

Perubahan frekuensi konsumsi makanan dan hubungannya dengan kerawanan pangan selama pandemi COVID-19 di Kota Yogyakarta: Studi Cross-Sectional

Changes in food consumption frequency and its association with food insecurity during the COVID-19 pandemic in Yogyakarta City: A Cross-Sectional Study

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Abstract

Background: The number of poor people in Yogyakarta City increased by 7,37% compared to the previous year in 2020 and 2021. The scale of household hunger in Daerah Istimewa Yogyakarta Province was 6% before the pandemic and increased during the pandemic to 11%. The research question of this study is whether there is a change in the frequency of food consumption during the COVID-19 pandemic in Yogyakarta City and whether there is a relationship between food insecurity and the frequency of food consumption in Yogyakarta City.

Objectives: This study aims to compare the frequency of food consumption among Yogyakarta City people aged 20–54 before and during the COVID-19 pandemic.

Methods: This study used cross-sectional design. The research was conducted in Yogyakarta City from February 2021 to February 2022. There were 357 people involved in this study. The sample was selected using multistage random sampling. Data were collected using interview techniques and filling out respondent identity questionnaires, Food Frequency Questionnaire (FFQ), and Household Food Insecurity Access Scale (HFIAS). Data were analyzed descriptively and analytically. The difference test used the Wilcoxon Signed Ranks Test. Relationship between food security status and frequency of food consumption during the COVID-19 Pandemic used the Spearman's rank Correlation Test.

Results: The results showed that there was a difference in the frequency of consumption of vegetables and fruit between before and during the COVID-19 pandemic ($p=0,035$; $p=0,010$). There was a significant relationship between food insecurity during the COVID-19 pandemic and the frequency of consumption of staple foods ($p=0,04$; $r=-0,10$), milk/dairy products ($p=0,02$; $r=-0,12$), meat ($p=0,00$; $r=-0,28$), fish/seafood ($p=0,00$; $r=0,33$), and fruit ($p=0,00$; $r=-0,19$).

Conclusion: Fruit and vegetable consumption has increased during the COVID-19 pandemic compared to pre-pandemic levels. There was a significant relationship between food insecurity during the COVID-19 pandemic and the frequency of consumption of staple foods, milk, meat, fish/seafood, and fruit. Public health strategies should ensure access to affordable sources of animal for food-insecure populations during health crises.

Keywords:

Food frequency, COVID-19, dietary changes, foodsecurity, Yogyakarta

Abstrak

Latar belakang: Skala kelaparan rumah tangga di Provinsi Daerah Istimewa Yogyakarta sebelum pandemi sebesar 6% dan meningkat selama pandemi menjadi 11%. Pertanyaan penelitian ini adalah apakah terdapat perubahan frekuensi konsumsi pangan pada masa pandemi COVID-19 di Kota Yogyakarta dan apakah terdapat hubungan antara kerawanan pangan dengan frekuensi konsumsi makanan di Kota Yogyakarta.

Tujuan: Penelitian ini bertujuan untuk membandingkan frekuensi konsumsi pangan masyarakat Kota Yogyakarta usia 20–54 tahun sebelum dan selama pandemi COVID-19.

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Metode: Penelitian ini menggunakan desain cross-sectional. Penelitian dilakukan di Kota Yogyakarta pada bulan Februari 2021 sampai dengan Februari 2022. Jumlah responden dalam penelitian ini sebanyak 357 orang. Pengambilan sampel menggunakan *multistage random sampling*. Data dikumpulkan dengan teknik wawancara dan pengisian kuesioner identitas responden, *Food Frequency Questionnaire* (FFQ), dan *Household Food Insecurity Access Scale* (HFIAS). Data dianalisis secara deskriptif dan analitik. Uji perbedaan menggunakan *Wilcoxon Signed Ranks Test*. Hubungan status ketahanan pangan dengan frekuensi konsumsi pangan pada masa pandemi COVID-19 menggunakan *Spearman's Rank Correlation Test*.

Hasil: Hasil penelitian menunjukkan bahwa terdapat perbedaan frekuensi konsumsi sayur dan buah antara sebelum dan selama pandemi COVID-19 ($p=0,035$; $p=0,010$). Terdapat hubungan yang signifikan antara kerawanan pangan selama pandemi COVID-19 dengan frekuensi konsumsi bahan makanan pokok ($p=0,04$; $r=-0,10$), susu/produk olahan susu ($p=0,02$; $r=-0,12$), daging ($p=0,00$; $r=-0,28$), ikan/seafood ($p=0,00$; $r=0,33$), dan buah ($p=0,00$; $r=-0,19$).

Kesimpulan: Konsumsi buah dan sayur meningkat selama pandemi COVID-19 dibandingkan dengan sebelum pandemi. Terdapat hubungan yang signifikan antara kerawanan pangan selama pandemi COVID-19 dan frekuensi konsumsi makanan pokok, susu, daging, ikan/makanan laut, dan buah. Strategi kesehatan masyarakat harus memastikan akses terhadap sumber protein hewani yang terjangkau bagi populasi yang mengalami kerawanan pangan selama krisis kesehatan.

Kata Kunci:

Frekuensi konsumsi, COVID-19, perubahan pola makan, kerawanan pangan, Yogyakarta

Introduction

On March 11, 2020, the World Health Organization (WHO) declared the coronavirus illness (COVID-19) to be a pandemic (WHO, 2020). On March 17, 2020, the president of the Republic of Indonesia proclaimed that the sickness was in the Emergency Response Stage (Gugus Tugas Percepatan Penanganan Covid-19, 2020). The outbreak of COVID-19 requires countries around the world to take action to contain and prevent the spread of the virus. Many countries have taken action by promoting social distancing and lockdown (Mumena, 2020). Numerous changes have been brought about by the COVID-19 pandemic in areas of human life such as psychology, economy, society, and health (Haleem et al., 2020; Pekmezci Purut & Başaran, 2021). The government's imposition of social services in Indonesia has impacted every segment of society, but notably daily laborers and those with lower middle-class incomes. Community groups that previously were not poor have finally become poor because of this large-scale of social distancing (Kurniasih, 2020).

The COVID-19 pandemic has a very significant impact on family life in Indonesia. Children can no longer take part in school food programs, three million people lost their employment or means of subsistence, and some families are unable to buy the food they always did. People need to spend more time at home and may change their food consumption to less variety, as well as increased consumption of processed foods and reduced consumption of nutritious foods, including fresh fruits and vegetables. Current circumstances may confront situations many families previously faced in accessing affordable

quality food. The current food supply chain and system are disrupted due to social distancing (United Nations Indonesia, 2020). Poverty in Indonesia has been made worse by the COVID-19 outbreak (Tarigan et al., 2020). Before the COVID-19 pandemic, the global community, including the Indonesian people, was diligent in paying attention to meeting the needs of life by utilizing the value of goods and services. However, during the COVID-19 pandemic, the community is encouraged to pay special attention to the consumption of food or products that do not only fulfill their needs but also help increase their immunity (Herianto et al., 2021). The epidemic condition has caused changes in the eating habits of the countries under study. They exacerbate the issue of being overweight and the negative effects it has on one's health (Skotnicka et al., 2021).

The problem of food security is a very vulnerable thing in the conditions of the COVID-19 pandemic (Purnasari et al., 2020). Previous studies have shown how the COVID-19 epidemic has affected people's food intake. A study conducted in Indonesia revealed that the COVID-19 pandemic has resulted in a decline in family food security levels by adversely affecting people's employment and earnings, particularly in urban and semi-urban areas. At several levels, household members' food consumption and nutritional intake are directly impacted by the poor degree of food security in the home. Household food intake is impacted by food shortages during the COVID-19 epidemic. Food-shortage households typically eat a smaller variety of foods. Furthermore, other people eat less, and some people never eat at all throughout a day (Syafiq et al., 2022). Frequency of consumption of various food groups was reduced and

this mainly occurred in low-income families (Kansiime et al., 2020). People tended to eat less during the COVID-19 pandemic because they had limited availability to food (Jafri et al., 2021).

In Daerah Istimewa Yogyakarta (DIY) Province, Yogyakarta City has the greatest population density—13,163 persons per km² (Dinkes DIY, 2017). Yogyakarta's tourism business already exists. The commerce, hotel, and restaurant industries, the financial sector, the transportation and communications business, the rental and corporate services sector, and the services sector are just a few of the many economic sectors that are involved in this industry. The economic and manufacturing businesses of Yogyakarta are undoubtedly impacted by the COVID-19 pandemic.

Every district/city in the Special Region of Yogyakarta Province was affected by the COVID-19 pandemic. The number of poor people in Yogyakarta City increased by 7,37% compared to the previous year in 2020 and 2021. As a tourist city, the Special Region of Yogyakarta Province experienced a decrease in the number of tourists visiting districts and cities in the region as a result of the COVID-19 pandemic. The COVID-19 pandemic also paralyzed the economy and tourism of Yogyakarta City, with restrictions on community activities or lockdowns, closures of tourist attractions, and layoffs in various businesses (Nugraha & Angeningsih, 2022). In addition to the tourism sector, the micro, small, and medium enterprises (MSMEs) sector in the Special Region of Yogyakarta Province has also experienced negative impacts from the COVID-19 pandemic. Negative effects include limited availability of raw materials, rising prices of primary raw materials, decreasing production capacity, decreasing business marketing, sales partners stopping buying their goods, workers being laid off, decreasing export demand, and lower availability of goods and services (Ridlo, 2020). This situation causes a decrease in people's income.

During the COVID-19 pandemic, most households experienced a decrease in income needed to meet their daily needs, including food needs. Families with limited income tend to have difficulty purchasing nutritious and diverse foods. Households experiencing food insecurity must reduce the number or volume of portions they eat, use cheaper foods, or skip meals (Hidayati, 2023). Previous studies have investigated household hunger levels during the COVID-19 pandemic in the Special Region of Yogyakarta. The results showed that household hunger levels were 6% before the pandemic and increased to 11% during the pandemic. The financial crisis caused by COVID-19 has also caused more

households to experience food insecurity. While the study's findings cannot be applied to every region in DIY Province, they do show that, under constant conditions, the degree of hunger may have an impact on food insecurity (Purnasari et al., 2020).

Previous study has examined the impact of the COVID-19 pandemic on changes in the eating habits of the Indonesian population. Several studies have examined the frequency of food consumption during the COVID-19 pandemic (Larasati & Lukmana, 2021), consume staple foods (rice, egg, chicken meat, cooking oil, milk, sugar) per capita before and during the pandemic (Riniati et al., 2022), changes in consumption of certain food (fast food, snack, soft-drink, supplement, fruit, vegetable) during pandemic (Puteri et al., 2022). Previous studies also analyzed differences in consumption of food groups before and during the COVID-19 pandemic (Dianah & Merdekawati, 2022; Dieny et al., 2021; Faridi & Furqan, 2021; Victoria et al., 2023). However, these studies have not yet linked food security during the COVID-19 pandemic with the frequency of food consumption. Based on these conditions, the research question of this study is whether there is a change in the frequency of food consumption during the COVID-19 pandemic in Yogyakarta City and whether there is a relationship between food security and the frequency of food consumption in Yogyakarta City. The aims of this study is to analyze changes in food consumption and its relationship to food security during the COVID-19 pandemic in Yogyakarta City.

Methods

Design, location, and time

The design of this study was cross-sectional. This research was conducted in Yogyakarta City from February 2021 to February 2022. The research population was adults aged 20 – 54 years. Based on population projections by gender and age group in Yogyakarta City, the population in the 20 - 54 year age group is 121,281 people (Nuraini & Jatmiko, 2021). The research sample met the research inclusion requirements, namely that the sample has been domiciled in the city of Yogyakarta for at least the last 6 months, was not in a condition of self-isolation due to being confirmed positive for COVID-19, was not currently on a special diet due to a certain disease, was willing to be a research subject by signing an informed consent, and not being pregnant for adult women. The minimum sample size calculation used the Table to determine the Number

of Samples from a Certain Population with an Error Rate of 1%, 5%, and 10% (Sugiyono, 2011). Based on the table for determining sample size, the population size is 100,000 - 150,000 with an error rate of 5%, the minimum sample size for this research was 336 - 340 people. The subjects involved in this study were 357 people. This research has received an ethical letter from Ethics Commission for Health Research of Health Science of Respati University of Yogyakarta (Number. 063.3/FIKES/PL/IV/2021). This study has obtained protocol and procedure approval from the Ethics Committee of Universitas Respati Yogyakarta number 063.3/FIKES/PL/IV/2021.

Sampling

The sampling technique used the Multistage Sampling technique (random stages). In this study, sampling technique combined three sampling techniques (Figure 1), namely cluster random sampling, stratified random sampling, and simple random sampling (Sugiyono, 2011).

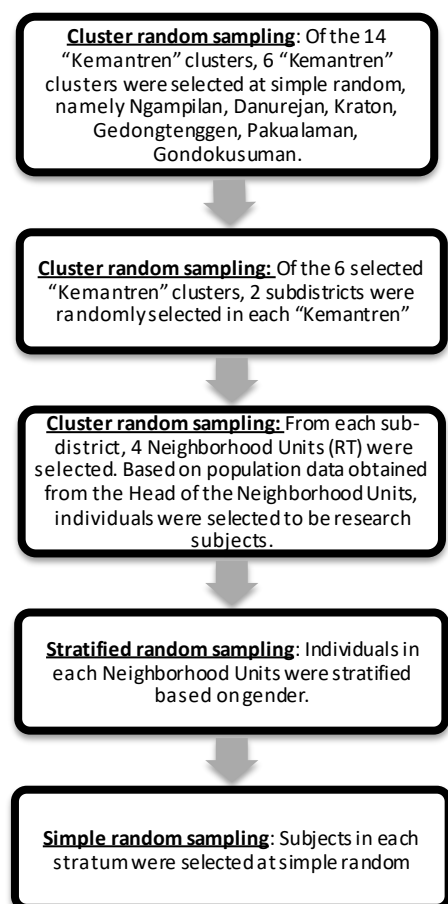


Figure 1. Technique sampling

Data collection

Variables in this study were frequency of food consumption before and during pandemic COVID-19,

socio-demographic characteristics, and household food security status. The food included staple foods (rice/cassava/noodles/bread), legumes, milk/dairy products, meat, fish/seafood, eggs, vegetables, fruits, snacks/juice/sweets drinks/ice cream/candy, sugar, and oil. Socio-demographic characteristics included age, gender, and education levels, employment status during pandemic (employed and unemployed), marital status (married and single/widowed/divorced/separated); respondent monthly income during the COVID-19 pandemic that based on the minimum salary level of Yogyakarta.

Frequency of food consumption was measured using the Food Frequency Questionnaire (FFQ). It was used to record information regarding the frequency of food group consumption in 3 months period before and during the COVID-19 pandemic. Respondents were asked about the frequency of food consumption per day or week or month or 3 months or never before (January - March 2020) and during (January - March 2021) the COVID-19 pandemic. The average frequency of food per day is calculated by converting the frequency of food consumption per day. For example, legumes are never consumed, equivalent to 0. Staple food is consumed 3 times per day, equivalent to $3 \times 1 = 1$. Meat is consumed 4 times per week, equivalent to $4/7$ per day = 0,57. Fruits consumed 3 times per month, equivalent to $3/30 = 0,1$. Milk consumed 5 times per 3 months equivalent to $3/90 = 0,03$. The researcher trained enumerators to improve their ability to collect food consumption frequency data in order to reduce respondents' recall bias when answering questions. Additionally, in the study, one of the criteria for research respondents is to be aged 20-54 years to reduce recall bias. The FFQ used has not been validated, but the researcher had identified that the foods and beverages included in the FFQ are types of food that are generally consumed by the community and are available or were typical foods in Yogyakarta City.

Food security was measured using the Household Food Insecurity Access Scale (HFIAS) which was released by the Food and Nutrition Technical Assistance Project (FANTA) in 2007 and published in 2012. The use of this method is based on the results of previous research. Based on the results of sensitivity and specificity tests, the HFIAS method can be used as a method for measuring the level of food security. The results of the sensitivity test show that the HFIAS method is 86,6% sensitive in identifying food-insecure households, with a reliability value of 0,84 for the HFIAS questionnaire. The Household Food Insecurity Access Scale can be

used as a method of measuring urban and rural household food security (Ashari et al., 2019). The Household Food Insecurity Access Scale consists of 11 questions. Each question received a score between 0 and 3 from the respondents. A score of 0 states never, 1 states rarely (1-2 times in 4 weeks), 2 states sometimes (3-10 times in 4 weeks), and 3 states often (> 10 times in 4 weeks). Food security is categorized into four levels, namely: a) food security if the total score obtained is 0-1; b) slightly food insecure if the total score obtained is 2-7; c) moderate level of food insecurity if the total score obtained is 8-14; d) severe food insecurity if the total score obtained is >14 (Ashari et al., 2019).

Age of respondents' were categorized as 20 - 29 yo, 30 -39 yo, 40 - 49 yo, and 50-54 yo. The level of education was categorized as incompleting elementary school, completed elementary school, completed junior high school, completed senior high school, and completed college. Employment status during pandemic was categorized as private or government employee/army/police/entrepreneurship; farmer/breeder/labor/others; and did not work. Family income compared to the Yogyakarta City Regional Minimum Wage in 2018 was IDR 2,069,530. Family income is the amount of money earned by all family members who live in the same house as the research subject. Income is categorized into low (less than the minimum wage) and high (more than or equal to the minimum wage). Marital status (during the COVID-19 pandemic) was categorized as married and

single/widowed/divorced. The data collection technique used the interview method using a structured questionnaire to collect demographic and socio-economic data on research subjects. This research involved 17 enumerators who were students in the fifth semester of the Bachelor of Nutrition Study Program at STIKes Panti Rapih Yogyakarta. Enumerators received training and detailed explanations from researcher regarding the use of research instruments before collecting data.

Data analysis

Data analysis used univariate analysis and bivariate analysis. Univariate analysis was conducted to describe the research variables. Bivariate analysis was conducted in stages including normality test analysis with the Kolmogorov-Smirnov test. The difference test used the Wilcoxon Signed Ranks Test. Relationship between food security status and frequency of food consumption during the COVID-19 Pandemic in Yogyakarta used the Spearman's rank Correlation Test. Data analysis used the SPSS program version 21.

Results

A total of 357 respondents aged 20 - 54 years participated in this study. The socio-demographic characteristics and household food security of the respondents are shown in Table 1.

Table 1. Distribution of respondent's socio-demographic characteristics and household food security status.

Characteristics	Median	Minimum-maximum	Characteristics	Median
Age (yo)	40	20-54		
20 - 24			50	14,0
25 - 29			31	8,7
30 - 34			33	9,2
35 - 39			60	16,8
40 - 44			67	18,8
45 - 49			57	16,0
50 - 54			59	16,5
Gender				
Men			155	43,4
Women			202	56,6
Education Level				
Incompleted elementary school			7	2,0
Completed elementary school			21	5,9
Completed junior high school			47	13,2
Completed senior high school			188	52,7
Completed college			94	26,3
Income per month (during the COVID-19 pandemic)	IDR 1.200.000	IDR		

< IDR 2.069.530	0-20.000.000	262	73,4
≥ IDR 2.069.530		95	26,6
Respondent's employment (during the COVID-19 pandemic)			
Private or government employee/army/police/ entrepreneurship		178	49,9
Farmer/breeder/labor/others		78	21,8
Did not work		101	28,3
Marital status (during the COVID-19 pandemic)			
Married		258	72,3
Single/widowed/divorced		99	27,7
Household Food Security (score)	4		
Food security	0 - 27	113	31,7
Mild food insecurity		120	33,6
Moderate food insecurity		76	21,3
Severe moderate food insecurity		48	13,4

Table 1 showed that respondents had a median age of 40 years with the highest percentage in the 40–44 age range (18,8%) and the lowest in the age group 25-29 years (8,7%). Most respondents were women (56,6%), had completed senior high school (52,7%), had a monthly income < Rp 2.069.530 (73,4%), was private or government employee/army/police/entrepreneurship (49,9%), and were married (72,3%). A median score of household food security of 4 (categorized as mild food insecurity) with most respondents having mild food insecurity (33,6%).

Figure 2 showed that the food groups consumed daily are staple foods, tofu/tempeh, vegetables, sugar, and oil both before and during the COVID-19 pandemic.

Based on Table 2, there was a significant difference in the frequency of vegetable and fruit consumption between before and during the COVID-19 pandemic. The frequency of consumption of vegetables and fruit during the COVID-19 pandemic is higher than

the consumption of vegetables and fruit before the COVID-19 pandemic. Table 2 also showed that there was no significant difference in the frequency of staple food, legumes, tofu/tempeh, milk/dairy product, meat, fish/seafood, egg, snacks/juice/sweets drinks/ice cream/candy, sugar, and oil between before and during the COVID-19 pandemic.

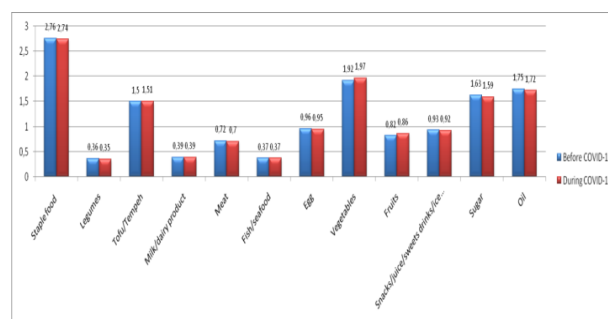


Figure 2. Frequency distribution of food consumption before and during pandemic COVID-19

Table 2. Differences in frequency of food consumption between before and during the COVID-19 pandemic in Yogyakarta

Frequency of food consumption	Before COVID-19 pandemic	During COVID-19 pandemic	Negative Ranks	Positive Ranks	p-value
	Median	Median			
Rice/cassava/corn/potato/noodles/bread	3,00	3,0	21	17	0,403
Legumes	0,29	0,29	34	36	0,519
Tofu/Tempeh	1,00	1,00	13	23	0,406
Milk/dairy product	0,14	0,14	26	45	0,412
Meat	0,43	0,43	20	25	0,406
Fish/seafood	0,29	0,29	24	27	0,238

Egg	1,00	0,86	20	25	0,555
Vegetables	2,00	2,00	9	22	0,035*
Fruits	0,43	0,43	28	54	0,010*
Snacks/Juice/sweets drinks/ice cream/candy	0,57	0,43	32	29	0,582
Sugar	1,00	1,00	18	10	0,103
Oil	2,00	2,00	17	9	0,262

Table 3. Relationship between Food Security Status and Frequency of Food Consumption During the COVID-19 Pandemic in Yogyakarta

Positive Correlation		Strength of correlation	p-value	Negative Correlation		Strength of correlation	p-value
X-Y ₃	0,07	Very low	0,16	X-Y ₁	-0,10	Very low	0,04*
X-Y ₇	0,01	Very low	0,81	X-Y ₂	-0,01	Very low	0,88
X-Y ₈	0,00	Very low	0,94	X-Y ₄	-0,12	Very low	0,02*
X-Y ₁₀	0,02	Very low	0,76	X-Y ₅	-0,28	Low	0,00*
				X-Y ₆	-0,33	Low	0,00*
				X-Y ₉	-0,19	Very low	0,00*
				X-Y ₁₁	-0,03	Very low	0,56

Note : *significant; X= food security; Y₁=frequency of staple food; Y₂=frequency of legume; Y₃=frequency of tofu/tempeh; Y₄=frequency of milk/dairy product; Y₅=frequency of meat; Y₆=frequency of fish/seafood; Y₇=frequency of egg; Y₈=frequency of vegetables; Y₉=frequency of fruits; Y₁₀=frequency of snacks/juice/sweets drinks/ice cream/candy; Y₁₁=frequency of oil

According to Table 3, the frequency of consumption of staple foods, milk, meat, seafood, and fruit was significantly correlated with food insecurity during the COVID-19 pandemic. There is a weak negative correlation between these variables. This indicates that the frequency of consumption of staple items, milk, meat, seafood, and fruit decreases with increasing food security score (the more food insecure). Furthermore, Table 3 demonstrated that the frequency of rice, cassava, corn, potatoes, noodles, bread, legumes, tofu, tempeh, eggs, snacks, juice, sweet drinks, ice cream, candy, sugar, and oil did not correlate with food security level.

Discussion

According to the study's findings, the frequency of fruit and vegetable eating varied before and during the COVID-19 pandemic. Compared to the pre-pandemic period, there has been a rise in the intake of fruits and vegetables during the COVID-19 pandemic. This research is in line with previous research which stated that there were significant differences before and during the Covid 19 pandemic in the frequency consumption patterns of vegetables and fruit (Dianah & Merdekawati, 2022; Dieny et al., 2021; Faridi & Furqan, 2021). According to the findings of the bivariate analysis, the frequency of consumption of staple food, milk, meat, seafood, and

fruit is significantly correlated with food insecurity during the COVID-19 pandemic. The higher the food insecurity score, the lower the frequency of consumption of staple foods, milk, meat, seafood, and fruit. The results of this study support the results of previous research which found that food-insecure families consumed fewer animal-source foods, foods rich in protein, dairy products (Angeles-Agdeppa et al., 2021; Rahayu et al., 2024) et al., 2024) and fruit (Angeles-Agdeppa et al., 2021).

During the pandemic, there has been an increase in public awareness to consume more healthy food, one of which is higher intake of fruits and vegetables (Yilmaz et al., 2020). The COVID-19 pandemic causes people to feel worried about their vulnerability to contracting COVID-19, thus encouraging a person to increase their habit of consuming fruit and multivitamins more frequently to prevent contracting COVID-19 compared to before the COVID-19 pandemic (Merita et al., 2021). Increase the amount of fruit and vegetables you eat—roughly 3–9 times per day for veggies and 3–9 times per week for fruit. Because fruits and vegetables are a great source of vitamins and minerals that help the body stay resistant, responders eat more of them on a regular basis (Dianah & Merdekawati, 2022). During the COVID-19 pandemic, people were asked to carry out activities at home, thereby possibly reducing the frequency of buying food outside the home. People are getting

used to cooking their food. This increase in vegetable and fruit consumption shows that even though people have limited access to shopping, they realize the importance of consuming vegetables and fruit, especially during this pandemic. In Indonesia, there are quite a lot of online shopping platforms, especially on the island of Java, which make it easier for people to buy fresh vegetables, fruit, and other food ingredients online during the COVID-19 pandemic (Dieny et al., 2021; Wang et al., 2020). The monthly allocation of funds issued by respondents is not related to the decrease in income experienced due to increased awareness of the importance of fruit consumption during the pandemic to increase immunity (Mufidah et al., 2021). Besides that, vegetables and fruit are available in large quantities and types in Indonesia, both by buying and growing them yourself. The prices of vegetables and fruit are relatively affordable for the public.

The media sector and journalists have started campaigns to inform and enlighten the public about COVID-19. In an attempt to stop the virus from spreading throughout Indonesia, these media campaigns aim to widely disseminate a variety of educational content (Djalante et al., 2020). Increasing public awareness of consuming nutritious food can also be influenced by mass media exposure. Social media platforms have made it easier for people to stay in touch with their loved ones, which has lessened the effects of loneliness and boredom brought on by chronic stress and anxiety. The use of social media is recommended for people isolating at home to help reduce the psychological impact (Brooks et al., 2020). Another advantage of social media is that content related to health information or education about COVID-19 spreads quickly. Faster dissemination of information increases the potential for taking preventative action (González-Padilla & Tortolero-Blanco, 2020). Various information is spread from government websites, health institutions, and experts regarding behavior that can be an effort to prevent COVID-19, such as recommendations for consuming balanced nutritious food, especially recommendations for consuming vegetables and fruit as well as other efforts to maintain the body's immune system (Fermeza & Isaura, 2022).

In this study, most respondents had low incomes but many respondents came from families with food-secure status during the COVID-19 pandemic so there was no difference in the frequency of consumption of staple foods, nuts, tofu/tempeh, milk and milk products, meat, fish, sugar, sweet foods, and oil between before and during the COVID-19 pandemic. The researchers

assume that the unchanged frequency of food consumption before and during the COVID-19 pandemic may be due to the fact that these food groups were either commonly or rarely consumed by the community before the pandemic. Staple foods, legumes, tofu and tempeh, eggs, snacks, sugar, and oil are basic necessities for the community that are easily purchased. Meanwhile, animal protein groups such as milk and its products, fish/seafood, and meat are food groups that are rarely consumed by most of the community because these food items are more expensive than staple foods and plant-based protein sources. According to previous research, respondents generally said that they continued to eat as usual during the pandemic, only changing certain side dishes. Others bought a lot of cheap side dishes and stored them in the refrigerator. Respondents saved money by shopping at cheaper places during the COVID-19 pandemic. In general, there was a decrease in respondents' income levels during the pandemic, but expenses tended to remain the same, and their incomes dropped drastically between 30% and 70% at first. However, not all respondents experienced significant changes in their eating patterns. They did not change their family's spending patterns but only changed certain types of side dishes. Some respondents saved money and reduced their cigarette spending. There were also people who tried fishing in the river to get additional side dishes. Although food expenses dropped by up to 40%, respondents continued to eat as usual and changed their side dishes according to their income (Kumiasih, 2020).

According to a study conducted in Indonesia, the COVID-19 epidemic has negatively impacted people's occupations and incomes in both urban and semi-urban areas, which has led to a decrease in household food security levels. Food consumption and nutritional intake of family members are directly impacted by inadequate levels of food security in the home on a number of levels (Syafiq et al., 2022). In households with low incomes, there is a decrease in protein adequacy, which shows that there are limited food choices for low-income people during the pandemic. Households facing the pandemic apply a coping strategy by preferring to consume foods that are more filling, such as carbohydrates (Siregar et al., 2023). Household economic status also plays an important role in explaining the diversity of household consumption patterns. Low-income households tend to have a positive influence on staple food commodity groups such as rice/tubers, vegetables/fruit, nuts/oil, and other food ingredients, while ready-made food commodity groups/fish/meat/eggs/ milk shows a negative influence. For low-income households and those with low purchasing power, fish/meat/eggs/milk, and

ready-made food commodities are a group of commodities that economically have a more expensive value than other food commodities. Therefore, low-income households will reduce the proportion of expenditure on these commodities and replace them with other commodities that are economically cheaper and more abundant to meet their food needs (Mayasari et al., 2018).

This study used FFQ to assess the frequency of food consumption during the last 3 months before the COVID-19 pandemic occurred and during the COVID-19 pandemic. Therefore, recall bias may affect the results of this study. The use of FFQ must be adjusted to the eating habits of the target population. Previous research has shown that the FFQ is a cost-effective method for assessing dietary patterns in large population groups over periods of months to years. Additionally, depending on the ethnic, social, and cultural background of the studied population, food consumption is highly diverse. This shows that the food list must be carefully selected and contain a lot of data. A questionnaire that is too long will bore participants and make it inaccurate. To reduce recall bias, dietary data with a list of 72 food items were collected over a period of one month (Liu et al., 2019).

The strengths of this research include the respondents were directly interviewed in order to obtain data for this study. In contrast to many studies that used online questionnaires for data collection during pandemic, the risk of data bias is greater. There have not been many studies that have examined the differences in the frequency of food consumption before and during the COVID-19 pandemic in Indonesia. This study used the Food-Frequency Questionnaire method which can assess the respondent's eating habits within 3 months before and during the COVID-19 pandemic, and used multistage random sampling as a sampling technique that can increase regional representation in Yogyakarta. However, the respondent's memory to remember the frequency of food consumption during the COVID-19 pandemic within a period of 3 months potentially leading to recall bias. In addition, the design of this study used a cross-sectional that can not prove the causal correlation.

Conclusions

There is a change in the frequency of vegetable and fruit consumption during the Covid-19 pandemic in Yogyakarta City. The COVID-19 pandemic has an impact on the emergence of food insecurity related

to a decrease in the frequency of consumption of staple foods, milk/dairy products, meat, fish/seafood, and fruit. Public health strategies should ensure access to affordable sources of animal protein and dairy for food-insecure populations during health crises. Further research with longitudinal design or qualitative interviews is needed to explore behavior drivers.

Declaration of Conflicting Interests

The author has no interest in the research.

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