



Low Nutritional Intake and Eating Habits in Adolescent Smokers

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Abstract. The nutritional status of adolescents is still a health problem in Indonesia. Many factors determine nutritional status. One of them is smoking behavior. Smoking behavior can affect the nutritional status of adolescents indirectly. This study aimed to determine differences in carbohydrate intake, protein intake, fat intake, frequency of eating main meals, and frequency of snacks in adolescent smokers and non-smokers. This research is a quantitative analytic study with a cross-sectional design. The research sample was divided into 30 groups of smokers and 30 groups of non-smokers. Teenagers who smoke tend to have a lower intake of carbohydrates, protein, fat, energy, and the frequency of eating main meals than non-smokers. Smokers tend to have more frequent snacks than non-smokers. Statistical test results showed that there was a significant difference between the average intake of macronutrients, energy, and eating habits in groups of adolescent smokers and non-smokers. It is expected that adolescents are aware that adolescence is a period of growth and development that requires sufficient intake so they have to stop or not smoke.

Keywords: adolescents, nutritional intake, smokers

1 Introduction

The nutritional status of adolescents is still a health problem in Indonesia. Based on RISKESDAS 2018 data, adolescents aged 16-18 years who experienced nutritional status were severely underweight 1.4%, underweight 6.7%, overweight 9.5%, and obese 4%. The nutritional status of adolescents in DKI Jakarta in 2018 also showed that 1.9% of adolescents were severely underweight, 7% were underweight, 12.8% overweight and 8.3% were obese [1].

Many factors determine nutritional status. One of them is smoking behavior. Smoking behavior can affect the nutritional status of adolescents indirectly [2]. Adolescent smoking behavior 3-6 cigarettes a day (51.5%), 7-12 cigarettes (36.4%), and 20-24 cigarettes (12.1%) [3]. The impact of nicotine on the central nervous system can increase the metabolic rate and suppress appetite [4].

Smoking behavior is related to diet. Research results by [5] showed that the amount of cigarette consumption was significantly associated with poor diet. The need for nutrients in adolescents including energy, protein, iron, calcium, and others increases in adolescents to support adequate growth and development. In conditions where intake is less than optimal, anemia and micronutrient deficiencies are high. The burden of disease in adolescents from

infections, injuries, nutritional deficiencies, and malnutrition is a major public health problem and overweight is increasing as well [6]. Developing countries still face a high burden of malnutrition and anemia. Meanwhile, the burden of being overweight continues to increase in both developed and developing countries [7]. The prevalence of underweight in adolescents and adults was high (36.9%) [8]. This study aimed to determine the differences in the average intake of carbohydrates, protein, fat, energy, meal frequency, and snack frequency between adolescent smokers and non-smokers.

2 Method

This research is quantitative research with a cross-sectional design. The research was conducted on adolescents at SMA Muhammadiyah 11 Jakarta. The research sample was divided into 2 groups. The first group is 30 teenagers who smoke and the second sample is 30 teenagers who don't smoke. The sampling technique used is quota sampling. The research time is December 2022 to June 2023. The data collection time is March 2023.

The dependent variable of the study is smoking behavior, the independent variables are energy and macronutrient intake, main meal frequency, and snack frequency. Data collection was carried out using a questionnaire. The smoking variable consisted of questions on smoker status, age at first smoking, type of cigarette, and number of cigarettes per day. Energy and macronutrient intake variables were collected using form 2 x 24-hour food recall. The first food recall is carried out on weekends and the second food recall is carried out on weekdays. Variables of main meal and snack frequency were conducted using a questionnaire.

Processing of food recall is carried out using Nutri-survey software. Data processing starts from editing, coding, cleaning, and entry using SPSS software. The analysis used is the analysis of independent compare means sample T-test. The purpose of the analysis was to find out whether there were differences in carbohydrate intake, protein intake, fat intake, energy intake, frequency of eating main meals, and frequency of snacks between smoking and non-smoker groups. This study received ethical approval with no 03/23.01/02215 from the UHAMKA health research ethics commission.

3 Result

The univariate results of smoking behavior showed that the age at first smoking was 15 years (50%). Most types of cigarettes are conventional 43.3% and electric 33.3%. The highest number of cigarettes was in the moderate category (5-14 cigarettes) per day (53.3%) (table 1). Univariate results of carbohydrate intake (average 287.04 ± 88.45 gr), protein intake (average 77.58 ± 26.35 gr), fat intake (average 80.78 ± 27.49 gr), energy intake (average 2206.13 ± 626.86 kcal), intake of main meal frequency (average 2.60 ± 0.764 times), snack frequency intake (average 1.90 ± 0.752 times) (table 2).

Table 3 shows the results of the independent sample T-test bivariate test between carbohydrate intake and smoking behavior, namely the average carbohydrate intake of respondents who have smoking behavior is 240.42 ± 99.33 gr while the average carbohydrate intake of respondents who have non-smoking behavior is 333.65 ± 39.43 gr. These results show that the average carbohydrate intake of the smoking group is lower than the average carbohydrate intake of the non-smoker group. Statistical test results obtained p value = 0.000,

meaning that at alpha 5% there was a significant difference between the average carbohydrate intake of respondents who smoked and respondents who did not smoke.

The results of the independent sample T-test bivariate test between protein intake and smoking behavior, namely the average protein intake of respondents who have smoking behavior is 70.86 ± 29.48 gr while the average protein intake of respondents who have non-smoking behavior is 84.29 ± 21.22 gr. These results show that the average protein intake of the smoking group is lower than the average protein intake of the non-smoker group. The statistical test results obtained $p = 0.047$, meaning that at alpha 5% there was a significant difference between the average protein intake of respondents who smoked and respondents who did not smoke (table 3).

The results of the independent sample T-test bivariate test between fat intake and smoking behavior, namely the average fat intake of respondents who have smoking behavior is 72.71 ± 28.68 gr while the average fat intake of respondents who have non-smoking behavior is 88.85 ± 24.06 gr. These results show that the average fat intake of the smoking group is lower than the average fat intake of the non-smoker group. The statistical test results obtained $p = 0.022$, meaning that at alpha 5% there was a significant difference between the average fat intake of respondents who smoked and respondents who did not smoke (table 3).

The results of the independent sample T-test bivariate test between energy intake and smoking behavior, namely the average energy intake of respondents who have smoking behavior is 1927.56 ± 678.35 kcal while the average energy intake of respondents who have non-smoking behavior is 2484.70 ± 422.78 kcal. These results show that the average energy intake of the smoking group is lower than the average energy intake of the non-smoker group. The statistical test results obtained a value of $p = 0.000$, meaning that at alpha 5% there was a significant difference between the average energy intake of respondents who smoked and respondents who did not smoke (table 3).

These results show that the average frequency of eating main meals for the smoker group is lower than the average frequency of eating main meals for the non-smoker group. The statistical test results obtained $p = 0.041$, meaning that at alpha 5% there was a significant difference between the average frequency of eating the main food of respondents who smoked and respondents who did not smoke. These results show that the average frequency of snacks for the smoker group is greater than the average frequency of snacks for the non-smoker group. The statistical test results obtained $p = 0.038$, meaning that at alpha 5% there was a significant difference between the average snack frequency of respondents who smoked and respondents who did not smoke (table 3).

Table 4 shows respondents who had less carbohydrate intake in the smoker group (66.7%) than non-smokers (6.7%). Respondents who had less protein intake were more in the smoker group (53.3%) than non-smokers (36.7%). Respondents who had less fat intake were more in the smoking group (50.0%) than non-smokers (20.0%). Respondents who had less energy intake were more in the smoker group (76.7%) than non-smokers (63.3%). Respondents who had the frequency of eating the main meal were less in the smoking group (53.3%) than non-smokers (30.0%). Respondents who had frequent snacks were more in the smoker group (33.0%) than non-smokers (6.7%).

Table 1. Smoking Habits Of Adolescents (N=30)

Smoking pattern	n	%
First smoking age		
9 years	2	6.6
13 years	5	16.7

14 years	5	16.7
15 years	15	50.0
16 years	3	10.0
Cigarette type		
conventional	13	43.3
electric	10	33.3
both of them	7	23.3
Number of cigarettes		
light (1-4 sticks)	14	46.7
medium (5-14 sticks)	16	53.3
smoking pattern	n	%
First smoking age		
9 years	2	6.6
13 years old	5	16.7
14 years	5	16.7
15 years	15	50.0
16 years	3	10.0

Table 2. Smoking Habits Of Adolescents (N=60)

Intake	Means	Median	Mode	Min	Max	SD	<i>P-value</i>
Carbohydrate	287.04	308.33	160.95	98.50	483.10	88.45	0.210
Proteins	77.58	73.95	45.95	32.15	149.60	26.35	0.689
Fat	80.78	77.92	18.95	18.95	169.60	27.49	0.932
Energy	2206.13	2252.65	974.65	974.65	4111.40	626.86	0.651
Main meal frequency	2.60	3	3	1	6	0.764	0.283
Snack frequency	1.90	2.00	2	1	4	0.752	0.247

Table 3. Distribution of Average Intake according to Smoking Behavior

Intake	Smoking Behavior	Means	SD	SE Means	P Value	N
Carbohydrate	Smoke	240.42	99.33	18.14	0.000	30
	Do not smoke	333.65	39.43	7.20		30
Proteins	Smoke	70.86	29.48	5.38	0.047	30
	Do not smoke	84.29	21.22	3.87		30
Fat	Smoke	72.71	28.68	5.23	0.022	30
	Do not smoke	88.85	24.06	4.39		30
Energy	Smoke	1927.56	678.35	123.84	0.000	30
	Do not smoke	2484.70	422.78	77.18		30
Main meal frequency	Smoke	2.40	0.621	0.113	0.041	30
	Do not smoke	2.80	0.847	0.155		30
Snack frequency	Smoke	2.10	0.845	0.154	0.038	30
	Do not smoke	1.70	0.595	0.109		30

Table 4. Intake and Smoking Behavior

Intake	Smoking Behavior			
	Yes		No	
	n	%	n	%

Carbohydrate				
Low	20	66,7	2	6,7
Normal	9	30,0	27	90,0
High	1	3,3	1	3,3
Proteins				
Low	16	53,3	11	36,7
Normal	6	20,0	8	26,7
High	8	26,7	11	36,7
Fat				
Low	15	50,0	6	20,0
Normal	8	26,7	16	53,3
High	7	23,3	8	26,7
Energy				
Low	23	76,7	19	63,3
Normal	7	23,3	9	30,0
High	0	0	2	6,7
Frequency of eating main meals				
Low	16	53,3	9	30,0
Normal	14	46,7	19	63,3
High	0	0	2	6,7
Snack frequency				
Often	10	33,3	2	6,7
Normal	12	40,0	17	56,7
Low	8	26,7	11	36,7

4 Discussion

The RDA for carbohydrate intake for male adolescents aged 13-15 years is 350 grams, and for male adolescents aged 16-18 years is 400 grams [9]. The main function of carbohydrates for humans is as a source of chemical energy which is important for the whole. Deficiency in carbohydrate intake can lead to malnutrition, ketoacidosis, and overweight. Total carbohydrate intake was found to be lower in the overweight and obese group than in the normal and malnourished group [10]. This study shows that there is a difference in the average energy intake of smokers and non-smokers, but the average of both smokers and non-smokers does not match the nutritional adequacy rate (RDA) [8]. Found energy intake of smokers (2482 kcal) was lower than non-smokers (2510 kcal). Studies by [11] also found that energy intake was lower than RDA. Women tend to have a higher intake than men.

Results [12] showed protein intake of smokers (69.1 g) was lower than non-smokers (74.4 g). The RDA for protein intake for boys aged 13-15 years is 70 grams, and for boys aged 16-18 years is 75 grams [9]. About 15% of the human body weight is in the form of protein. Proteins provide structure for individual cells and the body as a whole. The function of protein is the production of body components, maintaining fluid balance, contributing to acid-base balance, forming hormones and enzymes, contributing to immune function and body defense, providing energy and giving a feeling of satiety, body movement, transporters, and the acute phase response [13]. Low protein intake causes health problems including protein-energy malnutrition, megaloblastic anemia, stunting, liver disease, and disorders of bone and calcium homeostasis. Deficiencies in energy, protein, iron, and zinc intake as well as prolonged infections are the causes of nutritional disorders in children and adolescents [14].

RDA for fat intake for boys aged 13-15 years is 80 grams, and for boys aged 16-18 years is

85 grams [9]. The function of fat is as a depot for energy storage, as a protector of vital organs, a structural component of membranes, a regulator and signaler, a paracrine hormone, helps the transport and absorption of vitamins, provides functional constituents for various metabolic processes, and a major component of the nervous system network [13]. Low-fat intake increases the risk of coronary heart disease, lipid profile and body weight, micronutrient deficiencies, and mortality. According to [15], low-fat, high-carbohydrate diets and low-carbohydrate and high-fat diets are equally effective in controlling body weight and reducing cardiovascular risk factors (blood pressure, triglyceride levels, and blood glucose) [16].

Result [17] showed that smokers (1955 kcal) reported lower energy intake than non-smokers (2161 kcal). The protein intake of smokers (86 g) is lower than non-smokers (94 g). Smokers' fat intake (84 g) is higher than non-smokers' (81 g). Smokers' carbohydrate intake (239 g) is lower than non-smokers' (265 g). Recommended Dietary Allowance (RDA) for Indonesian is a value that indicates the average need for certain nutrients that must be fulfilled every day for almost everyone with certain characteristics which include age, gender, level of physical activity, and physiological conditions, to live healthy. RDA is used at the level of consumption which includes adequate energy, protein, fat, carbohydrates, fiber, water, vitamins, and minerals. The RDA for energy intake for male adolescents aged 13-15 years is 2400 kcal, and for adolescents aged 16-18 years is 2650 kcal [9]. Energy intake is low if $< 100\%$ RDA, normal $100 - < 130\%$ RDA and high $\geq 100\%$ RDA.

Study results from [18] showed respondents who eat with normal frequency have a smaller probability of abdominal obesity than those who eat > 3 times daily food intake with an increased risk of 2.52 (AOR 2.52 95% CI: 1.10-5.75). Consumption of one or more nutrients can cause malnutrition. A deficiency of energy or nutrients causes malnutrition in the form of malnutrition. One of the reasons is due to insufficient intake. Food intake is important to meet the energy needs of the body. Nutrients are chemical substances in food that are essential for human growth and function. Macronutrients are needed in large quantities, usually in units of grams per day. Nutrients included as macronutrients are carbohydrates, fats, and proteins [13].

School children experience malnutrition 18.2%, stunting 41.6%, and underweight 20.0% [19]. Prevalence of undernutrition is 15.7%, overweight 2.1%, and wasting 8.0% [20]. Stunting prevalence is 10.4%, and wasting is 12.1% [21]. Results [22] showed that there was a tendency for lower BMI in smokers than non-smokers. BMI smokers (22.6) were lower than non-smokers (24.8) ($p < 0.001$). The energy intake of smokers is 1699 kcal lower than the energy intake of non-smokers 1734. Carbohydrate intake in smokers is 269 g lower than in non-smokers (278 g). The protein intake of smokers was 59.60 g and of non-smokers 59.68 g. Fat intake is 19.60 g in smokers and 20.16 g in non-smokers.

Adolescents must consume healthy, hygienic, and nutritious snacks containing protein, fat, carbohydrates, and vitamins and minerals [23]. Don't eat snacks that contain toxic dyes, formalin, borax, and flavorings, dirty, uncovered, strikingly beautiful colors, strikingly thick and durable, and too tasty and sweet [24]. One of the causes of smokers experiencing malnutrition is a lack of nutritional intake. Nicotine contained in cigarettes can suppress appetite thereby triggering behavioral changes that encourage smokers to reduce meal portions or meal frequency. There is a relationship between smoking habits and eating frequency among brick workers in Wringinputih Village, Muncar District ($p=0.028$). There is a relationship between smoking habits and the level of energy consumption by brick laborers in Wringinputih Village, Muncar District ($p = 0.001$) [25].

Nicotine in cigarettes can also suppress appetite, thereby triggering behavioral changes that encourage smokers to eat less. This process begins when a cigarette is burned, namely the entry of nicotine into the blood circulation by 25% and into the human brain for approximately 15

seconds. Then nicotine will be received by acetylcholine-nicotinic receptors to stimulate the dopaminergic system in the reward pathway so that it will reduce appetite. In addition, smoking also causes a lack of food taste in smokers, so smokers experience a decrease in appetite [26]. A person who quit smoking is reported to have a weight gain of 1.63 kg (male) and female (1.51 kg) [27]. Smoking behavior in adolescents is influenced by many factors including beliefs, attitudes, mother's work, father's work, access to cigarettes, family smoking behavior, peer influence [28][29].

5 Conclusion

Teenagers who smoke tend to have a lower intake of carbohydrates, protein, fat, energy, and the frequency of eating main meals than non-smokers. Smokers tend to have more frequent snacks than non-smokers. Statistical test results showed that there was a significant difference between the average intake of macronutrients, energy, and eating habits in groups of adolescent smokers and non-smokers. It is expected that adolescents are aware that adolescence is a period of growth and development that requires sufficient intake so they have to stop or not smoke. If the intake is lacking, it will interfere with the growth and development of adolescents. Continuous education for adolescents is needed so that youth are aware and concerned that smoking is not good for their health. Counseling is also needed for teenagers who are already smoking to quit smoking.

Abbreviations

RISKESDAS: Riset Kesehatan Dasar; UHAMKA: Universitas Muhammadiyah Prof. Dr. Hamka, RDA: Recommended Dietary Allowances, Kcal: kilocalories; g: gram.

Ethics Approval and Consent to Participate

This study received ethical approval with no 03/23.01/02215 from the UHAMKA health research ethics commission

Competing Interest

This research is the obligation of lecturers in the tri dharma of education. as a lecturer must carry out the tri dharma one of which is research. Research research every semester and is an internal grant from uhamka. The author's research roadmap is about adolescent health and adolescent nutrition.

Availability of Data and Materials

Research data using primary data. data measurement conducted by interview. Sources of information obtained from respondents according to the instrument. Instrument intake using the instrument to remember 2 x 24 hours.

Authors' Contribution

NM has a role in designing concepts, data processing and analysis, data interpretation and article creation. FB has a role in data collection, coordination, proofreading, translating. H played a role in cleaning data, discussing articles and presenting data.

Acknowledgment

Researchers would like to thank the UHAMKA Research and Development Center (Lemlitbang) for funding with contract letter no. 677 / F.03.07 / 2022 Batch 1 2022.

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