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Review of Nutritional Content in Street Vendor Snack Food Around Maranatha Christian University Bandung

Robby Susanto[1], Shiela Stefani [2*], Dani[3]
[1]Maranatha Christian University Faculty of Medicine, Bandung, Indonesia
[2]Department of Nutrition, Faculty of Medicine, Maranatha Christian University, Bandung, Indonesia
[3]Department of Public Health Sciences, Faculty of Medicine, Maranatha Christian University. Bandung , Indonesia
Email: shiela.stefani@med.maranatha.edu

Abstract. he rapid development of the times globally has caused changes in food consumption patterns, especially snacks in Indonesia. From studies and research conducted previously in 22 developing countries, the results of the high prevalence of students being overweight were obtained. The purpose of this study is to determine the nutritional content of street vendor snack food around Maranatha Christian University. In this study, an observational descriptive research design was used with a quantitative approach using primary data and sampling was carried out by *convenience sampling*. The parameters measured in this study were the content of macronutrients, especially carbohydrates, proteins, fats and total calories in a 100 g serving of food with a kilo calorie unit (kcal). The research was conducted from early January 2021 to November 2021. The average value of carbohydrate content was 30.3 g, protein 6.9 g, and total calories 248.3 kcal, while the fat content analysis used a median value of 9.2 g. The conclusion in this study was obtained 15 snacks high in carbohydrates, 13 high in fat, 1 high in protein, and 1 high in carbohydrates and fats which were determined based on the percentage value of macronutrient content to total calories.

Keywords : Nutrition, Snacks, Macronutrients, Street Vendors, Calories

INTRODUCTION

Street snacks (*street food*) is a cultural, social, and economic phenomenon typical of urban areas, related to a sedentary lifestyle to provide a very affordable and inexpensive source of nutrition (Gelormin, 2015). A 2014 study that collected data and was conducted in 22 countries with student subjects in developing countries showed a high prevalence of overweight and obesity. Countries in Asia such as Bangladesh have a prevalence of obesity of 20.8%, China 2.9%-14.3%, Malaysia 20%-30.1%, Thailand 31%, Pakistan 13%-52.6%, and India 11%-37.5% (Pelizer, 2014). Basic Health Research (Riskesdas) 2018 shows that 31% of adults over 18 years old in Indonesia experience central obesity and as many as 21.8% have BMI>27 (obesity), with women (29.3%) higher than men (14.5%) (National Report, 2018). The prevalence of central obesity in adults over

18 years old will increase in 2023 to 36.8% and the prevalence of central obesity is 23.4% based on the 2023 Indonesian Health Survey (Ministry of Health, 2014).

Based on Riskesdas 2018 data and studies conducted in developing countries, it shows that many people are overweight and obese in developing countries. Excess nutrition occurs due to the intake of excess energy drinks and foods, containing a lot of sugar, salt, and saturated fat, but lack of intake of nutritious foods such as vegetables, fruits and grains, and rarely doing physical activity (Ministry of Health, 2014). Street vendor snacks provide energy intake of 36% of total energy, protein of 29%, and iron of 52% for students (Notoatmojo, 2010). Based on macronutrient research *street food* in Bishkek, Kyrgyzstan measured through chemical analysis. Homemade foods provide high energy or servings compared to industrially processed foods (median kcal per serving: 357 to 145, $p < 0.001$). In addition, the food studied contains *trans-fat* and high saturated fatty acids and high in protein (Albuquerque, 2020).

The majority of Indonesian people choose snacks as an alternative food that is easy to carry and as an interlude and serves as a food to delay hunger (Albuquerque, 2020). The rapid development of the times, especially in socio-economic changes, has had an impact on the Indonesian people who sell snack food, generally fried food because it is practical and uses cheap and easy-to-obtain raw materials and is widely liked by students, especially students, but certain snacks sold at street vendors are not known for their nutritional content (Albuquerque, 2010). Because the nutritional content is unknown and there has been no research on the nutritional content of snack foods, especially snacks that are fried around the Maranatha Christian University Bandung, it is necessary to conduct this research.

METHODS

The materials used in this study are snacks or *street food* namely ready-to-eat food that has small portions, and can be eaten quickly due to limited time and is prepared and/or sold by street vendors on the roadside or other similar locations. Snacks are foods that are sold around educational institutions and do not come from canteens or restaurants (Steyn et. al, 2014 and Banna et al, 2017). The percentage (%) of AKG (Nutritional Adequacy Number) used is based on the energy needs of male adults aged 18-30 years in a day, which is 2650 kcal (Ministry of Health, 2018). This study uses an observational descriptive design with a quantitative (numerical) approach using primary data in the form of snack food samples around Maranatha Christian

University Bandung. The research variables analyzed were the content of macronutrients, namely carbohydrates, proteins, and fats as well as total calories in 100 grams of snacks in kcal.The method of data collection used in the study is by buying snack food, then weighing each component in the snack using an electric scale, then recording the data obtained and entering the data into the application *nutrisurvey*. The location of this research was carried out at the Faculty of Medicine, Maranatha Christian University and its surroundings with a research period from January 2021 to November 2021. The subject of the study was carried out on snack food with a radius of at least 1 km around Maranatha Christian University Bandung. Sampling of snack food is carried out *Convenience sampling* with a total of 30 snacks (Albuquerque, 2020). The data collected is processed using the application *nutrisurvey*. Application *Nutrisurvey* 2007 is an application that contains a collection of food databases from all over the world, especially in Indonesia, used by food experts and/or nutritionists to analyze the nutritional content of foodstuffs (Fittipalty, 2016). Next, data analysis is carried out by entering each food component that has been weighed using an electric scale of 0-500 grams (accuracy 0.1 grams) and above 500 grams (accuracy 0.5 grams) into the application *nutrisurvey* with a database using AKG for men aged 19-24 years and then obtained results in the form of the amount of macronutrients and micronutrients in 100 grams of food portions. If there is a food that is analyzed is not in the application database *nutrisurvey* So the researcher asked the seller for a recipe to be done *Input* data manually. Furthermore, univariable data analysis was carried out to test the normality of data distribution in the form of *mean, median, standard deviation, standard error,* Minimum value, maximum value, and percentage with the conclusion to be drawn is the type of snack that has high calories. This research submitted a permit to the Research Ethics Commission of Maranatha Christian University Bandung to obtain a permit to collect data and the purpose of the research. The Research Ethics Commission of Maranatha Christian University Bandung has approved and allowed this research by issuing Decree No. 050/KEP/III/2021 stipulated in Bandung on March 29, 2021.

RESULTS

A study on the nutritional content of street vendor snack food around Maranatha Christian University has been carried out with a total sample of 30 snack foods. After data processing using the application *nutrisurvey* can be seen in Table 1.

Table 1. Macronutrient Content Data of Street Vendor Snack Food Per 100 grams

It	Food	Weight 1 serving of snacks (grams)	Macronutrients (grams/100 grams of food)			Total Calories (kcal) and %AKG
			Carbohydrates	Protein	Fat	
1	Tahu Kriuk	199,5	1,7 (3%)	7,3 (14%)	20,3 (83%)	206,0 (7,78%)
2	Cireng	207,4	39,2 (44%)	5,3 (6%)	20,5 (50%)	363,0 (13,70%)
3	Molen Banana	39,4	18,2 (34%)	1,6 (3%)	15,4 (63%)	212,0 (8,00%)
4	Corn Bakwan	40,5	13,9 (37%)	7,3 (20%)	7,4 (43%)	142,9 (5,39%)
5	Bala-Bala	38,8	39,2 (30%)	5,3 (4%)	40,5 (66%)	539,9 (20,37%)
6	Cilor (Aci Telor)	25,3	32,9 (41%)	6,5 (8%)	18,9 (51%)	328,5 (12,40%)
7	Banana Penyet	237,1	21,7 (44%)	1,2 (2%)	12,2 (54%)	186,9 (7,05%)
8	Brown Sugar Donuts	34,3	49,2 (50%)	4,9 (5%)	20,5 (45%)	398,2 (15,03%)
9	Batagor	362,4	1,4 (4%)	12,1 (32%)	11,3 (65%)	152,0 (5,74%)
10	Chicken Cilok	136,7	38,9 (61%)	7,8 (12%)	8,0 (27%)	256,0 (9,66%)
11	Mendoan	31,2	49,1 (56%)	14,3 (16%)	11,4 (28%)	351,6 (13,27%)
12	Martabak Chocolate Beans	354,2	52,1 (50%)	7,1 (7%)	20,5 (43%)	414,9 (15,66%)
13	Fried Mushrooms	64,4	8,5 (70%)	2,6 (21%)	0,5 (9%)	43,2 (1,63%)
14	Rempeyek Beans	24,3	20,7 (20%)	17,2 (16%)	31,3 (64%)	406,9 (15,36%)
15	Martabak Egg	48,5	31,0 (40%)	7,7 (10%)	18,1 (50%)	319,1 (12,04%)
16	Cassava Crackers	50,8	70,2 (95%)	2,4 (3%)	0,7 (2%)	288,0 (10,87%)
17	Fried Intestines	63,6	5,4 (20%)	13,8 (51%)	3,6 (29%)	113,0 (4,26%)
18	Round Tofu	27,5	2,1 (9%)	8,4 (38%)	5,3 (52%)	82,6 (3,12%)
19	Tofu Contents	46,9	29,1 (65%)	8,5 (19%)	3,2 (15%)	177,9 (6,71%)
20	Cimol	87,3	39,2 (44%)	5,3 (6%)	20,5 (50%)	363,0 (13,70%)
21	Cassava Cheese	482,9	31,3 (90%)	1,5 (4%)	0,8 (5%)	135,0 (5,10%)
22	Vegetable Donuts	36,6	39,0 (47%)	4,4 (5%)	18,3 (47%)	336,3 (12,69%)

It	Food	Weight 1 serving of snacks (grams)	Macronutrients (grams/100 grams of food)			Total Calories (kcal) and %AKG
			Carbohydrates	Protein	Fat	
23	Inkfish	54,5	49,5 (70%)	11,1 (16%)	4,4 (14%)	289,6 (10,93%)
24	Sweet potato balls	113,4	36,9 (90%)	3,4 (8%)	0,2 (1%)	162,5 (6,13%)
25	Odeng	133,6	21,3 (49%)	14,8 (34%)	3,4 (17%)	182,4 (6,88%)
26	*Tteokbokki*	150,5	37,8 (89%)	2,3 (6%)	1,1(5%)	175,7 (6,63%)
27	Risoles	20,3	33,3 (55%)	10,3 (17%)	7,6 (28%)	246,9 (9,32%)
28	Fried Banana	35,4	17,5 (43%)	0,9 (2%)	10,4 (55%)	158,0 (5,96%)
29	Pork Cake	76,8	27,1 (83%)	2,7 (8%)	1,3 (9%)	134,3 (5,07%)
30	Meises Toast	97,2	52,5 (75%)	8,6 (12%)	4,3 (13%)	283,9 (10,71%)
	Average		30,3 (50,27%)	6,9 (13,5%)	11,4 (36,1%)	248,3 (9,38%)

AKG: Nutritional Adequacy Figure. In this calculation, the daily calorie recommendation for adult males aged 19-24 is 2650 kcal/day.

Of the 30 food samples of street vendors obtained and processed using the *Nutrisurvey* application, the food with the highest carbohydrate content in 100 grams of snack portions is cassava crackers. In contrast, the snack with the lowest carbohydrate content is batagor. The highest protein content in 100 grams of snack is peanut crackers, while the lowest protein content is in fried banana snacks. The highest fat content in a 100-gram snack serving is bala-bala while the snack with the lowest fat content is in sweet potato ball snacks. The total calories in kilo calories (kcal) are highest in bala snacks, while the lowest total calories are in mushroom snacks. The percentage of AKG in this study uses the calories of adult males aged 19-24 years of 2650 kcal in a day. Then, the calcification of snack food is carried out based on the source of macronutrients, which can be seen in Table 2.

Table 2. Street Vendor Snack Food Data Based on Macronutrient Source Food

Number	Street Vendor Snacks		
	High in Carbs	**High in Protein**	**High in Fat**
1	Brown Sugar Donuts	Fried Intestines	Tahu Kriuk
2	Chicken Cilok		Cireng
3	Mendoan		Molen Banana
4	Martabak Chocolate Beans		Corn Bakwan
5	Fried Mushrooms		Bala-Bala
6	Cassava Crackers		Cilor (Aci Telor)
7	Tofu Contents		Banana Penyet
8	Cassava Cheese		Batagor
9	Inkfish		Rempeyek Beans
10	Sweet potato balls		Martabak Egg
11	Odeng		Round Tofu
12	*Tteokbokki*		Cimol
13	Risoles		Fried Banana
14	Pork Cake		Vegetable Donuts
15	Meises Toast		
16	Vegetable Donuts		

Category division based on the largest percentage of macronutrients to the total calories of each snack food

Of the thirty street vendor snack foods studied, fifteen are classified based on their highest macronutrient content. One food has a high carbohydrate content, one has a high protein content, thirteen have a high-fat content, and one has both, namely, vegetable donuts.

From the food data of street vendors' snacks obtained, a normality test of data distribution was carried out. The number of research samples obtained was 30 snacks, so the normality test results of the data distribution used were the significance value of the Shapiro-Wilk method. Carbohydrates, proteins, fats, and total calories have consecutive significance values of 0.447, 0,100, 0,005, and 0.449. Carbohydrates, proteins, and total calories have a significance value of >0.05, indicating that the data distribution is normal. The histogram is bell-shaped, so the study's results can use *the mean* value because *the mean* is the same as the median is the same as the mode (mean=median=mode). In contrast, fat has a significance value of 0.05, which indicates abnormal or extreme data distribution, and the histogram is not in the shape of a bell. Hence, the results of the study use the median value.

In the normality test of carbohydrate data distribution, a significance value of >0.05 was obtained; the value used was *a mean* of 30.3 grams with *a standard* error of 3.13, *a standard*

deviation of 17.16, and an average percentage of carbohydrates of 50.27%. In the normality test of protein data distribution, a significance value of >0.05 was obtained; the value used was *a mean* of 6.9 grams with *a standard* error of 0.81, *a standard* deviation of 4.43, and an average percentage of protein of 13.5%. In the normality test of the distribution of fat data, a significance value of ≤0.05 was obtained.The value used was a median of 9.2 grams with *a standard* error of 0.81 and *a standard* deviation of 9.95 and an average percentage of fat of 36.1%. In the normality test of the distribution of total calorie data, a significance value of >0.05 was obtained, then the value used was *a mean* of 248.3 kcal with *a standard* error of 21.23 and *a standard* deviation of 116.29 and an average percentage of total calories of 9.38%.

DISCUSSION

In this study, the collection of 30 snack samples was carried out within a radius of at least 1 km, if in that radius there is more than 1 trader who sells similar snacks, then the closest sample to the researcher will be taken. The research radius was expanded to 2 kilometers (km) due to the COVID-19 pandemic and many traders who do not sell around Maranatha Christian University Bandung. The study has met a minimum of 30 samples of street vendor snack food around Maranatha Christian University. Of the thirty food samples, there were 10 snack foods, namely *tteokbokki*, odeng, round tofu, cuttlefish, sweet potato balls, chicken cilok, rice cakes, fried mushrooms, fried intestines, and chocolate bean martabak which were not included in the *nutrisurvey* application database. The researcher tried to ask for the recipe from the 10 snack foods, however, the seller did not allow them to provide the snack food recipe, so the researcher manually *entered* the data by taking the average weight of each food ingredient component from 3 recipes obtained through a collection of recipes on the internet while the other 20 food samples were found in the *nutrisurvey application*.

In the research sample, as many as 24 snack foods were obtained that were processed by frying, namely tofu kriuk, cireng, banana molen, corn bakwan, bala-bala, aci telor (cilor), banana penyet, brown sugar donuts, batagor, mendoan, fried mushrooms, peanut crackers, egg martabak, cassava crackers, fried intestines, round tofu, stuffed tofu, cimol, cheese cassava, vegetable donuts, cuttlefish, sweet potato balls, risoles, and fried bananas. The results of this study are in line with the research of Mellia, et al. in 2018 which showed that the majority of snack food sold by street vendors is fried food (Irdianty and Sani, 2018).

Snack foods that are processed by frying are an easy way to process for the Indonesian people and can provide delicious tastes such as savory and crispy tastes (Hanum, 2016 and Nurhasnawati, 2017). Food processed by frying will absorb oil/fat. In manufactured food/industry, the oil/fat content will be listed on the product label, while in household food/*Homemade* food sold on the side of the road, the oil/fat content is naturally contained in the foodstuff or from the addition of oil when processing is carried out, such as frying Ministry of Health (2017). However, in this study, no analysis was carried out regarding the addition of oil/oil absorption into snacks.

Snack food that is steamed, boiled, baked/grilled is obtained, each has 2 foods, namely chicken cilok and rice cake stuffed; odeng dan *Tteokbokki*; martabak chocolate beans and meises toast. This snack food does not go through the cooking process by frying but by steaming/baking, indicating that this snack food is classified as a better food than fried food, but the food contains a lot of simple carbohydrates that are quickly metabolized by the body (Maharani, 2020). A total of 25 snack foods in this study contain flour (simple carbohydrates), namely tofu kriuk, cireng, banana molen, corn bakwan, bala-bala, cilor, brown sugar donuts, batagor, cilok ayam, mendoan, martabak chocolate beans, fried mushrooms, peanut crackers, egg martabak, fried intestines, round tofu, stuffed tofu, cimol, vegetable donuts, cuttlefish, sweet potato balls, *Tteokbokki*, odeng, risoles, and fried bananas as well as 5 snack foods that do not contain flour, namely banana penyet, cassava crackers, cassava cheese, rice cakes, rice cakes, toast meises. Foods that contain flour or simple carbohydrates will cause an increase in blood sugar levels. This is because simple carbohydrates are metabolized faster in the body compared to complex carbohydrates. If you consume too many simple carbohydrates, the calories that enter the body will exceed the energy needs in a day. The recommended intake of simple carbohydrates is less than 1% of total daily calories (Ministry of Health, 2014 and Maharani, 2020).

From the data, it was found that snack foods that were high in carbohydrates had the highest percentage of carbohydrate content as many as 16 snacks and high in fat had the highest percentage of fat content with 14 snacks. There is 1 snack that is high in protein and has the highest percentage of protein content, namely fried intestines at 51% of total calories. There is 1 snack that is high in carbohydrates and high in fat, namely vegetable donuts which contain 47% of total calories each.

Excessive consumption of foods high in fat will increase the risk of obesity and degenerative diseases, namely coronary heart disease, hypertension, and diabetes mellitus (National Report, 2018; Ministry of Health, 2023 and Halil et al., 2017). *Monounsaturated Fatty*

Acid (MUFA) and *Polyunsaturated Fatty Acid* (PUFA) is a type of good fat that can be consumed in greater quantities because it can lower triacylglycerol and increase HDL. Fats that are not good for consuming in large quantities are *Saturated Fatty Acid* (SFA) because it can increase the risk of degenerative diseases (Syarifusin, 2018).

The results of this study indicate that the snack food around Maranatha Christian University contains a lot of high carbohydrates and high fat, which is seen from the percentage of each macronutrient content to the total calories of the food. The snack food of these street vendors is not considered a balanced nutritional food because most contain a lot of carbohydrates, fat/oil (fried), and salt. This is in line with research on the nutritional content of street food conducted by Albuquerque et al. in Dushanbe, Tajikistan, in 2019, which showed the nutritional content of street food. Studied ones are high in carbohydrates and high in fat (Querque, 2019). Research conducted by Steyn et al. in 2014 regarding the nutritional contribution of *street food* In developing countries, the results are in line namely, around 40% of snack foods contain high carbohydrates, sugar, fat, *trans-fat*, and salt (Steyn at al, 2014).

The results obtained in this study are not in line with the research conducted by Albuquerque et al, in Bishkek, Krygystan in 2020 which was obtained from food *street food* Many foods contain high protein with the same sample number of 30 snacks (Querque, 2020). This can happen because the type of snack studied is different and the food sample studied is western food such as *Hotdogs, hamburgers, and sausage rolls* which contains a lot of meat which is a source of protein, while in Indonesia the majority of snack foods are fried and made from flour so that they are high in carbohydrates and fat. The recommended percentage of macronutrient needs in Indonesia based on the AKG age of 18-30 years or balanced nutrition guidelines for men is 40-60% for carbohydrates, 5-15% for protein, and 25-55% for fat (Hardiansyah, 2013).

The weakness of this study is the limitation of data collection and data collection time because it is in the condition of the COVID-19 pandemic and the Implementation of Community Activity Restrictions (PPKM) since the beginning of 2021. Learning activities are also carried out online, this causes many snack food traders around Maranatha Christian University to not sell and makes it more difficult to collect data for research so that it is necessary to expand the range of sampling radius. The study also did not analyze the ingredients as well as the amount used to make every 100 grams of each snack, but directly used an app that already provided a database of snack foods. This study did not analyze foods that use *toppings* (sauces) or other additional spices against

the calories of food consumed. The cost limitation of this study caused the lack of objective gold standard inspection in the laboratory.

CONCLUSION

Thirty snack samples that have been researched, the following conclusions were obtained, namely that the snack food sold by street vendors around Maranatha Christian University contains high carbohydrate and high fat nutritional content and based on the value of the macronutrient percentage to total calories there are 15 high-carbohydrate snacks, 13 high-fat snacks, 1 high-protein snack, and 1 high-carbohydrate and fat snack.

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