor.

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