Nutrition Knowledge and Frequency of Food Consumption During COVID-19 Outbreak

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ABSTRACT

Nutrition recommendation is expected to provide better knowledge and eating behavior so that it can help to maintain nutrition and healthy lifestyle during COVID-19 outbreak. The purpose of this study is to determine the relationship between the knowledge of nutrition recommendation and the frequency of food consumption during COVID-19 outbreak. This research was a descriptive study with a cross sectional design and sampling technique used was purposive sampling. Participants were asked to fill out a survey about the nutrition knowledge during COVID-19 outbreak and frequency of food consumption using FFQ Questionnaire. Nutrition knowledge data consist of 13 questions regarding the nutrition recommendation during the COVID-19 outbreak using the nutrition knowledge Questionnaire. All collected data was analyzed by descriptive test and Chi Square test ($p<0.05$). The results showed that 70.2% knowledge about nutrition recommendation during COVID-19 pandemic was in the good category. There was a significant relationship between nutrition knowledge and frequency of healthy foods (fruit, vegetable, meat) and unhealthy foods (fast food, instant products, savory snacks and sweet snacks). The knowledge of nutrition recommendation during the COVID-19 outbreak can affect the selection of healthy and unhealthy foods.

Keywords: nutrition recommendation, food frequency, COVID-19 outbreak

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a respiratory disease caused by a new type of coronavirus, namely Novel Corona Virus 2019 or SARS-CoV-2 which emerged in December 2019 from Wuhan, China. The number of cases of this disease continues to grow and becomes a viral pandemic that has infected several countries in the world [1] [2] [3] [4] [5] [6] [7] [8].

The first COVID-19 case was announced in Indonesia on March 2020. The distribution data of COVID-19 sufferers as of March 2021 globally amounted to 2,735,133 confirmed cases with 62,944 death cases and a mortality rate of 2.30%. The number of regional cases in Southeast Asia was 167,809 confirmed cases and 1,898 death cases (1.13%). This case has infected 215 countries worldwide and declared 195 countries as local transmission. The number of cases is categorized as very high global risk. Indonesia is one of the countries affected by the local transmission. Data on the distribution of patients in Indonesia in the same month showed 45,028 positive confirmed cases with 1,100 death case (2.44%). The number of affected districts and cities in Indonesia was 416 with 128 local transmissions.

Magetan District is one of the districts with a fairly high increase in COVID-19 cases, as many as 6,680 positive confirmed cases with 159 deaths (2.38%) as of March 1, 2021 [9]. This increase in cases is due to the lack of adherence of the Magetan people in applying the health protocols, especially when leaving the house, so the risk of being exposed to COVID-19 is greater. In addition, most of those who have been confirmed positive for COVID-19 come to the puskesmas or hospital already in moderate and even tend to be severe status, with oxygen saturation of less than 80%. Even though the Magetan government has imposed The Public Activity Restrictions (PPKM/Pemberlakuan Pembatasan Kegiatan Masyarakat), the social life which is still thick with a culture of community service, social gathering, and feast which are usually carried out in gatherings, is a habit that is still difficult to avoid so that it becomes one of the factors that causes an increase in COVID-19 cases in Magetan [10].

PPKM is a restriction of public activities in an area suspected of being infected with COVID-19 so that it is expected to help reducing and preventing the spread of COVID-19 [11]. Some activities that are restricted during PPKM include learning activities, only done from home and workplace, restrictions on religious activities, and restrictions on activities in public facilities [12]. PPKM that applies in the long term can affect eating patterns, food availability and food choices in individuals [13]. This results in the frequency of buying ready-to-eat food becomes more often than cooking it by yourself [14]. A research by Di Renzo et al., and Górnicka et al., (2020) showed that during a pandemic, people have a tendency to consume foods high in fat, sugar, and salt such as fast food, ready-to-eat cereals, and snacks because of limited access to fresh vegetables, fruit, and fish . The result of the research

by Scarmozzino and Visioli (2020) also stated that as many as 42.5% of respondents experienced an increase in consumption of comfort food, such as ice cream, chocolate, desserts and savory snacks.

During the current COVID-19 outbreak, it is very important to know and understand what recommendations for food intake and good eating behavior like. The Ministry of Health issues the balanced nutrition guidelines during the COVID-19 pandemic, one of which is by maintaining a balanced nutritional foods [18]. This food intake recommendation is expected to improve knowledge and eating behavior so that it can help maintaining the nutrition intake and healthy lifestyle during the COVID-19 outbreak [19]. Based on this study, the researchers are interested in studying how the knowledge of nutrition recommendation and the frequency of food consumption during the COVID-19 outbreak. This study aims to determine the relationship between the knowledge of nutrition recommendation and the frequency of food consumption during the COVID-19 outbreak

METHODS

This research is a descriptive study with a cross sectional design. Sampling was done by purposive sampling technique in which selecting the sample using the criteria that have been determined by the researcher. The inclusion criteria in this study are adults aged 26-45 years who live in the Magetan District area and are able to read, type, and access the internet. While the exclusion criteria are samples of those who are unemployed, have noncommunicable diseases, and have been confirmed positive for COVID-19 and have received/seeked for information on healing COVID-19 disease. Determination of the number of participants used the Slovin formula with a population of 144,133 people with a tolerable accuracy percentage of sampling error of 0.1 so that the estimated number of required participant is 120 people with a reserve of 20%.

Data collection was done directly by researchers through filling out online questionnaires using Google Form, the data included: 1) nutrition knowledge data with the total of 13 questions related to the meaning of food intake recommendation; what foods should be increased and limited; servings of carbohydrates, animal side dishes, vegetable side dishes, vegetables and fruit in a day; types of vitamins and minerals that play a role in boosting the immune system, and 2) frequency of food consumption of vegetables, fruit, nuts, animal products, milk, fast food, instant food and snacks (savory and sweet snacks).

Instrument data for nutrition knowledge had been tested for validity and reliability with valid categories. Nutrition knowledge data is given a value of 1 for each correct answer and is categorized as good knowledge if it is able to answer more than 56% of the correct answers from the total questions (or correctly answered 8-13 questions) and lack of knowledge if less than 56% of the correct answers. Data on frequency of food consumption collected using FFQ Questionnaire and grouped based on food ingredients with a frequency of > 3 times a day (score 50), 1 time a day (score 25), 3-6 times per week (score 15), 1-2 times per week (score 10), 2 times a month (score 5) and never (score 0). Frequency of food consumption was categorized as frequent, that is, if the average frequency of food consumption of the subject is more than the average frequency of food consumption of the population. Furthermore, the data obtained were analyzed using SPSS 17 software using the Chi-Square Test.

Data collection that has been carried out from April to May 2021. Penyebaran kuesioner online dilakukan pada sosial media. The online questionnaire was distributed on social media The research information form and informed consent are shown on the first page of the form. All data was collected anonymously and there was no charge for completing the form. This research has received approval from KEPK FK UNSOED with KEPK Registration No: 082/KEPK/III/2021.

RESULTS

Data collection that has been carried out from April to May 2021 obtained 158 participants who filled out online questionnaires. The researcher selected the participants according to the inclusion criteria. The excluded participants are those who are more than 26-45 years old, live outside the Magetan district, are unemployed, have an infectious disease, and had been confirmed positive for COVID-19. The final result of the number of participants that match the inclusion is 124 participants as presented in Figure 1.
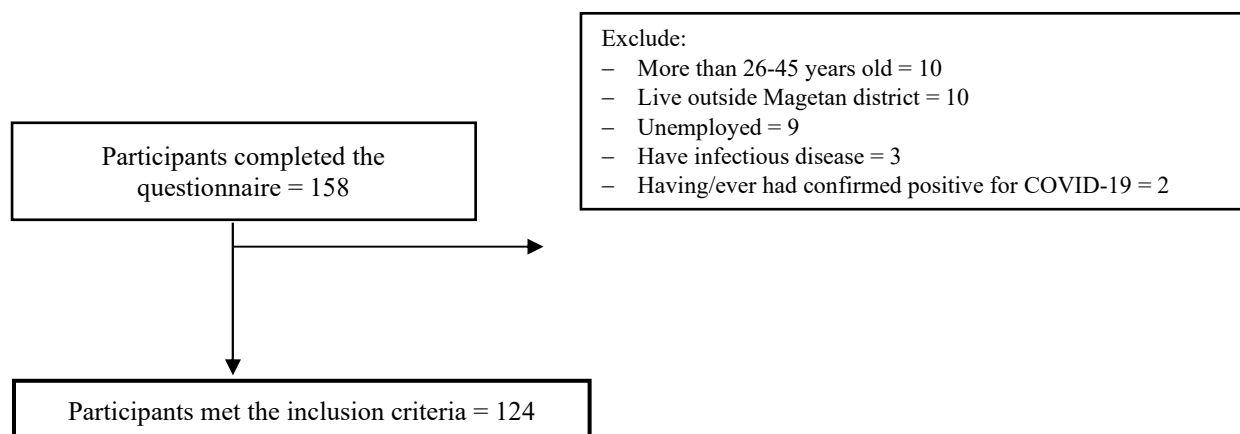
Figure 1. Flowchart of the Process of Collecting Participants

The characteristics of the subjects in this study include gender, weight change, nutritional status, education background, ways of working during the COVID-19 pandemic, average monthly income and eating behaviours during COVID-19 outbreak. The frequency distribution of the participants characteristics can be seen in Table 1.

Table 1. Participants Characteristics

Characteristics	Frequency (n=124)	Percentage (%)
Gender		
Male	52	41,9
Female	72	58,1
Weight Change		
Static/No weight change	69	55,7
Decrease of weight	5	4,0
Increase of weight	50	40,3
Nutritional status		
Underweight	8	6,5
Normal	58	46,8
Overweight	54	43.5
Unknown	4	3,2
Education Background		
Diploma/Bachelor/Master	92	74,2
SMA/equal	32	25,8
Working ways during COVID-19 pandemic		
Full time working at distance	45	36,3
Regular working (directly to workplace)	79	63,7
Average Income per Month (in rupiah)		
≥2.500.000	59	47,6
1.000.000 - <2.500.000	37	29,8
500.000 - 1.000.000	28	22,6
More food portions		
Yes	43	34,7
No	70	56,4
Not sure	11	8,9
Frequency of mealtimes per day		
1-3 times	106	85,5
4-5 times	18	14,5
Snacking more frequent		
Yes	46	37,1
No	63	50,8
Not sure	15	12,1
Frequency of snacking per day		
1-2 times	90	72,6
3-4 times	17	13,7
Never	17	13,7
Cooking more frequent		
Yes	71	57,2

No	42	33,9
Not sure	11	8,9

Most of participants in this study are female as many as 72 participants (58.1%) and the rest are male, as many as 52 participants (41.9%). Subjects felt that there was an increase in body weight (40.3%) and most did not feel any change. Nutritional status was calculated using Body Mass Index (BMI) based on reports or recognition of the participant's weight and height. Most of the participants had normal nutritional status as many as 58 people (46.8%) and the lowest distribution is undernutrition status, as many as 8 participants (6.5%). A total of 3.2% of participants did not know BMI because they did not do routine weighing. The smallest BMI is 16.3 kg/m^2 and the largest BMI is 35.5 kg/m^2. The distribution of the education background is mostly Diploma/Bachelor/Master graduates as many as 92 participants (74.2%) and the rest graduated from high school/equal that is 32 participants (25.8%). The way of working during the COVID-19 pandemic, most of them worked regularly (directly to the workplace) as many as 79 participants (63.7%) and the rest worked full-time at a distance, as many as 45 participants (36.3%) with the most average income of them are 2,500,000 rupiahs, which are 59 participants (47.6%) and the rest is 500,000 - 1,000,000 rupiahs, as many as 28 participants (22.6%).

Most of the participants felt that there was no change in the food portions during the COVID-19 outbreak (56.4%) and the mealtimes frequency of participants was mostly 1-3 times per day (85.8%). Likewise with snacking, half of them felt that there was no change in snacking frequency (50.8%) with the frequency of eating snacks 1-2 times per day. Most of the participants became more frequent in cooking during the COVID-19 outbreak (57.2%).
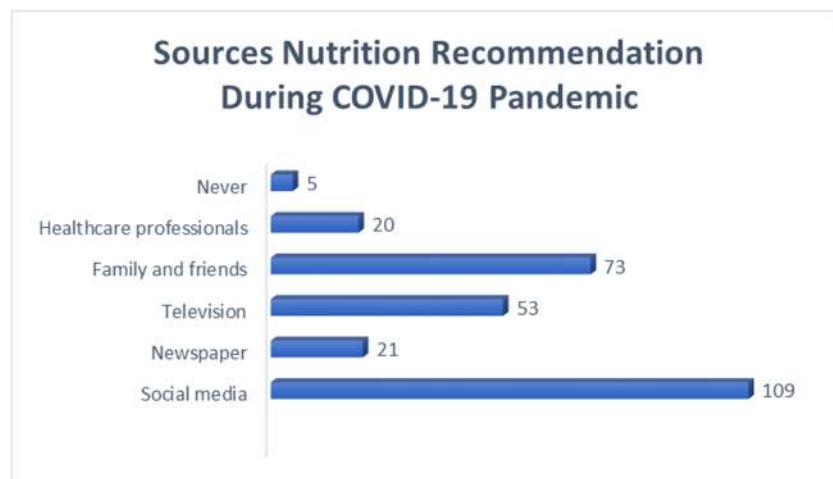
Nutrition Knowledge

The Indonesian Ministry of Health has provided recommendation for Balanced Nutrition Guidelines during COVID-19 Pandemic Outbreak. Most of the subjects have ever read, obtained or sought for the information regarding the food intake recommendations during the COVID-19 outbreak, as many as 119 participants (96.0%) and the rest have never done that as many as 5 participants (4%) as presented in Table 2.

Tabel 2. The Exposure of Information on the Nutrition Recommendation During COVID-19 Outbreak

Exposure of Information	Frequency (n)	Percentage (%)
Ever	119	96,0
Never	5	4,0
Total	124	100

Most participants had ever read, obtained or sought for the information through social media the most are 109 participants and at least 20 participants are from health workers/nutritionists (Figure 2) *⁾

Picture 1. The Source of Information

Good nutrition knowledge category if they understand: the meaning of food intake recommendation; what foods should be increased/limited; servings of carbohydrates, animal side dishes, vegetable side dishes, vegetables and fruit in a day; types of vitamins and minerals that play a role in boosting the immune system. Based on table 3, it can be seen that the level of knowledge of the participants is mostly in the good category as many as 87 participants (70.2%).

Table 3. The Level of Nutrition Knowledge

Level of Nutrition Knowledge	Frequency (n)	Pecentage (%)
Low	37	29,8
Good enough	87	70,2
Total	124	100

The results of this study indicate that most of the participants already understand what exactly is meant by food intake recommendations, what foods should be increased or limited during the COVID-19 outbreak, each of which answered correctly regarding the question, as many as 119 participants (91,1). %), 87 participants (70,2%), and 88 participants (71,0%). However, most of the samples did not know how much of the recommended serving of vegetables, fruit, and carbohydrates consumed in a day so that most of the samples answered incorrectly regarding the question, as many as 97 participants (87,2%), 113 participants (91,1%), and 107 participants (86,3%).

Frequency of Food Consumption

Frequency of food consumption of the participants is measured through the FFQ (Food Frequency Questionnaire) which aims to determine eating habits related to how often the sample consumes types of food ingredients in a certain period of time. The distribution of food frequency based on the groups of food ingredients can be seen on Table 4.

Tabel 4. The Distribution of Food Frequency Based on The Groups of Food Ingredients

Food Ingredients	Not Frequent		Frequent	
	(n)	(%)	(n)	(%)
Fruits and Vegetables	59	47,6	65	52,4
Nuts	64	51,6	60	48,4
Grains	81	65,3	43	34,7
Meat	48	38,7	76	61,3
Milk and Dairy Products	55	53,2	58	46,8
Fast Foods	63	50,8	61	49,2
Instant Foods	65	52,4	59	47,6
Sweet snacks and sugar	66	53,2	58	46,8
Savory snacks	48	38,7	76	61,3

Based on table 4, it can be seen that as many as 65 participants (52.4%) frequently consumed fruits and vegetables, 76 participants (61.3%) frequently consumed meat, and 58 participants (46.8%) frequently consumed milk and dairy products. From the results above, it can be assumed that the participants frequently consumed these food ingredients because during the COVID-19 outbreak, these food ingredients are in sufficient availability or easy to find, another reason may be that most of the participants have an average monthly income of 2,500,000 rupiahs so it is easy to meet some of these types of food ingredients. On the other hand, most of the participants still frequently consumed savory snacks, as many as 76 subjects (61.3%).

Nutrition Knowledge and Frequency of Food Consumption

Nutrition recommendation based on the Balanced Nutrition Guideline during COVID-19 outbreak that has been issued by the Indonesian Ministry of Health aims to protect families from transmission of the corona virus and how to increase immunity with balanced nutrition. The guideline recommends adequate portions of vegetables and fruit, increasing foods containing nutrition that play a role in increasing body immunity and limiting the consumption of certain foods to reduce the risk of chronic diseases and infections [18]. Table 5 presents the relationship between knowledge of nutrition recommendation and the frequency of food consumption. There was

a significant relationship between knowledge of nutrition recommendation of vegetables, fruit and meat with the frequency of frequent consumption of these foods (p<0.05). This means that good knowledge can increase the nutrition as an effort to prevent COVID-19. Likewise with certain food restrictions. There was a significant relationship between knowledge of nutrition recommendation and restrictions on fast food, instant food products, sweets, sugar and savory snacks (p<0.005). There is a tendency of good knowledge to have frequent consumption of nuts although not statistically significant (p>0.05). The researcher assumed that the frequency of grains and milk consumption is rare because the lifestyle and habits of the Indonesian people do not routinely consume these foods so that statistically there was no relationship between knowledge and the food frequency of grains and dairy products (p> 0.05).

Table 5. The Relationship between Nutrition Knowledge and Frequency of Food Consumption

Knowledge of Food Ingredients	Food Frequency				Total		p-*value*
	Not frequent		Frequent				
	n	%	n	%	n	%	
Fruits and Vegetables							
Less	25	42,4	12	18,5	37	29,8	0,004*
Good	34	57,6	53	81,5	87	70,2	
Nuts							
Less	21	32,8	16	26,7	37	29,8	0,455
Good	43	67,2	44	73,3	87	70,2	
Grains							
Less	21	25,9	16	37,2	37	29,8	0,191
Good	60	74,1	27	62,8	87	70,2	
Meat							
Less	6	12,5	31	40,8	37	29,8	0,001*
Good	42	87,5	45	59,2	87	70,2	
Milk and Dairy products							
Less	16	24,2	21	36,2	37	29,8	0,146
Good	50	75,8	37	63,8	87	70,2	
Fast foods							
Less	10	15,9	27	44,3	37	29,8	0,001*
Good	53	84,1	34	55,7	87	70,2	
Instant foods							
Less	11	16,9	26	44,1	37	29,8	0,001*
Good	54	83,1	33	55,9	87	70,2	
Sweet snacks and sugar							
Less	9	13,6	28	48,3	37	29,8	0,000*
Good	57	86,4	30	51,7	87	70,2	
Savory snacks							
Less	8	16,7	29	38,2	37	29,8	0,011*
Good	40	83,3	47	61,8	87	70,2	

DISCUSSION

The global COVID-19 outbreak that has occurred since December 2019 has forced governments in all countries to implement certain policies to prevent the transmission. These policies, including lockdown, isolation, quarantine, social distancing, physical distancing and PPKM implemented in Indonesia have caused several sectors such as education, places of worship, sports facilities and gathering places to be limited. This forces everyone to do activities at home and do online communication and education activities. As a result, there are changes in mental health, lifestyle and diet. Limited activities outside the home can lead to a lack of physical activity [20]. In addition, prolonged stress due to limited social activities can interfere the eating habits and changes in body weight [21]. A total of 40.3% of study subjects reported an increase in body weight during the COVID-19 pandemic. Similar to research Cheikh Ismail *et al* (2020), Alhusseini *et al* (2020) and Gornicka *et al* (2020) Di Renzo *et al.*, dan Górnicka *et al.*, (2020)who reported that the increase in body weight during the pandemic was due to an increase in the frequency of primary meals and a lack of physical activity[21] [20]. Several recent studies have also mentioned the same thing regarding this problem during the COVID-19 outbreak.

Changes in eating habits have also been reported during COVID-19 outbreak due to the implementation of these policies. Changes in eating habits due to this policy are due to the limited access to food and limited market and supermarket facilities so that it can affect eating habits [20] Di Renzo *et al.*, dan Górnicka *et al.*, (2020). Limited dining facilities as a result of the implementation of the policy forced a person to process food independently (57.2%). As many as 33.9% of the participants in this study did not process their own food because they could buy food online. During the implementation of the COVID-19 transmission prevention policy, restaurants and diner only serve online orders. This is thought to be the cause of the subjects of this study not processing their food independently. Research by Alhusseini *et al* (2020) stated that there was an increase of 28.6% in buying food online[20].

The concept of changing food consumption during the COVID-19 outbreak is complexly presented in Figure 2. In addition to these government policies, each individual has their own perception of food consumption during the pandemic. There are those who pay attention to disease prevention so they will increase food nutrition which can increase immunity. Meanwhile, someone who is worried about COVID-19 is likely to increase the consumption of comfort food. Meanwhile, at the household level, the COVID-19 pandemic will be able to change the ability to prepare and process food [22].
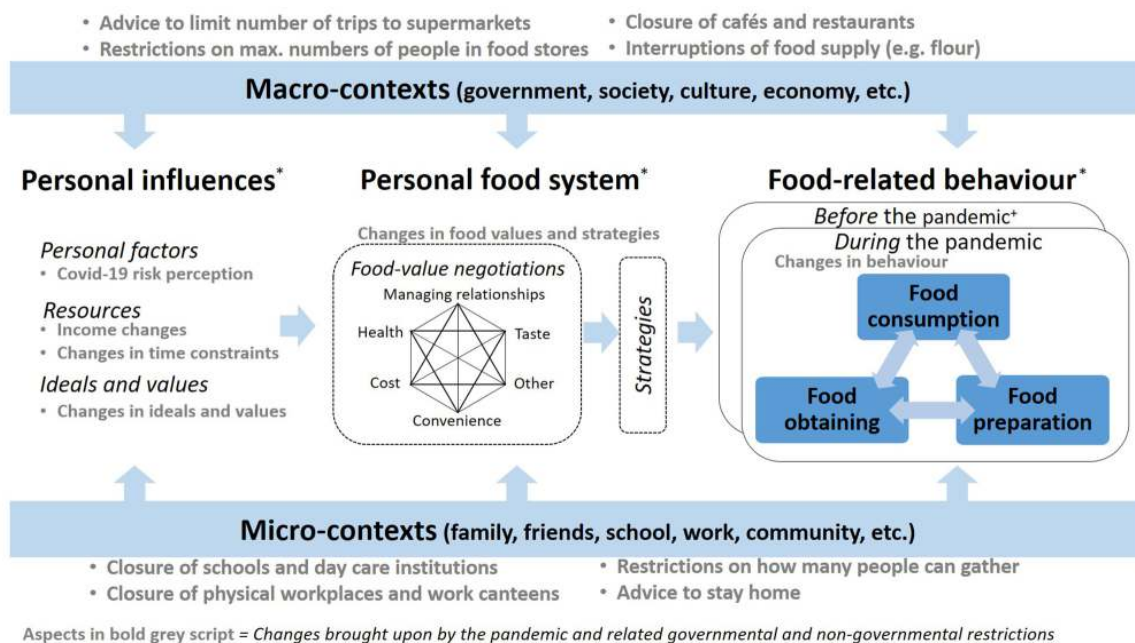

Figure 2. The Concept of Changes on Food Consumption During COVID-19 Pandemic [22]

Up to now, there is no cure for COVID-19, so it is necessary to recommend a healthy, safe and balanced nutrition followed by regular physical activity and mental health management. Most of the information on nutrition recommendation during the COVID-19 pandemic in this study was obtained from social media. This is in accordance with a research by Cheikh Ismail *et al* (2020) [21] which stated that social media is the main source of information. Social media has become one of the Ministry of Health's information media, including the Balanced Nutrition Guideline during the COVID-19 pandemic. It contains the guideline for maintaining a healthy diet during the COVID-19 pandemic and maintaining a balanced nutritional diet in improving the immune system and preventing non-communicable diseases [18]. Nutrition is one of the important pillars in creating immunity and preventing from viruses. Balanced nutrition can help to improve the immune system during the COVID-19 pandemic [20].

The incessant information from social media is thought to be able to cause the participant's knowledge of nutrition recommendation during the pandemic to be in the good category (79.2%) so that a tendency for an increase in the frequency of consumption of healthy food and a decrease in unhealthy food is reported in this study. Frequent repetition of information about food recommendation during the COVID-19 pandemic can change one's eating habits and food purchasing behavior [23]. This is similar to a study by Alhusseini *et al* (2020) [20] which compared eating habits before and during the COVID-19 outbreak that there was a significant increase in choosing healthy food and processing their own food.

This study shows that good knowledge can affect the frequency of consumption of certain foodstuffs. Similar to the research conducted by Yilmaz *et al* (2020) and Saah *et al* (2021) [23] [24] that most of the subjects experienced an increase in knowledge related to healthy food choices and was followed by an increase in consumption of vegetables and fruit. That is, someone who has increased knowledge or has good knowledge will be followed by an increase in consumption of vegetables and fruit. Further research by Yilmaz *et al* (2020)[23] stated that increasing consumption of vegetables, fruit, red meat, and fish can help to boost the immune system and prevent the transmission of COVID-19. Increasing fruits and vegetables as a source of antioxidants is one of the recommendations in eating arrangements during the pandemic [21]. Vegetables are rich in vitamins A, C, B, K, folic acid, iron, potassium, zinc, calcium, beta-carotene, and other antioxidants that can boost the immune system. While nuts contain vitamin E and zinc which can improve a person's immune function [25]. It is in contrast to research which stated that there is a tendency to decrease fresh foods from vegetables, fruit, meat, fish, milk and bread. Similar to that study, instant food products in this study experienced an increase in consumption during the COVID-19 pandemic. This is thought to be due to the limited availability of fresh food every day, so there is tendency to choose instant food products Di Renzo *et al.*, (2020). In addition, each individual's perception of COVID-19 is different so that it will change one's eating habits.

On the other hand, most of the subjects also frequently consumed savory snacks as many as 76 participants (61.3%). Research conducted by Skotnicka et al., (2021) showed an increase in the consumption of sweet foods and tea before and during the COVID-19 pandemic in Austria with the percentage from 17.85% to 24.36% and from 54.11% to 58.36%, respectively. Another study conducted by Ruiz-Roso *et al.*, (2020) dan Pietrobelli *et al.*, (2020) found an increase in the consumption of comfort foods such as potato chips, fried foods, cakes, chocolate, and sweet drinks during the lockdown due to COVID-19 because people are more often at home so they have more time to consume comfort food. According to Bennett *et al.*, (2021) in a literature study, it was stated that consuming savory and sweet snacks was used to help overcome the anxiety that arose during the lockdown.

The food frequency during the COVID-19 outbreak is not only related to knowledge about nutrition recommendation; there are many other factors that can influence it including food shopping frequency, COVID-19 perception, COVID-19 anxiety, closure of workplace, closure of office canteens, closure of cafe and restaurant, income loss due to pandemic and eating frequency before the pandemic. Changes in shopping frequency will reduce the frequency of shopping for fresh food ingredients such as vegetables, fruit, meat, fish, milk, thereby shifting the purchase of frozen and instant food products. Perceptions about COVID-19 will also affect one's eating frequency. There is someone who has the perception of increasing the nutrition of healthy food to increase immunity, on the other hand there is someone who feels anxious about COVID-19 so they prefer comfort food in the form of sweet, savory snacks and alcohol. Reduced income during the pandemic led to a decrease in consumption of fruit vegetables, food preparation and processing independently, thus shifting to the consumption of bread and sweet foods [22]

This study is limited to the data on food frequency during the COVID-19 outbreak, without comparing the differences before the pandemic. The data collected based on the self-reported questionnaire could be one of the biases in data collection or errors in reporting the data personally. Online data collection is limited to subjects who can access the questionnaire, yet have not been able to include subjects who are not reached by the internet or able to fill out research forms. Future research can analyze nutrition knowledge and changes in eating habits and also food frequency before and during the pandemic, both in terms of quality and quantity

CONCLUSION

Good nutrition knowledge about nutrition recommendation during pandemic is able to change a healthy lifestyle by increasing the food frequency which can help the immune system and limiting unhealthy food which can cause negative effects on other health during the COVID-19 pandemic. The results of this study can be used as information related to minimizing the negative effects of the pandemic on the nutrition. The COVID-19 pandemic is still ongoing, the data in this study is to be informed in future studies with larger population.

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