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The Relationship Between Consumption of Vegetables, Fruits, and Breakfast with the Incidence of Overweight in Students

Hubungan Antara Konsumsi Sayur, Buah, dan Sarapan dengan Kejadian Status Gizi Lebih pada Mahasiswa

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Abstract: *Overweight is a manifestation of the body due to excess energy intake so that it is stored in more form in the body. During the last ten years there has been an increase in the incidence of overweight and obesity in Indonesia. Students are a group that is vulnerable to experiencing overweight events due to changes in lifestyle that affect eating patterns. Risk factors that can be improved in diet are consumption of vegetables, fruit, and breakfast.* ***Objectives:*** *This study was conducted to determine the relationship between consumption of vegetables, fruit, and breakfast with the incidence of overweight in students in Sleman Regency.* ***Methods:*** *The design of this study was cross-sectional. Data was obtained using a google form questionnaire. Sampling technique with consecutive sampling. The subjects of this study amounted to 251 students. Data analysis used descriptive analysis, Chi-square, Fisher exact, Haenszel Mantel, and multiple logistic regression. The results showed that there was a significant relationship between the consumption of fruit menu types (PR = 0.523 p = 0.043) and the timeliness of breakfast (PR = 0.486 p = 0.047) with the incidence of more overweight in students.* ***Results:*** *There was no significant relationship between consumption of vegetables, types of vegetable menus, amount of fruit, regularity of breakfast, and breakfast components with the incidence of overweight in students (p>0.05). Students who often eat fatty foods and eat breakfast on time have a 2 times greater risk of experiencing more overweight [(95% CI 1.143-4.077) p=0.017]. It can be concluded that there is a significant relationship between the consumption of fruit menus and the timeliness of breakfast with the incidence of more overweight of students.* ***Conclusion:*** *There is no significant relationship between vegetable consumption and the incidence of overweight status of students. Students who often eat fatty foods and eat breakfast on time have a 2.2 times greater risk of experiencing excess overweight.*

Keywords: *Breakfast, Overweight, Vegetable and fruit consumption*

1. INTRODUCTION

Overweight status is a picture of the state of the body experiencing excess energy due to excessive food intake from the body's needs, so that it is stored in the form of fat in the body (1). Overweight status consists of 2 categories which are distinguished based on the measurement range of body mass index (BMI), namely >25.0 - 27.0 for overweight and >27.0 for obesity (2). The impact of overweight status that is not

handled in the long term can contribute to being one of the risk factors for increasing degenerative diseases throughout the world (3).

Around 1.9 billion adults worldwide are overweight or obese (4). According to Basic Health Research data in the last ten years, there has been an increase from 10% and 11.7% (5) to 13.6% and 21.8% of the incidence of overweight and obesity in Indonesia (6) contributed to the national 12th rank in contributing to the incidence of 13.3% overweight and 21.4% obesity. Sleman Regency has the second highest prevalence of 14.20% overweight and the third highest 22.95% obesity which is higher than the prevalence in Indonesia (6).

More overweight problems can be found in all age groups, one of which is students who enter the age of 18-25 years or early adulthood. In early adulthood there is a transition from adolescence to adulthood which affects changes in lifestyle (7) and dietary behavior (3). The incidence of overweight during this period is influenced by several things, namely consumption patterns, physical activity, body image, gender (8), and allowance (9). Diet is an important behavior because it can have an influence on a person's nutritional state, this is related to both the quantity and quality of drinks or food consumed (2).

Vegetables and fruit are the main sources of dietary fiber (1; 11). Fiber has benefits for the body to delay gastric emptying (12). The need for fiber in the 19-29 year age group for both men and women is 37 grams and 32 grams per day (13). The need for fiber can be met by consuming vegetables and fruit in accordance with the recommendations of the Ministry of Health of the Republic of Indonesia in a Balanced Nutrition Message of 250 grams of vegetables and 150 grams of fruit per day (2). Awareness of consuming vegetables and fruit in Indonesia is still lacking, only around 4.5% have implemented the recommendation (6). Lack of consumption of vegetables and fruit from needs is one of the factors for increasing body weight (14). Other studies show different results, consumption of several types of vegetables and fruit can actually increase body weight (15; 10).

A quality breakfast has benefits for maintaining weight and is able to meet the intake of 15-30% of a person's nutritional needs in a day (16). The habit of skipping breakfast in Asia, the Pacific, and Western countries is associated with the incidence of overweight and obesity (17). When a person skips breakfast, he tends to feel hungry and overeat at the next meal. This situation will cause an imbalance in the intake of nutrients in the body which can increase the percentage of body fat (18) thus triggering the incidence of obesity (18). Inversely proportional results show that breakfast habits have no effect on the overweight of students (19) and there is no significant difference in the overweight of individuals who eat breakfast and skip breakfast (20).

The inconsistency of several studies conducted between each variable and no previous similar research found linking the consumption of vegetables, fruit, and breakfast with more overweight in students was the reason the researchers chose the topic of discussion. This study was conducted to determine the relationship between consumption of vegetables, fruit, and breakfast with more overweight in students in Sleman Regency.

2. METHODS

The method used in this research is quantitative research. The type of research is analytic observational, and the research design is cross-sectional. This study has a population of all university students in Sleman Regency totaling 205,293 students (21). The samples in this study were university students in Sleman Regency aged 19-25 years. The inclusion criteria for the subjects of this study were all active university students in Sleman Regency, aged 19-25 years, and agreed to the informed consent form given. Exclusion criteria for the subjects of this study were incomplete data samples related to variables (patterns of consumption of vegetables and fruit, breakfast, expenditure used for food, housing, consumption of risky foods and beverages), athletes, having a history of diseases/conditions that interfered with measurement and interpretations such as diabetes, pregnancy, or hypertension, following a special diet, and/or taking education outside the Sleman Regency Universities. The sampling technique is consecutive sampling which uses all subjects according to the selection criteria within a certain time to be selected as samples (22).

The data collection technique was done by filling out a questionnaire or an online questionnaire. The tool used to collect data is a google form with questions used to adjust to the required variables. This research was carried out in June 2021 online to be filled out by students.

3. RESULTS

This study lasted for two weeks in order to reach the minimum required number of subjects, namely 233 people. The number of participating subjects was 251 people with an age range of 19-25 years. No subjects were excluded from this study after cleaning the data.

The subjects in this study had less tendency to consume vegetables (96.4%) and fruit (84.1%) than the recommended amount, with an average of 36.18 grams and 72.36 grams per day. Most of the subjects had good consumption of vegetable menu types (57.4%), but not consumption of fruit menu types (23.9%). The subjects in this study had relatively regular breakfast (50.2%), most of them had breakfast on time (72.9%) and had less breakfast components (72.9%). The average overweight of the subjects was 22.34 kg/m2 which was included in the normal category.

Table 1. Characteristics of Subjects Based on Number of Vegetables, Types of Vegetable Menus, Number of Fruits, Types of Fruit Menus, Breakfast Regularity, Timeliness of Breakfast, Breakfast Components, and Student overweight

Variable	N	%
Number vegetable (gram)		
Moderate (>100 gr)	9	3,6
Low (≤100 gr)	242	96,4
Types of vegetable menus (menu)		
Good (≥2 Types of menu)	144	57,4
Low (<2 Types of menu)	107	42,6
Number fruit (gram)		
Moderate (>100 gr)	40	15,9
Low (≤100 gr)	211	84,1

Types of menu fruit (menu)		
Good (≥2 Types of menu)	60	23,9
Low (<2 Types of menu)	191	76,1
Breakfast regularity		
Regular (4-7 times/week)	126	50,2
irregular (1-3 times/week)	125	49,8
Timeliness of breakfast		
On time (≤09.00)	183	72,9
Late (>09.00)	68	27,1
Breakfast Components		
Good (≥5 components)	68	27,1
Low (<5 components)	183	72,9
Nutrition Status (kg/m²)		
Not overweight (≤25,00)	181	72,1
Overweight (>25,00)	70	27,9

Based on statistical data, it was found that there was a significant relationship between the type of fruit menu and the timeliness of breakfast with the incidence of overweight status in students ($p<0.05$). The variable number of vegetables, type of vegetable menu, amount of fruit, regularity of breakfast, and breakfast components have a relationship with the incidence of overweight status in students, but not statistically significant. The consumption of fruit menu types has a Prevalence Ratio (PR) = 0.523 which is significant as a protective factor (95% CI 0.278-0.984). The punctuality of breakfast has a value of PR = 0.486, but the meaning cannot be known with certainty as a risk or protective factor because the confidence interval includes the number 1 (95% CI 0.236-1,000). This means that the sample of this study may still have a PR value = 1, so it cannot be directly concluded that the inaccuracy of breakfast time being studied is a protective factor in the incidence of overweight status.

Table 2. The Relationship Between Consumption of Vegetables, Fruits, and Breakfast with the Incidence of overweight in Students

Variable	Not overweight		overweight		*p* value	*PR*	CI 95%
	n	%	n	%			
Number vegetable							
Moderate (>100 gr)	9	3,6	0	0,0			1,255-1,457
Low (≤100 gr)	179	71,3	63	25,1	0.177	1,352	
Types of menu vegetable							
Good (≥2 Types of menu)	104	41,4	40	15,9			0,395-1,282
Low (<2 Types of menu)	84	33,5	23	9,2	0,256	0,712	
Number fruit							
Moderate (>100 gr)	29	11,6	11	4,4			0,403-1,846
Low (≤100 gr)	11	63,3	52	20,7	0,703	0,862	
Types of menu fruit							
Good (≥2 Types of menu)	39	15,5	21	8,4			0,278-0,984
Low (<2 Types of menu)	149	59,4	42	16,7	0,043*	0,523	
Breakfast regularity							
Regular (4-7 times/week)	92	36,7	34	13,5			0,461-1,448
irregular (1-3 times/week)	96	38,2	29	11,6	0,489	0,817	
Timeliness of breakfast							
On time (≤09.00)	131	52,2	52	20,7			0,236-1,000
Late (>09.00)	57	22,7	11	4,4	0,047*	0,486	
Breakfast components							
Good (≥5 components)	51	20,3	17	6,8			0,530-1,915

Low (<5 components)	137	54,6	46	18,3	0,982	1,007

Based on statistical data, it was obtained that there was a significant relationship between the consumption of fatty foods and the incidence of overweight in students (p <0.05). Consumption of fatty foods has a PR value = 2.048 which means that students who often eat fatty foods have a 2 times greater chance of experiencing more overweight events than students who rarely eat fatty foods (95% CI 1.095-3.834). Insignificant results were obtained on the variables of the relationship between gender, place of residence, allowance, consumption of sweet foods, sweet drinks, and instant foods with more overweight in students.

Table 3. The Relationship Between Gender, Place of Residence, allowance, and Consumption of Food at Risk with the Incidence of overweight in Students

Variable	Not overweight		overweight		*p* value	*PR*	CI 95%
	n	%	n	%			
Sex							
Men	50	19,9	20	8,0			0,418-1,450
Women	138	55,0	43	17,1	0,430	0,779	
Residence							
Private Home	108	43,0	40	15,9			0,413-1,399
Dormitory	80	31,9	23	9,2	0.399	0,776	
allowance (Rupiah)							
High (>750.000)	107	42,6	35	13,9			0,595-1,877
Low (≤750.000)	81	32,2	28	11,2	0,884	1,057	
Sweet food consumption							
Rarely (≤2 times/week)	75	29,9	26	10,4			0,529-1,688
Often (>2 times/week)	113	45,0	37	14,7	0,847	0,945	
Sweet drink consumption							
never	18	7,2	7	2,8			
Rarely (≤2 times/week)	114	45,4	39	15,5	0,807	0,880	0,342-2,265
Often (>2 times/week)	56	22,3	17	6,8	0,788	0,781	0,279-2,182
Consumption of fatty foods							
Rarely (≤2 times/week)							
Often (>2 times/week)	81	32,3	17	6,8	0,023*	2,048	1,095-3,834
	107	42,6	46	18,3			
Instant food consumption							
Never	6	2,4	2	0,8			
Rarely (≤2 times/week)	152	60,6	49	19,5	1,000	0,967	0,189-4,948
Often (>2 times/week)	30	12,0	12	4,8	1,000	1,200	0,212-6,801

Stratification was carried out to determine the PR value in each strata class and to determine the role of risky food consumption of fatty foods as a confounding factor and/or effect modifier that affects the incidence of overweight status in students. Consideration of the stratification of consumption of fatty foods on the consumption of vegetables, fruit, and breakfast on the incidence of overweight status of students is carried out because fatty foods are one of the contributors to increased energy in the body. Stratification analysis in this study used the Haenszel Mantle test. The difference between crude PR and adjusted PR (MH PR) is greater than 10% which indicates that there is a confounding factor. Based on these conditions, it is known that there is no confounding factor in the consumption of fatty foods on the consumption of fruit, vegetables, and breakfast with the incidence of excess overweight in students.

Consumption of fatty foods is an effect modifier on the relationship between consumption of vegetable menus and the incidence of overweight status in students. This is known from the PR value in each stratum which has a difference of more than 10%. Rarely eating fatty foods in students who are not good at consuming the type of vegetable menu have a 1 time lower chance of experiencing more overweight events than students who are good at eating the type of vegetable menu. Students who are not good at consuming vegetable menus and often eat fatty foods have a 1.6 times lower chance of occurrence of overweight than students who are good at eating vegetable menus. The results obtained in this analysis were not statistically significant (Table 4).

Table 4. Stratification of fatty food consumption on the relationship between consumption of vegetable menus and the incidence of student overweight

Consumption of fatty foods	Types of vegetable menus	Overweight		PR	*P*	CI 95%
		No	Yes			
Rarely (≤2 times/week)	Good	46	10			(0,318-2,659)
	Low	35	7	0,920	0,878	
Often (>2 times/week)	Good	58	30			(0,308-1,292)
	Low	49	16	0,631	0,206	
			Crude PR	0,712		(0,395-1,282)
			MH PR	0,710		(0,392-1,283)

Consumption of fatty foods is an effect modifier on the relationship between consumption of the amount of fruit and the incidence of overweight in college students. Rarely consuming fatty foods in students who consume less amount of fruit have a 2.2 times greater chance of experiencing more overweight events than students who consume sufficient amounts of fruit. Consumption of a low amount of fruit in students who often consume fatty foods has a 1.4 times lower chance of occurrence of overweight than students who consume sufficient amounts of fruit. The results obtained in this analysis were not statistically significant (Table 5).

Table 5. Stratification of consumption of fatty foods on the relationship between consumption of the amount of fruit with the incidence of overweight status of students

Consumption of fatty foods	Number fruit	Overweight		PR	*p*	CI 95%
		No	Yes			
Rarely (≤2 times/week)	Moderate	11	1			(0,302-20,904)
	Low	70	16	2,154	0,379	
Often (>2 times/week)	Moderate	18	10			(0,307-1,728)
	Low	89	36	0,728	0,471	
			Crude PR	0,862		(0,403-1,846)
			MH PR	0,923		(0,424-2,010)

Consumption of fatty foods is an effect modifier on the relationship between consumption of fruit menus and the incidence of overweight in students. Students who are not good at consuming fruit menus and rarely eat fatty foods have a 3.1 times lower chance of occurrence of overweight than students who are good at consuming fruit menus. Frequently consuming fatty foods in students who are not good at consuming fruit menu types have a 1.4 times lower chance of experiencing more overweight events than students who are good at consuming fruit menu types. Statistically significant

results were found in the variable that rarely consumed fatty foods, while frequent consumption of fatty foods was not statistically significant (Table 6).

Table 6. Stratification of fatty food consumption on the relationship between consumption of fruit menu types with the incidence of student overweight

Consumption of fatty foods	Types of Menu fruit	Overweight		PR	*p*	CI 95%
		No	Yes			
Rarely	Good	12	6			(0,099-
(≤2 times/week)	Low	69	11	0,319	0,047*	1,026)
Often	Good	27	15			(0,328-
(>2 times/week)	Low	80	31	0,698	0,349	1,484)
			Crude	0,523		(0,278-
			PR	0,565		0,984
			MH PR			(0,300-
						1,065)

Consumption of fatty foods is an effect modifier on the relationship between breakfast regularity and the incidence of overweight in university students. Rarely eating fatty foods in students who do not regularly have breakfast have a 1.5 times lower chance of experiencing more overweight events than students who regularly eat breakfast. Students who do not regularly eat breakfast and often eat fatty foods have a 1.1 times lower chance of experiencing overweight than students who regularly eat breakfast. The results obtained in this analysis were not statistically significant (Table 7).

Table 7. Stratification of fatty food consumption on the relationship between breakfast regularity and the incidence of student overweight

Consumption of fatty foods	Breakfast regularity	Overweight		PR	*p*	CI 95%
		No	Yes			
Rarely	Regular	39	10			(0,225-1,876)
(≤2 times/week)	Irregular	42	7	0,650	0,424	
Often	Regular	53	24			(0,451-1,797)
(>2 times/week)	Irregular	54	22	0,900	0,764	
			Crude PR	0,817		(0,461-1,448)
			MH PR	0,816		(0,458-1,454)

Consumption of fatty foods is an effect modifier on the relationship between breakfast timeliness and the incidence of overweight in university students. Students who do not have breakfast on time and rarely eat fatty foods have a 6 times lower chance of experiencing more overweight events than students who eat breakfast on time. Frequently consuming fatty foods in students who do not have breakfast on time have a 1.8 times lower chance of experiencing overweight events compared to students who eat breakfast on time. The results obtained in this analysis were not statistically significant (Table 8).

Table 8. Stratification of fatty food consumption on the relationship between punctuality of breakfast with the incidence of overweight status of students

Consumption of fatty foods	Timeliness of breakfast	Overweight		PR	*p*	CI 95%
		No	Yes			

Rarely	On time	59	16			
(≤2 times/week)	Late	22	1	0,168	0,060	(0,021-1,340)
Often	On time	72	36			
(>2 times/week)	Late	35	10	0,571	0,172	(0,255-1,283)
			Crude PR	0,486		(0,236-1,000)
			MH PR	0,449		(0,215-0,939)

Consumption of fatty foods is an effect modifier on the relationship between breakfast components and the incidence of overweight status in students. Students who have less breakfast components and rarely eat fatty foods are 1.9 times more likely to experience more overweight events than students who have sufficient breakfast components. Frequently consuming fatty foods and having breakfast components that are less likely to experience overweight events are 1.2 times lower than students who have sufficient breakfast components. The results obtained in this analysis were not statistically significant (Table 9).

Table 9. Stratification of fatty food consumption on the relationship between breakfast components and the incidence of student overweight

Consumption of fatty foods	Komponen breakfast	Overweight		PR	*p*	CI 95%
		No	Yes			
Rarely (≤2 times/week)	Good	23	3			
	Low	58	14	1,851	0,361	(0,486-7,048)
Often (>2 times/week)	Good	28	14			
	Low	79	32	0,810	0,588	(0,378-1,735)
			Crude PR	1,007		(0,530-1,925)
			MH PR	1,015		(0,529-1,947)

Multiple Logistics Regression Test on multivariate analysis produces several regression models in analyzing the relationship between the incidence of overweight status in students and the factors that influence it. The manual method was used to determine other variables excluded from the analysis, which were known to have no significant relationship with the incidence of overweight status (p> 0.05). In model 3, it is known that students who often eat fatty foods and don't have breakfast on time have a 2.2 times greater risk of experiencing more overweight than students who rarely eat fatty foods [(95% CI 1.143-4.077) p = 0.017. The ability of the independent variable in explaining the incidence of overweight is better known from the Pseudo R-square value of 5.9%, which means that there are still 94.1% of other factors outside the model that explain the incidence of overweight status in students (Table 10).

Table 10. Logistics Regression Model Relationship of Fruit and Breakfast Consumption with the Incidence of overweight of Students

Variable	PR	CI 95%	*p* value	*Pseudo R-square*
Model 1				
Types of menu fruit (Low vs Good)	0,511	0,270-0,968	0,040*	4,8%
Timeliness of breakfast (Late vs on time)	0,475	0,230-0,983	0,045*	

Model 2				
Types of menu fruit (Low vs Good)	0,558	0,295-1,058	0,074	4,9%
Consumption of fatty foods (Often vs Rarely)	1,951	1,037-3,671	0,038*	
Model 3				
Timeliness of breakfast (Late vs on time)	0,455	0,219-0,943	0,034*	5,9%
Consumption of fatty foods (Often vs Rarely)	2,163	1,143-4,077	0,017*	
Model 4				
Types of menu fruit (Low vs Good)	0,543	0,285-1,037	0,064	7,8%
Timeliness of breakfast (Late vs on time)	0,443	0,212-0,926	0,031*	
Consumption of fatty foods (Often vs Rarely)	2,073	1,093-3,930	0,026*	

4. DISCUSSION

The relationship between vegetable consumption and the incidence of overweight

The results of the univariate analysis showed that students had a habit of consuming vegetables that were lower than the recommended one. On average, students consume 36.18 grams of vegetables per day. Studies in Makassar show several reasons that trigger teenagers to be reluctant to eat vegetables such as the absence of vegetable dishes to eat, not liking the vegetable dish, not in the mood to eat vegetables, or not getting used to eating vegetables by their parents (23). This indicates that students are not accustomed to consuming vegetables in sufficient quantities, not only by one factor, but by several factors that influence it. Some students have good habits in consuming vegetable menus, namely at least two types of vegetable menus a day. This is related to the variety of vegetable menus consumed by students. It is not known for certain what types of vegetable menus are usually consumed by students.

Bivariate analysis found that there was an insignificant relationship between vegetable consumption consisting of aspects of the number and type of vegetable menus with the incidence of overweight status in students. Vegetable consumption among students is influenced by three things, namely health, mood, and weight control (24). Students who have good nutrition knowledge have a higher level of vegetable consumption than those with less knowledge (25; 26). This is supported by research conducted by Pem & Jeewon (27) which shows that nutritional knowledge plays an important role in increasing vegetable consumption.

Not much different from the data found in Riskesdas in 2018 which showed that the proportion of lack of consumption of vegetables/fruits was 95.5%, with the average vegetable consumption in the 20-24 age group only 1.2 servings per day (6). This correlates with data on the prevalence of overweight in the student age group (20-24 years) which is only the last third contributor to the incidence of overweight status in Indonesia. Noerfitri et al (28) stated that vegetable consumption has no relationship with the incidence of overweight, there are other factors such as nutritional knowledge, excessive food intake, lack of physical activity, negative body image, and gender that

affect overweight status. Awaliya et al (29) added that the frequency of vegetable consumption had a significant relationship with the incidence of overweight. The calories contained in the vegetables themselves are relatively low, namely a maximum of 50 calories per 100 grams (2), so it is possible such as processing methods, and other additives that can affect nutritional content, especially vegetable calories.

The relationship between fruit consumption and the incidence of overweight

The results of the univariate analysis showed that students had a habit of consuming a lower amount of fruit than the recommended one. On average, students consume 72.36 grams of fruit per day. Several studies have shown similar results that not many students consume fruit every day (30; 31). Most students have bad habits in consuming fruit menus. This is related to not varying the type of fruit menu consumed by students. In this study, the types of fruit menus consumed were not separated, such as fresh fruit and processed fruit, and it was not possible to know for sure what types of fruit menus were consumed by students.

Bivariate analysis found that there was a significant relationship between consumption of fruit menus and the incidence of overweight in students. The lack of types of fruit menus consumed by students has a lower effect on experiencing more overweight. This shows that students have the potential to be more fond of consuming processed fruit foods compared to fresh fruit. It is important to pay attention to the content contained in each type of fruit menu available because otherwise it can be a risk factor for excess overweight.
Processed fruit menus such as fruit salads, fruit soups, smoothies, lotis, and fruit juices with the addition of sugar, syrup, or sweetened condensed milk are variations that are not uncommon for students to consume. Some types of certain fruit menus have a high content of simple sugars if consumed in excess can trigger an increase in lipogenesis, triglyceride levels, VLDL, LDL, and body fat mass and some processed fruits increase the number of calories of the fruit itself and reduce satiety which in the long run can be one of the factors of obesity (32). Studies show that consumption of fresh fruit has an effect on weight loss, but not fruit juice (10).

Consumption of fruit, especially fresh fruit every day, provides benefits to the body because fruit can increase the variety and delicacy of food (33) and reduce the possibility for weight gain (14). Sharma et al (32) showed that fruit has anti-obesity compounds that have benefits for the body including: First, reducing calorie intake because it does not contain fat, is high in fiber, and is high in water, which has a negative energy balance effect; Second, increasing satiety because it can delay gastric emptying, decrease catabolic enzyme activity, and increase gastrointestinal satiety hormones; Third, increasing the intake of micronutrients that affect the reduction of adipogenesis; Fourth, increasing non-essential phytochemicals that reduce oxidative stress, lipogenesis, and adipogenesis (27); Fifth, improving the gut microbiota thereby increasing Bacteriodetes and Actinobacteria which are commonly found in obese patients (34).

One of the factors that influence students to get used to eating vegetables is good nutritional knowledge (27). Students who are in families who are accustomed to eating fruit have the same possibility of getting used to eating fruit (35). When families do not have the habit of eating fruit every day, this situation will affect students' eating preferences (36). Fruit consumption preferences are influenced by allowance, family income, awareness to process, buy, provide, and consume fruit (37).

Consumption of the amount of fruit has no significant relationship with the incidence of overweight in students. This is in line with the research conducted by Awaliya et al (29) which showed that the amount of fruit consumed did not have a significant relationship with the incidence of excess overweight in students.

The relationship between breakfast consumption and the incidence of overweight

Breakfast consumption is divided into three important aspects, namely regularity, timeliness, and breakfast components. The results of the univariate analysis showed that some students regularly had breakfast and most students had the habit of having breakfast on time, but had a breakfast component that was lacking. Regularly having breakfast by paying attention to the right time allows students to wake up earlier so they have more time to do physical activity in the morning, the possibility of not sleeping late at night so as to reduce snack consumption at night, and be able to maintain a balance in the body's blood sugar levels. The breakfast component has a relationship with the quality of breakfast consumed by students. The more diverse the components, the better because they are able to meet the body's nutritional needs, besides that a quality breakfast can be seen from the adequacy of energy, protein, carbohydrates, and low fat (38; 39).

The components of breakfast that are usually consumed by students are related to their breakfast habits. This is formed since childhood or since the student is at home. Sari et al (38) revealed that mother's education and occupation, parents' income, and family size with adolescent eating habits in Bogor Regency had a significant relationship. Studies show that eating rice with at least three side dishes can reduce the number of servings of rice consumed and increase nutrient intake and food diversity in breakfast (40).

Bivariate analysis found that there was a significant relationship between breakfast timeliness and the incidence of overweight in students, while there was an insignificant relationship between the regularity and components of breakfast. The accuracy of breakfast time using a reference at 9 am as applicable to children aged 6-12 years (16) did not have a definite impact on students. Students who eat breakfast after 9 am have a tendency to combine breakfast and lunch, but it does not affect their overweight (18). This study is in line with the results obtained by Sievert et al (21) and Levitsky and Pacanowski (43) who found that breakfast habits would actually increase daily energy intake.

Timeliness of breakfast is related to student discipline in meeting the energy intake needed in the morning for the next activity. Breakfast not on time does not completely have a negative impact, because breakfast only contributes 25% of the total daily needs and is influenced by the amount and portion of food (43). The incidence of excess overweight in students is not influenced by the inaccuracy of breakfast time, but depends on the adequacy of energy from various foods (43). Several studies have shown that other factors such as the morning class schedule (18), access to food, eating habits (44), and sleeping late so that they wake up late (45) are the reasons that affect the inaccuracy of breakfast time. .

The regularity and components of breakfast were not significantly associated with the incidence of overweight in students. In line with the results in this study, Noerfitri et al (28) said that breakfast consumption did not provide a significant relationship with the

incidence of overweight status. Breakfast is not a factor that directly affects a person's overweight, but skipping breakfast tends to increase the intake of fatty foods at the next meal (46). The energy that is met in a day will come more from the consumption of high-fat foods. Therefore, there is an assumption that someone who skips breakfast will tend to overeat (47). In contrast to research by Levitsky and Pacanowski (43) which showed that someone who skipped breakfast did not increase the amount of intake at the next meal and his total daily energy intake was relatively lower than someone who had breakfast.

Breakfast serves to replace energy after fasting during sleep, provide energy for the next activity, increase concentration, increase activity in the morning, prevent overeating at the next meal, and prevent large fluctuations in blood sugar (48; 49). It is proven by the study of Mansouri et al (50) that students who habitually eat breakfast reduce their risk of obesity by 33%. Students who regularly have breakfast but are not matched by choosing a good breakfast menu also provide the potential for more overweight events in students. Students who can't, don't like, or don't even have time to cook food prefer to buy food from outside (44). Knowledge and awareness of students to implement a healthy lifestyle is a factor for students to be able to eat a good breakfast (51).

Factors associated with the incidence of overweight

The results of the stratification analysis showed that the consumption of fatty foods modified the effect of the type of vegetable menu, the amount of fruit, the type of fruit menu, the regularity of breakfast, the timeliness of breakfast, and the breakfast component on the incidence of overweight in students. The decrease in the chance of occurrence of more overweight by frequently consuming fatty foods in students who are not good at consuming the type of vegetable menu. One of the food choices that are often consumed is fatty foods by students because they are easy to obtain (44). The possibility that occurs is that the amount or portion of fatty foods often consumed by students is not excessive, other factors such as the level of student activity, body image (52), gender (53), place of residence (54), and healthy food preferences (55) can reduce the potential for experiencing excess overweight.

Students who rarely eat fatty foods have a greater chance of occurrence of overweight compared to students who often eat fatty foods in students who consume less fruit and have less breakfast components. The possibility that occurs is that fatty foods are consumed in large quantities and/or large portions. This is in accordance with Kandinasti and Farapti's research (56) which said that an increase in consumption of high-fat foods on weekends could lead to an increase in caloric intake so that it played a role in the incidence of obesity. Types of high-fat foods, especially those rich in saturated fatty acids, are able to disrupt the balance of intestinal microbes and trigger inflammation that has the potential to cause obesity. In addition to fatty foods, students' habits of consuming high-sugar foods are also able to potentially increase the total consumption of simple sugars thereby increasing lipogenesis in the body (32).

The decrease in the chance of occurrence of more overweight by rarely consuming fatty foods compared to students who often eat fatty foods in students who are not good at eating types of fruit menus, do not regularly eat breakfast, and do not have breakfast on time. Rarely eating fatty foods can reduce the total calorie intake of students, thereby reducing the risk of overweight. Experimental studies have shown that reducing caloric intake and fatty foods coupled with increased fruit/vegetable consumption has a

weight loss effect. Consumption of high energy density foods, especially those from fat, leads to a positive energy balance that results in weight gain (34). So it is necessary to pay attention to the total daily energy intake that is adjusted to the balance of food intake that comes from a variety of foods or drinks consumed.

Multivariate analysis showed that students who often eat fatty foods and don't eat breakfast on time have a 2.2 times greater chance of experiencing more overweight than students who rarely eat fatty foods. Students are said to be frequent if they eat fatty foods more than twice per week, while rarely if they consume a maximum of two fatty foods per week. The effect of consumption of fatty foods on overweight will increase if consumption exceeds 25% of total energy consumption (2). Throughout the last 12 years in Indonesia, there has been an increase in the trend of consumption of fatty foods from 27.9% in 2009 to 41.7% in 2018 (5). This is directly proportional to the increase in the incidence of overweight and obesity in Indonesia. Consumption of fried foods has a relationship with the incidence of overweight and obesity (57).

Lianaj et al (58) said that the increase in consumption of fatty foods in college students was influenced by the habit of eating late at night and eating out of the house. Another study found that the habit of consuming take-away food from outside also increased the preference for high-fat foods (59). The effect of stress also has an impact on students preferring to consume high-fat foods, especially in male students (60). Dislike and poor cooking skills, eating habits with friends, taste, cleanliness, quality, and low prices are the reasons students like to eat fast food more than twice per week which increases the risk of overweight and obesity (61).

Excessive intake of saturated fat in the body has a detrimental effect, namely increasing the gut microbiota of Firmicutes and Proteobacteria which are identical to those found in obese individuals (32). Changes in the gut microbiota provide possibilities that occur, including: First, excess production of short chain fatty acids that increase energy intake thereby promoting lipogenesis; Second, suppress adipocyte factor induced during fasting which increases lipoprotein lipase activity thereby promoting lipogenesis; Third, it increases cholesterol synthesis which causes systemic inflammation so that all these possibilities encourage obesity (34). Students who have better nutritional knowledge choose to reduce fatty foods and cholesterol (62). Preventive action by increasing student knowledge is expected to reduce the habit of consuming fatty foods in students.

Breakfast is an activity to meet the needs of food intake in the morning which is recommended to be done before 9 am as an important part to replace the energy used during sleep, become a source of energy for the next activity, increase concentration and activity in the morning, and reduce the risk of obesity (2; 48; 50). Not eating breakfast on time increases the risk of overweight because: First, skipping breakfast can damage insulin sensitivity because it increases the postprandial hyperglycemia reaction so that individuals overeat at the next meal; Second, individuals who don't have breakfast on time have a habit of staying up late at night, thus interfering with the BMAL1 gene which can trigger an increase in body fat and increase the consumption of snacks, soft drinks, instant and fatty foods at night; Third, it increases the likelihood of overeating at the next meal (66; 45; 47). If the consistency of breakfast can be maintained by paying attention to its content such as high protein, it will increase the feeling of fullness for longer and control hunger (39). Changes in eating patterns by getting used to a good breakfast can be improved by increasing knowledge and awareness of the importance of health in students (51).

This study has advantages because it has never been done before on students in Sleman Regency and has data analysis using stratification and multivariate analysis to determine the relationship between variables related to overweight status in students. The subjects who participated in this study were students who studied at universities in Sleman Regency which had the largest distribution and number of students compared to other Regencies/Cities in the Special Region of Yogyakarta. This study also has a weakness, namely the cross-sectional study design and the determination of overweight that cannot be measured directly. Further research is still needed on each variable, especially the variety of processing methods, types, and amounts of vegetables/fruits as well as the components of breakfast consumed to analyze their nutritional content, as well as physical activity, smoking habits, and nutritional knowledge.

5. CONCLUSION

There is a significant relationship between the consumption of fruit menu types and the timeliness of breakfast with the incidence of overweight in students.

REFERENCES

1. Par'I, H.M., Wiyono, S., & Harjatmo, T.P. (2017). Bahan Ajar Gizi: Penilaian Status Gizi. Jakarta: Kemenkes RI.
2. Kemenkes RI. (2014). Peraturan Menteri Kesehatan RI Nomor 41 Tahun 2014 Tentang Pedoman Gizi Seimbang. Jakarta: Kemenkes RI.
3. Hardinsyah & Supariasa, I.D.N. (2016). Ilmu Gizi: Teori & Aplikasi. Jakarta: EGC.
4. WHO. (2020). Malnutrition. Retrieved from https://www.who.int/.
5. Kemenkes RI. (2010). Laporan Nasioanl RISKESDAS 2010. Jakarta: Kepala Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI.
6. Kemenkes RI. (2019). Laporan Nasioanl RISKESDAS 2018. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan (LPB).
7. Putri, A.F. (2019). Pentingnya orang dewasa awal menyelesaikan tugas perkembangannya, Indonesian Journal of Counseling, 3(2): 35-40. DOI: https://doi.org/10.23916/08430011
8. Ruslie, R.H. & Darmadi. (2012). Analisis regresi logistik untuk faktor-faktor yang mempengaruhi status gizi remaja. Majalah Kedokteran Andalas, 1(36): 62-72.
9. Kurniawan, M.W.W. & Widyaningsih, T.D. (2017). Hubungan pola konsumsi pangan dan besar allowance mahasiswa manajemen bisnis dengan mahasiswa jurusan teknologi hasil pertanian universitas brawijaya terhadap status gizi, Jurnal Pangan dan Agroindustri, 5(1): 1-12.
10. Dreher, M. L., & Ford, N. A. (2020). A Comprehensive Critical Assessment of Increased Fruit and Vegetable Intake on Weight Loss in Women. Nutrients, 12(7), 1919. https://doi.org/10.3390/nu12071919
11. Garcia-Amezquita, L.E., Tejada-Ortigoza, V., & Serna-Saldivar, S.O. et al. (2018). Dietary Fiber Concentrates from Fruit and Vegetable By-products: Processing, Modification, and Application as Functional Ingredients. Food Bioprocess Technol 11: 1439–1463. https://doi.org/10.1007/s11947-018-2117-2
12. Yahia, E. M., & Carrillo-Lopez, A. (Eds.). (2018). Postharvest physiology and biochemistry of fruits and vegetables. Woodhead Publishing.

13. Kemenkes RI. (2019). Peraturan Menteri Kesehatan RI Nomor 28 Tahun 2019 Tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia. Jakarta: Kemenkes RI.
14. Pratiwi, R. & Mardiyati, L.N. (2018). Screen time dengan konsumsi vegetable dan fruit serta kenaikan berat badan pada mahasiswa Fakultas Ilmu Kesehatan. Nutrisia Journal. 20(2): 53-60.
15. Bertoia, M. L., Mukamal, K. J., Cahill, L. E., Hou, T., Ludwig, D. S., Mozaffarian, D., … & Rimm, E. B. (2015). Changes in Intake of Fruits and Vegetables and Weight Change in United States Men and Women Followed for Up to 24 Years: Analysis from Three Prospective Cohort Studies. PLoS medicine, 12(9), e1001878. https://doi.org/10.1371/journal.pmed.1001878
16. Hardinsyah & Aries, M. (2012). Types of pangan breakfast dan perannya dalam asupan gizi harian anak usia 6-12 tahun di indonesia. Jurnal Gizi dan Pangan. 7(2): 89-96.
17. Horikawa, C., Kodama, S., Yachi, Y., Heianza, Y., Hirasawa, R. et al. (2011). Skipping breakfast and prevalence of overweight and obesity in Asian and Pacific regions: A meta-analysis. Preventive Medicine, 53(4-5), 260–267. doi:10.1016/j.ypmed.2011.08.030
18. Putra, A., Syafira, D.N., Maulyda, S., dkk. (2018). Kebiasaan breakfast pada mahasiswa aktif. Higeia Journal of Public Health Research and Development. 2(4): 577-586.
19. Arraniri, M., Desmawati, D., & Aprilia, D. (2017). Hubungan kebiasaan breakfast dan asupan kalori dengan persentase lemak tubuh pada mahasiswa prodi profesi dokter fakultas kedokteran universitas andalas angkatan 2013-2015. Jurnal Kesehatan Andalas. 6(2): 265-270.
20. Sievert, K., Hussain, S. M., Page, M. J., Wang, Y., Hughes, H. J., Malek, M., & Cicuttini, F. M. (2019). Effect of breakfast on weight and energy intake: systematic review and meta-analysis of randomised controlled trials. bmj, 364. Retrieved from https://www.bmj.com/.
21. Badan Pusat Statistik. (2020). Number perguruan tinggi, mahasiswa, dan tenaga pendidik (negeri dan swasta) di bawah kementerian riset, teknologi dan pendidikan tinggi/kementerian pendidikan dan kebudayaan menurut kabupaten/kota di provinsi D.I. Yogyakarta 2019. Retrieved from https://yogyakarta.bps.go.id/
22. Sastroasmoro, S. (2014). Dasar-dasar Metodologi Penelitian Klinis. Jakarta: Sagung Seto.
23. Harti, A.D., Indriasari, R., & Hidayanti, H. (2019). Hubungan pola konsumsi pangan sumber serat dengan kejadian overweight pada remaja di smp 3 makassar. Journal of Indonesian Community Nutrition. 8(2): 71-78.
24. Aulia, L. & Yuliati, L.N. (2018). Faktor keluarga, media, dan teman dalam pemilihan makanan pada mahasiswa ppku ipb. Jurnal Ilmu Kesehatan dan Konsumen. 11(1): 37-48. DOI: http://dx.doi.org/10.24156/jikk.2018.11.1.37
25. Bachtiar, A., Sumarto, Karimah, I., & Nuraeni, I. (2016). Pengetahuan, pengeluaran, dan konsumsi vegetable-fruit pada mahasiswa gizi dan non-gizi poltekes kemenkes tasikmalaya. Buletin Media Informasi. 12(1).
26. Sadida, H.S., Ilyas, N.O., Fitria, M., Pusparini, Azka, S.F. (2019). Efek pendidikan gizi terhadap pengetahuan dan konsumsi vegetable dan fruit pada remaja di asrama. Jurnal Riset Kesehatan Poltekkes Kemenkes Bandung. 11(2): 75-81.
27. Pem, D., & Jeewon, R. (2015). Fruit and Vegetable Intake: Benefits and Progress of Nutrition Education Interventions- Narrative Review Article. Iranian journal of public health, 44(10), 1309–1321.
28. Noerfitri, Putri, T.W., & Febriati, R. U. (2021). Hubungan antara kebiasaan melewatkan breakfast, konsumsi vegetable fruit dan fast food, aktivias fisik,

aktivitas sedentary dengan kejadian status gizi lebih. Jurnal Ilmiah Kesehatan Masyarakat. 13(2): 56-63.
29. Awaliya, H.B.P., Pradigdo, S.F., & Nugraheni, S.A. (2020). Lownya konsumsi fruit dan vegetable sebagai faktor risiko kejadian overweight pada remaja putri (studi pada mahasiswi di salah satu universitas di kota semarang). Jurnal Ilmiah Mahasiswa. 10(2): 34-38.
30. Damanik, T.K. (2014). Faktor risiko yang menyebabkan kejadian status gizi lebih pada mahasiswa fakultas kesehatan masyarakat usu tahun 2014. Skripsi Sarjana Kesehatan Masyarakat. Universitas Sumatera Utara.
31. Hermina & Prihatini, S. (2014). Gambaran konsumsi vegetable dan fruit penduduk indonesia dalam konteks gizi seimbang: analisis lanjut survei konsumsi makanan individu (skmi) 2014. Buletin Penelitian Kesehatan. 44(3): 205-218.
32. Sharma, S. P., Chung, H. J., Kim, H. J., & Hong, S. T. (2016). Paradoxical Effects of Fruit on Obesity. Nutrients. 8(10): 633. https://doi.org/10.3390/nu8100633
33. Mytton, O.T., Nnoaham, K., Eyles, H. et al. (2014). Systematic review and meta-analysis of the effect of increased vegetable and fruit consumption on body weight and energy intake. BMC Public Health 14(886). https://doi.org/10.1186/1471-2458-14-886
34. Cândido, F.G., Valente, F.X., Grześkowiak, L.M., Moreira, A.P.B., Rocha, D.M.U.P & Alfenas, R.C.G. (2017). Impact of dietary fat on gut microbiota and low-grade systemic inflammation: mechanisms and clinical implications on obesity, International Journal of Food Sciences and Nutrition. DOI: 10.1080/09637486.2017.1343286
35. Schroeter, C. & House, L.A. (2015). Fruit and vegetable consumption of college students: what is the role of food culture. Journal of Food Distribution Research. 46(3): 131-152.
36. Dewi, Y. (2013). Studi deskriptif: persepsi dan perilaku makan fruit dan vegetablean pada anak obesitas dan orang tua. Jurnal Ilmiah Mahasiswa Universitas Surabaya. 2(1): 1-17.
37. Terati, Yuniarti, H., & Marsalinda, D. (2020). Analisis faktor-faktor dan preferensi konsumsi fruit dengan tingkat kecukupan vitamin a pada remaja. MGMI. 11(2): 127-140.
38. Sari, A.F.I., Briawan, D., & Dwiriani, C.M. (2012). kebiasaan dan kualitas breakfast pada siswi remaja di kabupaten bogor. Jurnal Gizi dan Pangan. 7(2): 97-102.
39. Fathimah, F.Z. & Mulyati, T. (2015). Pengaruh pemberian breakfast tinggi protein terhadap tingkat rasa kenyang wanita obesitas, Journal of Nutrition Collage, 4(1): 10-17. Retrieved from https://ejournal3.undip.ac.id/
40. Chung, S., Lee, Y., Lee, S., & Choi, K. (2015). Breakfast skipping and breakfast type are associated with daily nutrient intakes and metabolic syndrome in korean adults. Nutrition Research and Practice. 9(3): 288-295. DOI: 10.4162/nrp.2015.9.3.288.
41. Levitsky, D.A. & Pacanowski, C.R. (2013). Effect of skipping breakfast on subsequent energy intake. Physiology & Behavior. 119: 9-16. http://dx.doi.org/10.1016/j.physbeh.2013.05.006
42. Ifdal & Khomsan, A. (2014). Kebiasaan breakfast pada mahasiswa tpb ipb dengan status gizi normal dan obes. Skripsi Sarjana Gizi. Institut Pertanian Bogor.
43. Soedwiwahjono, W.K., Widajanti, L., & Lisnawati, N. (2021). Hubungan asupan breakfast dan kecukupan gizi dengan kejadian obesitas pada mahasiswa di jawa tengah. Media Kesehatan Masyarakat Indonesia. 20(3): 185-192. DOI:10.14710/mkmi.20.3.185-192.
44. Jauziyah, S.S.A., Nuryanto, Tsani, A.F.A., & Purwanti, R. (2021). Pengetahuan gizi dan cara mendapatkan makanan berhubungan dengan kebiasaan makan mahasiswa universitas diponegoro. Journal of Nutrition College. 10(1): 72-81.

45. Watanabe, Y., Saito, I., Henmi, I., Yoshimura, K., Maruyama, K., Yamauchi, K., … & Asada, Y. (2014). Skipping Breakfast is Correlated with Obesity. Journal of rural medicine : JRM, 9(2), 51–58. https://doi.org/10.2185/jrm.2887
46. Mathiyalagen, P., Yadav, D., R, A., Vasudevan, K., Sundar, B., R, P., Mishra, M., & Jin, J. (2019). Breakfast consumption habit and its impact on nutrient intake and overweight of medial undergraduates. Progress in Nutrition. 21(3): 570-576. DOI: 10.23751/pn.v21i3.7903.
47. Ardeshirlarijani, E., Namazi, N., Jabbari, M., Zeinali, M., Gerami, H., Jalili, R. B., ... & Azadbakht, L. (2019). The link between breakfast skipping and overweigh/obesity in children and adolescents: a meta-analysis of observational studies. Journal of Diabetes & Metabolic Disorders, 18(2), 657-664. Retrieved from https://link.springer.com/ .
48. Behan, M. (2014). Benefits of breakfast. Retrieved from https://www.unh.edu/
49. Departement of Health & Human Services. (2020). Breakfast. Retrieved from https://www.betterhealth.vic.gov.au/
50. Mansouri, M., Hasani-Ranjbar, S., Yaghubi, H. et al. (2020). Breakfast consumption pattern and its association with overweight and obesity among university students: a population-based study. Eat Weight Disord 25: 379–387. https://doi.org/10.1007/s40519-018-0609-8.
51. Seedat, R. & Pillay, K. (2019). Breakfast consumption and its relationship to sociodemographic and lifestyle factors of undergraduate students in the school of health sciences at the university of kwazulu-natal. South African Journal of Clinical Nutrition. 33(3): 79-85. DOI: 10.1080/16070658.2018.1564470.
52. Jiang, S., Peng, S., Yang, T., Cottrell, R. R., & Li, L. (2018). Overweight and Obesity Among Chinese College Students: An Exploration of Gender as Related to External Environmental Influences. American Journal of Men's Health, 926–934. https://doi.org/10.1177/1557988317750990. Retrieved from https://journals.sagepub.com/
53. Ratsavong, K., van Elsacker, T., Doungvichit, D. et al. (2020). Are dietary intake and overweight influenced by gender? The pattern of dietary intake in Lao PDR: a developing country. Nutr J 19(31). https://doi.org/10.1186/s12937-020-00545-9
54. Rachmi, C.N., Li, M., & Baur, L.A. (2017). Overweight and obesity in indonesia: prevalence and risk factors-a liRegulare review, Public Health, 147: 20-29. DOI: https://doi.org/10.1016/j.puhe.2017.02.002
55. Boek, S., Bianco-Simeral, S., Chan, K., & Goto, K. (2012). Gender and race are significant determinants of students food choice on a college campus. Journal of Nutrition Education and Behavior. 44(4): 372-378. DOI: 10.1016/j.jneb.2011.12.007
56. Kandinasti, S. & Farapti. (2018). Obesitas: pentingkah memperhatikan konsumsi makanan di akhir pekan?. Amerta Nutr. 307-316. DOI : 10.2473/amnt.v2i4.2018.307-316
57. Qin, P., Liu, D., Wu, X., Zeng, Y., Sun, X., Zhang, Y. … & Hu, F. (2021). fried-food consumption and risk of overweight/obesity, type 2 diabetes mellitus, and hypertension in adults: a meta-analysis of observational studies. Critical Reviews in Food Science and Nutrition. 1-12. https://doi.org/10.1080/10408398.2021.1906626
58. Lianaj, E., Adany, R., Lachat, C., & D'Haese, M. (2018). Examining food intake and eating out home patterns among university students. PLOS One. 13(11): 1-14. DOI: https://doi.org/10.1371/journal.pone.0197874
59. Jiang Y, Wang J, Wu S, Li N, Wang Y, Liu J, … & Zheng R. (2019). Association between Take-Out Food Consumption and Obesity among Chinese University Students: A

Cross-Sectional Study. International Journal of Environmental Research and Public Health. 16(6):1071. https://doi.org/10.3390/ijerph16061071

60. Vidal EJ, Alvarez D, Martinez-Velarde D, Vidal-Damas L, Yuncar-Rojas KA, et al. (2018). Perceived stress and high fat intake: a study in a sample of undergraduate students. PLOS ONE 13(3): 1-11. https://doi.org/10.1371/journal.pone.0192827.
61. Al-Otaibi, H.H.A. & Basuny, A.M. (2015). Fast food consumption associated with obesity/overweight risk among university female student in saudi arabia. Pakistan Journal of Nutrition. 14(8): 511-516.
62. Yahia, N., Brown, C.A., Rapley, M., & Chung, M. (2016). Level of nutrition knowledge and its association with fat consumption among college students. BMC Public Health. 16(1047):1-10. DOI: https://doi.org/10.1186/s12889-016-3728-z
63. Ma X, Chen Q, Pu Y, Guo M, Jiang Z, Huang W, … & Xu Y. (2020), Skipping breakfast is associated with overweight and obesity: A systematic review and meta-analysis. Obes Res Clin Pract. 14(1):1-8. doi: 10.1016/j.orcp.2019.12.002. Epub 2020 Jan 7. PMID: 31918985. Retrieved from https://pubmed.ncbi.nlm.nih.gov/31918985/