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Association between Energy and Macronutrient Intake and Sleep Duration with Nutritional Status of New Students of the Faculty of Public Health, Universitas Airlangga during Online Courses

Hubungan Asupan Energi dan Zat Gizi Makro serta Durasi Tidur dengan Status Gizi Mahasiswa Baru Fakultas Kesehatan Masyarakat Universitas Airlangga selama Kuliah Online

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ABSTRACT

Background: Learning from home is a government policy to decrease the number of COVID-19 in Indonesia. This condition requires university students to adapt to new technology that has the potential to affect sleep and consumption patterns that will influence their nutritional status.
Objectives: The purpose of the study was to analyze the relationship between energy, macro-nutrient consumption, and sleep duration with the nutritional status of new students of FKM UNAIR.
Methods: The research was an observational study with a cross-sectional design. A total of 55 students were randomly selected to be the research sample. Research data collection was done by using Google Forms. Research data were analyzed using the Spearman correlation test.
Results: Most of the new FKM UNAIR students were female (87.3%), had sleep duration <7 hours/day (56.4%), and had normal nutritional status (69.1%). Most of the respondents had less intake of energy (47.3%), fat (54.5%), carbohydrates (60%), and excess protein intake (52.7%). The statistical tests showed that energy intake (p-value = 0.426), macronutrients including protein (p-value = 0.170), fat (p-value = 0.129), and carbohydrates (p-value = 0.884), also sleep duration (p-value = 0.190) was not related to the nutritional status of new students of FKM UNAIR.
Conclusions: There was no correlation between energy intake, macronutrients, and sleep duration with the nutritional status of new FKM UNAIR students. Instead, students should pay attention to the duration of sleep and intake following the principles of balanced nutrition.

INTRODUCTION

Adolescence is a journey to adulthood characterized by physical and psychic changes[1]. Meanwhile, a teenager is between 10-19 years[2] and can also be defined as a citizen aged 10-18 years or 10-24 years old and unmarried[3,4]. A college student aged 18-21 years enrolled in a college is considered in the early adulthood period[5].

Nutritional status is a condition that describes a person's intake and the nutritional needs needed for various metabolisms of the body[6]. As many as 20.7% of Indonesian adolescents aged 19 are under-nutrition while 15.5% are overweight[7]. The prevalence of adolescents at the age of >19 years who were under-nutrition and overweight was 15.8% and 20.5%, respectively[7]. The state of a person's nutritional status determines a person's nutritional state. Various factors, including age[8], gender[8], and ethnicity[9], can influence a person's nutritional status. A person's nutritional status is also influenced by food intake[10], sleep duration[11], and physical activity level[12]. Other studies have also shown that improper intake patterns increase the likelihood of a college student having lean or obese[13]. The higher a person's food intake, the more nutritional status tends to lead to overweight or even obese[14,15]. Therefore, eating habits that do not follow nutritional rules will cause excessive weight or underweight[16].

The duration and sleep quality also impact a person's nutritional status. Short sleep duration and quality increase a person's risk of obesity by up to 2.28 times greater[17,18]. Short sleep duration can also cause changes in some hormones, such as ghrelin and leptin,

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which increases appetite[19]. As a result, a person's diet and nutritional state will be imacted[20].

The COVID-19 pandemic is a serious global health problem, including in Indonesia. This situation causes various changes in various aspects of life, including education. This condition has caused the government to take steps to reduce the transmission rate of COVID-19 by enforcing rules for work and school from home[21]. Studying from home requires students to adapt quickly to the systems and technology through online lectures, which will likely cause changes and disruptions in sleep patterns. As many as 82% of students sleep poorly during online lecture activities[22].

Besides, online lectures also impact consumption patterns. During the COVID-19 pandemic, student consumption patterns have shifted, surging vegetable and fruit consumption among students[23]. On the contrary, another study showed that during the COVID-19 pandemic, 18.8% of students had poor consumption patterns by not paying attention to nutritional guidelines and nutritional content in the food consumed[24]. Disruption of sleep and consumption patterns can affect the nutritional status of students[25,26]. Accordingly, researchers aimed to study the relationship between energy intake, macronutrients, and sleep duration with the nutritional status of new students of the Faculty of Public Health (FKM), Universitas Airlangga (UNAIR).

METHODS

This research was conducted at FKM Universitas Airlangga Surabaya from March to July 2021 using a *Google Form*. An observational study was used with a cross-sectional research design. Independent variables were sleep duration and intake patterns, including students' energy, protein, fat, and carbohydrate intake during online lectures. The dependent variable was the nutritional status of new undergraduate students of FKM UNAIR. The measurement of variables was carried out using several questionnaires to determine the characteristics of respondents, such as gender, weight and height, sleep duration, and residence status during online lectures as well as a semi-quantitative food frequency questionnaire (SQ-FFQ) to see student nutrient intake. Weight and height were obtained through direct measurements by respondents and were used to determine nutritional status through body mass index (BMI). The BMI category in this study refers to the Regulation of the Minister of Health of the Republic of Indonesia Number 41 of 2014, which is divided into five categories[9]: (1) Skinny if BMI score <17, (2) Thin if BMI 17 to <18.5, (3) Normal if BMI 18.5 to 25, (4) Overweight if BMI >25 to 27, and (5) Obesity if BMI >=27. Data processing was carried out using The Spearman correlation test through the SPSS 25.0 application. New students in 2020 who are currently studying bachelor's degree at FKM UNAIR were the sample, following the inclusion criteria: (1) Not in a sick state, (2) Do not carry out drug therapy or specific diets that can affect consumption patterns, (3) Have no history of ever coming or consulting a psychiatrist, (4) Willing to be a respondent for its research.

The sample size was selected using the Lemeshow formula for simple random sampling, and it was found that the minimum number of samples was 55 new students of S1 FKM UNAIR. This study was approved by The Health Research Ethics Commission of the Faculty of Dentistry, Universitas Airlangga (KEPK FKG UNAIR) on May 28, 2021 (No.266/HRECC.FODM/V/2021).

RESULTS AND DISCUSSION

A total of 55 students were selected and met the criteria as respondents. Most respondents in this study were female (87.3%) and had a sleep duration of <7 hours per day (56.4%). Moreover, almost all respondents in this study lived with their parents (98.2%) during online lectures. Table 1 illustrates the characteristics of the respondents.

Table 1. Characteristics of respondents

Characteristics	n	%
Gender		
Male	7	12.7
Female	48	87.3
Sleep Duration (National Sleep Foundation, 2010)		
<7 hours/day	31	56.4
7-8 hour/day	22	40.0
>8 hours/day	2	3.6
Where to Stay during Online Lectures		
Parent's House	54	98.2
Boarding House/Rented	1	1.8
Total	55	100.0

Most respondents' nutritional status in this study was normal (69.1%). Meanwhile, the nutritional status of obese students ranked the lowest percentage, only 5.5%. The nutritional status of respondents can be seen more clearly in Table 2.

Table 3 shows that most respondents in this study had less energy intake levels (47.3%). As many as 60% of respondents have a low level of carbohydrate intake. Furthermore, most respondents had less fat (54.5%) and more protein (52.7%).

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Table 2. The percentage of respondents' nutritional status

Nutritional Status	n	%
Severely Underweight	4	7.3
Underweight	4	7.3
Normal	38	69.1
Overweight	3	5.5
Obesity	6	10.9
Total	55	100.0

Table 3. Respondents' energy intake and macro-nutrient intake

Food Intake	Category	n	%
Energy Intake	Less	26	47.3
	Enough	20	36.4
	Over	9	16.4
	Total	55	100.0
Carbohydrate Intake	Less	33	60.0
	Enough	16	29.1
	Over	6	10.9
	Total	55	100.0
Fat Intake	Less	30	54.5
	Enough	15	27.3
	Over	10	18.2
	Total	55	100.0
Protein Intake	Less	7	12.7
	Enough	19	34.5
	Over	29	52.7
	Total	**55**	**100.0**

Table 4 shows no association between sleep duration and respondents' nutritional status (p-value = 0.190). Many questions in the research questionnaire caused boredom, and respondents were not filling the questionnaire according to their condition. This condition leads to bias in data collection. Hence no relationship was found between the two variables.

Studies by Mufidah (2021) and Setiawati (2019) supported our finding that the nutritional status of a student was not affected by sleep duration[27,28] but rather influenced by other factors such as eating intake and physical activity, age, and gender[29]. Other studies also mentioned that sleep duration was not related to the nutritional status of students[30]. The study also explained that there was no relationship between these variables because of indirect factors such as sleep duration and direct factors such as infection and food intake. The effect of less sleep duration on the increase in body mass index occurs more in children than adults[31]. It can happen because the tolerance changes in biological balance in children are better than in adults[32].

On the contrary, other studies have shown that lack of sleep duration could increase a person's risk of being overweight and obese[33]. Another study showed that adolescents with short sleep duration had a 1.1 times greater risk of being overweight than adolescents with long sleep duration (> 11 hours/day)[34]. Meanwhile, the recommended sleep duration by the National Sleep Foundation (NSF) is 7 to 9 hours each night[35]. A study by Wang (2018) explained that short sleep duration could increase a person's appetite due to changes in the secretion of hunger and satiety hormones[36]. Moreover, short sleep duration could also increase a person's tendency to consume unhealthy foods, including sugary drinks, fast food, instant noodles, and confectionery products, and decrease the consumption of vegetables, fruit, and milk[37]. The impact of not following the sleep duration recommendations can increase the size of a person's waist circumference, which is one of the indicators to determine the risk of various cardiovascular diseases[38].

The Spearman correlation test shows that there was no correlation between energy intake (p-value = 0.426), protein intake (p-value = 0.170), fat intake (p-value = 0.129), and carbohydrate intake (p-value = 0.884) and the nutritional status. On top of that, the researcher did not conduct preliminary studies on the population group but only took food types based on the availability and access to food for all regions. This condition affected the results due to incomplete food consumption recorded by the researcher.

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Table 4. Relationship of sleep duration with nutritional status of respondents

Variable	Nutritional Status												*p-value*	*r value*
	Severely Underweight		Underweight		Normal		Overweight		Obesity		Total			
	n	%	n	%	n	%	n	%	n	%	n	%		
Sleeping Duration														
<7 hours/day	2	3.6	0	0.0	24	43.6	1	1.8	4	7.3	31	56.4	0.190	-0.188
7-8 hour/day	1	1.8	4	7.3	13	23.6	2	3.6	2	3.6	22	40.0		
>8 hours/day	1	1.8	0	0.0	1	1.8	0	0.0	0	0.0	2	3.6		
Total	5	7.2	4	7.3	38	69.0	3	5.4	6	10.9	55	100.0		

*) Significant if p-value < 0.05

Studies conducted on 3rd-semester students of STIKES PKU Muhammadiyah Surakarta also showed that energy intake (p-value= 0.227), protein intake (p-value= 0.162), fat intake (p-value= 0.218), and carbohydrate intake (p-value= 0.634) were not related to nutritional status[39]. Another study also explained no correlation between energy intake and the nutritional status of first-year students at the Faculty of Medicine, Universitas Brawijaya[36]. In comparison, a study explained that protein intake (p-value = 0.039) and energy (p-value = 0.010) were related to the nutritional status of adolescents[40]. Another study explained that the more fat consumed, the higher a person's tendency to be overweight or obesity[41]. High fat intake during adolescence causes increased risks of being overweight or obese, leading to various diseases later in life[42].

Table 5. Relationship of energy and macro-nutrient intake with respondents' nutritional status

Variable	Nutrition Status												*p-value*	*r-value*
	Severely Underweight		Underweight		Normal		Overweight		Obesitas		Total			
	n	%	n	%	n	%	n	%	n	%	n	%		
Energy intake														
Less	1	1.8	4	7.3	17	30.9	1	1.8	3	5.5	26	47.3	0.426	0.110
Enough	2	3.6	0	0.0	16	29.1	0	0.0	2	3.6	20	36.4		
Over	1	1.8	0	0.0	5	13.2	2	3.6	1	1.8	9	16.4		
Total	4	7.2	4	7,3	38	73.2	3	5.4	6	10.9	55	100.0		
Protein Intake														
Less	0	0.0	1	1,8	5	9.1	0	0.0	1	1.8	7	12.7	0.170	0.188
Enough	2	3.6	1	1,8	16	29.1	0	0.0	0	0.0	19	34.5		
Over	2	3.6	2	3,6	17	30.9	3	5.5	5	9.1	29	52.7		
Total	4	7.2	5	7,2	38	69.1	3	5.5	6	10.9	55	100.0		
Fat Intake														
Less	2	3.6	4	7,3	21	38.2	0	0.0	3	54.5	30	54.5	0.129	0.207
Enough	1	1.8	0	0.0	11	20.0	1	1.8	2	3.6	15	27.3		
Over	1	1.8	0	0.0	6	10.9	2	3.6	1	1.8	10	18.2		
Total	4	7.2	4	7.3	38	69.1	3	5.4	6	59.9	55	100.0		
Carbohydrate Intake														
Less	2	3.6	3	5.5	22	40.0	1	1.8	5	9.1	33	60.0	0.884	-0.020
Enough	1	1.8	1	1.8	13	23.6	1	1.8	0	0.0	16	29.1		
Over	1	1.8	0	0.0	3	5.5	1	1.8	1	1.8	6	10.9		
Total	4	7.2	4	7.3	38	69.1	3	5.4	6	10.9	55	100.0		

*) Significant if p-value < 0.05

On the other hand, lack of energy intake and macro-nutrients can also cause imbalances of metabolisms, resulting in a decrease in body mass and can cause changes in the immune system, blood circulation, digestive tract, and body metabolism[43]. No relationship between the two variables can be caused by respondents' inability to remember and know the food consumed, both type and quantity, causing the results of the intake calculation not to describe the suitability of the respondent's actual nutritional state. Not only do energy and macro-nutrient intake factors affect the situation, but various other factors, such as physical activity levels, stress levels, nutrition knowledge, economic levels, environmental factors, etc., that were not studied and analyzed in this study[44]. The limitation of the study is that the researcher did not conduct a preliminary study related to respondents' consumption patterns, and a large number of questions can result in respondents feeling bored, which can affect the study results.

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CONCLUSIONS

To conclude, energy and macro-nutrient intake and sleep duration have no relationship with the nutritional status of new undergraduate students of FKM UNAIR during online lectures. Researchers recommend that students continue to pay attention to sleep duration and consumption patterns under the principles of balanced nutrition to prevent the changes in nutritional status that lead to overweight or obesity.

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