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# Factors associated with food security in Depok City, Indonesia during the COVID-19 pandemic: a cross-sectional study

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**Introduction:** The COVID-19 pandemic has considerably impacted food insecurity. The study aimed to assess the impact of the COVID-19 pandemic on food security and its related factors.

**Methods:** The study employed a cross-sectional design, utilizing face-to-face interviews to collect data from 140 selected households using Simple Random Sampling. The study assessed the independent variables: socio-economic characteristics including parental age, maternal education, employment status, family type, number of biological children, family income, and food expenditure, with the food security level as the dependent variable. Family food security was determined through a modified version of the United States Family Food Security Survey Module-USDA, utilizing 15 of the original 18 questions. Binary Logistic Regression Analysis was employed to identify the dominant factor related to household food insecurity.

**Results and discussion:** A significant proportion of families (66.4%) experienced food insecurity, where severe hunger was the most prevalent problem (25%). Parental age and employment, maternal education, family composition, number of biological children, income, total food expenditure, government social assistance, the impact of COVID-19 on the family, and percentage of food consumption to total spending ( $p < 0.001$ ) significantly influenced family food security levels. The Binary Logistic Regression Analysis revealed that mothers over the age of 44 had a 9.9-fold increased likelihood of experiencing food insecurity compared to those under 35. Mothers with lower levels of education exhibited a 6.9-fold higher probability of food insecurity than those with moderate education. Families incorporating non-food expenses demonstrated a 23-fold greater risk of food insecurity than those without such expenditures. Families who received government social assistance were more at risk of food insecurity than those without such support. Thus, government social assistance played a critical role as a primary determinant factor for food security during the pandemic, with a probability of 45 times.

**Conclusion:** Food security levels were influenced by various factors, including parental age and employment, maternal education, family composition, number of children, income, total food expenditure, government social assistance, and the impact of COVID-19 on the family. Government social assistance was essential during COVID-19 to enhance food security.

## KEYWORDS

COVID-19, food security, food insecurity, determinants, government social assistance

# 1 Introduction

The COVID-19 pandemic caused high food price inflation in all countries at the retail level. It reflects prolonged supply disruptions caused by social distancing measures, currency devaluation, and other factors (Bairagi et al., 2022; Muller et al., 2022). The increasing levels of food insecurity pose a threat to previous developmental achievements. Furthermore, the spikes in agricultural commodity prices were due to high demand, weather uncertainties, macroeconomic conditions, and disruptions in the supply chain. As retail prices and income declined, the family was compelled to reduce the quantity and quality of food consumption, which impacted food insecurity (FAO, 2011).

The specific challenge faced in metropolitan areas during the pandemic was food insecurity due to increased food prices (47.1%), reduced market availability (41.4%), and also challenges in accessing traditional foods (Shafiee et al., 2023). In March 2020, household food insecurity in the United States increased to 38% from 11% in 2018 (Wolfson and Leung, 2020). The global impact of COVID-19 on food security in developing countries, including Indonesia, has been significant, and in Tehran Province, Iran, households' food security initially improved during the early stages of the pandemic (Charvadeh et al., 2021; Movahed et al., 2022). During the COVID-19 pandemic, the food security situation of rural households has worsened. There have been changes in the consumption of certain food groups (Movahed et al., 2022).

Indonesia's food security in 2022 scored 60.2 on the Global Food Security Index (GFSI), an improvement from 59.2 in 2021. Despite the increase, it ranked 69th out of 113 countries, falling below the global average of 62.2 and the Asia-Pacific average of 63.4 (Rizaty, 2022). The GFSI evaluates four distinct factors, including accessibility, availability, quality and safety, natural resources, and resilience. The slide from the Food Security Index reveals the adverse impact of COVID-19 on Indonesia's food security (Global Food Security Index, 2022). The impact signs are characterized by obstacles in the import–export sector, difficulties in obtaining local food supplies, and halts in economic activities. The challenge of attaining sustainable development objective one, prioritizing poverty and hunger alleviation, is intertwined with the food security dilemma. The populace's food purchasing has persistently declined, emphasizing the gravity of the situation. The complexity of this issue necessitates coordinated resolution efforts from all stakeholders, as indicated by relevant studies analyzing the interplay between COVID-19 and Indonesian food security. The insufficient savings to offset income loss during this period increased the number of individuals who are indebted to grocery stores and food vendors (Widyarningsih et al., 2022). Additionally, only 19% of families reported having sufficient nutrition, while 35% indicated a frequent reduction in food intake due to financial constraints (UNDP, Prospera, SMERU UNICEF, 2021). Furthermore, LIP's et al. (2020) study revealed that 35.9% of respondents experienced food insecurity, with 23.84% facing food insecurity without hunger, 10.14% dealing with moderate hunger, and 1.95% experiencing acute hunger (Prakoso, 2020). Additionally, Fitriah et al. (2021) found that the COVID-19 pandemic worsened Indonesia's already challenging food affordability, availability, and price stability.

The achievement of food security in Indonesia has routinely encountered numerous obstacles, as expounded in the Decree of the Head of the Food Security Agency Number 82/KPTS/

RC.110/J/10/2020 (Ministry of Agriculture of Food Security Agency, 2021). These challenges encompass regions with restricted access to food, high rates of poverty, a significant portion of income is spent on food, limited access to electricity and clean water, low levels of education, an elevated risk of underweight and malnutrition, as well as high levels of stunted growth in young children and reduced life expectancy. The COVID-19 pandemic has compounded food security issues in certain regions. Indonesian Law Number 18/2012 stipulates attaining food security through meeting the state's and its population's food needs. This requirement necessitates the availability of sufficient, safe, diverse, nutritious, just, and affordable food while also honoring the population's religious, philosophical, and cultural practices. Food security is achieved when individuals have physical and economic access to adequate food to lead productive and healthy lives. It is impacted by several factors that fall into food availability, accessibility, and utilization (FAO, 2009; Setyorini et al., 2022).

Social assistance through food and cash is one way to increase food security during the pandemic. In Indonesia, the Ministry of Agriculture has created four strategies regarding food security (Maharani, 2016). These strategies entail enhancing production capacity, diversifying local food sources, strengthening food reserves and logistics systems, and promoting contemporary agriculture techniques. Several programs were implemented to achieve the objectives, including intelligent farming, screen houses to increase horticultural commodity production beyond the usual growing season, farmer corporations' establishments, and food estates. The pandemic has led to many innovations in the food industry, including urban farming and integrated agriculture practices.

Depok, a semi-urban city situated as a buffer zone in DKI Jakarta Province, has faced considerable food insecurity. This issue has impacted 65% of households at various levels (Syafiq et al., 2022). Regarding similar circumstances, a significant majority (61.8%) have also undergone comparable challenges. Family income has been crucial in maintaining food security during the pandemic (Hidayah and Fikawati, 2021). The economic welfare of households has significantly declined, resulting in reduced earnings and an inability to fulfill necessities (Syahreza and Manaf, 2021). Furthermore, a notable association was found between food security and stunting rates throughout the pandemic (Sugiyanti et al., 2023). Additional research is needed on food security in Depok City, focusing on the socio-demographic characteristics, the impact of non-food spending on food security, government/private/NGO social assistance, the effects of COVID-19 on families, and the proportion of food expenditure to total income.

The research on factors affecting food security during COVID-19 in Depok City still needs to be completed (Hidayah and Fikawati, 2021; Syafiq et al., 2022). The COVID-19 pandemic is affecting households' food security in Depok City due to worsening employment and income conditions. The two previous studies did not examine other factors that affect food security, such as government social assistance, living arrangements with family members, the impact of COVID-19 on families, the age of parents, the number of children, and the percentage of total expenditures spent on food. Hence, a study on the factors affecting household food security during the pandemic in Depok City can add to the existing research literature. The present findings can assist in comprehending the needs of urban populations during the COVID-19 epidemic. This understanding can

facilitate the planning and implementation of preventive measures for these populations, such as government social assistance and protection. The objective of this study was to assess the factors associated with food security among selected families in Depok City during the COVID-19 pandemic.

## 2 Materials and methods

### 2.1 Study design

This cross-sectional study assessed 140 individuals from eight villages: Rangkapan Jaya Baru, Rangkapan Jaya Lama, Mampang, Beji, Sukamaju Baru, Depok, Sukatani, Bojongsari Baru, and Sawangan. Initially, Depok Jaya was chosen as the place to study, but then Depok Jaya was not included in the study due to many COVID-19 cases during the assessment period. Ethical clearance was acquired from the Health Research Ethics Commission of Agency for Health Research, Indonesian Ministry of Health (Number: LB.02.01/2.KE.374/2021), and all participants provided informed consent before the study in early July 2021.

### 2.2 Population and sample

The study population consisted of individual residing in eight villages in Depok City, West Java Province, Indonesia. Simple Random Sampling was used to select respondents who met the inclusion criteria, including households from high, middle, and low socio-economic backgrounds, permanent residency in the villages, and having at least one biological child under five or adolescent. One hundred forty respondents fully participated in this study, and a sample size was determined using proportional estimation with relative precision (Lwanga and Lemeshow, 1991).

$$n = Z^2 \frac{1 - \alpha}{2} \frac{(1 - P)}{\epsilon^2 P}$$

In the formula,  $n$  represents the sample size,  $Z_{1-\alpha/2}$  represents the error rate of 1.64 at a 90% Confidence Level, and  $\epsilon$  represents the relative precision at 0.10.  $P$  is the prevalence of household food insecurity in Depok City at 65% (Syafiq et al., 2022). After inputting the values into Lemeshow's formula, the sample size was estimated to be 140 individuals. The number of respondents selected from each village is drawn in Table 1.

### 2.3 Study variables

The study analyzed multiple independent variables, including the socio-demographic characteristics (parental age, maternal education, parent employment, cohabitation with family members, number of biological children, and family income), total food consumption during the COVID-19 pandemic; the relationship between non-food and food expenditure; decrease in income; social assistance from government, private or NGO sources; and the percentage of food consumption relative to total expenditure. The study focused on food security within families, with data collected through face-to-face interviews conducted by trained enumerators at respondents' residences on 15–30 July 2021. To ensure the safety and confidentiality of participants during face-to-face interviews, we obtained signed informed consent, trained enumerators, and explained the confidentiality before interviews to the respondents.

### 2.4 Data analysis

The univariate analysis presented the frequency distribution of both dependent and independent variables to describe and clarify the self-characterization of all variables by the respondents. Categorical data were illustrated through tables and pie/diagram figures, whereas numerical data were represented using mean, standard deviation, minimum, and maximum values. The Chi-Square test was to examine the association between socio-demographic characteristics, reducing total income during a pandemic, social assistance from the government, private or NGO sources, COVID-19 impact on family income, and the percentage of food expenditure to total expenditure and the households' food security with significance set at  $p < 0.05$ . The Odds Ratio (OR) was calculated with a 95% Confidence Interval (CI) to evaluate the relationship between food security and other independent variables.

The Binary Logistic Regression Test was used to identify the significant predictors of food insecurity at a household level. It is useful when the dependent variable is dichotomous, like food secure and food insecure (Hosmer et al., 2013). To determine the respondents' significant concerns about food availability during a pandemic, we used a four-point Likert scale. If the Likert mean score of an item is lower than 2.50, then the respondents have a minor concern about the particular item (Wanjohi and Syokau, 2021).

Food security level is defined by calculating the scores for each answer from the 15 statements in the United States Family Food Security Survey Module-USDA. Responses labeled frequent,

TABLE 1 Frequency distribution of respondents by area.

Villages	Frequency	
	$n$ (person)	%
Bojongsari	25	17.9
Sawangan	31	22.1
Pancoran Mas	47	33.6
Beji	14	10.0
Tapos	23	16.4
Total	140	100.0

occasional, do not know, and never were assigned a score of 1. Household food security was categorized into four levels: food security (score of 0), food insecurity without hunger (scores of 1–2), food insecurity with mild hunger (scores of 3–7), and food insecurity with severe hunger (scores of 8–15). We put the code for food insecurity with 0 and food security with 1 in the Binary Logistic Regression Test. Food security is defined as meeting the physiological needs for growth and public health standards of regions, communities, or households at all times. Food insecurity is defined as when they do not have regular access to sufficient safe and nutritious food for average growth, development, and an active, healthy life (FAO, 2009). The instrument of the present study comprised 15 questions, which were modified from the 18 items of the United States Family Food Security Survey Module-USDA. We used 15 questions due to the combination of Child Stage 1 and Child Stage 2 into Child Stage. The purpose of the modification was to enhance the clarity of Child Stage statements for households.

## 3 Results

### 3.1 Demographic characteristic

The demographic characteristics of female participants are described in Table 2. A significant portion of mothers were over 49, while those between 35 and 49 and above were almost equally represented. The average age of mothers was  $38.5 \pm 8.7$  years, with the youngest being 21 and the oldest 74. On the other hand, most fathers were between 35 and 49 years old, with an average of  $41.1 \pm 9.9$  years, a maximum age of 59, and a minimum age of 21. Over 75% of respondents had achieved intermediate final education, exceeding 12 years of study. Most mothers were unemployed, while most fathers were employed in the private sector. More than half of the respondents lived with their spouses and children; most mothers had two biological children. Half of all respondents reported a family income below US\$ 193.5, with monthly expenses ranging from US\$ 64.5 to 193.5. A number of individuals suffered decreased revenue due to the COVID-19 pandemic. The Depok City Government provided most respondents with social assistance through essential items and monetary support (Table 2).

### 3.2 Food availability and food insecurity

Table 3 displays eight statements regarding food availability during the COVID-19. A majority of respondents express vital concern about running out of food. Some respondents faced various challenges, including the inability to buy nutritionally balanced food, limited funds to feed children, food shortages due to affordability issues, weight loss due to insufficient food, and children eating less than three meals daily (Table 2). When asked about the food availability at the household level during the pandemic, all respondents gave an average score above 2.5 on a four-point Likert scale. This indicates that respondents were greatly concerned about food availability during the pandemic (Table 3). The proportion of families experiencing mild food insecurity compared to those without hunger is drawn in Table 4. There were 66.4% of households with various levels of food insecurity during the COVID-19 pandemic. Most

households experienced severe food insecurity, the most prevalent category (Table 4).

Table 5 displays the discrepancies in levels of food security depending on socio-demographic characteristics, monthly family spending, social support from government/private/NGO, and the percentage of food consumption compared to the total expenses. A greater parental age was associated with increased family food insecurity, while a higher rate of family food insecurity influenced a lower maternal education level. Unemployed mothers experienced a higher incidence of food insecurity than those employed. In comparison, fathers in labor and online motorcycle taxiing occupations had greater food security than self-employed fathers. Additionally, larger families with more than three biological children tended to possess greater food security. Additionally, individuals with a monthly income below 3 million and, a total monthly food expenditure of less than 1 million, experiencing a reduction in monthly revenue, receiving social assistance from government, private, or NGO sources, and those significantly impacted by COVID-19 had higher levels of food insecurity. Furthermore, households with a lower percentage of food consumption than total expenditure reported elevated levels of food insecurity (Table 5).

The Binary Logistic Regression Analysis shows the maternal age, mothers' educational level, government social assistance, and the percentage of food consumption to total expenditure influenced by the household's food security. Social assistance was the most impactful variable related to family food insecurity, with a probability of 45 times (Table 6). Maternal age, maternal education, government social assistance, and the percentage of food expenditure to total expenditure strongly affected household food security.

## 4 Discussion

The objective of the study aimed to assess the impact of the COVID-19 pandemic on food security and its related factors. The initial step assessed the food security situation of urban households. The results indicated that more than half of the total households had food insecurity, with the most significant proportion being severe. This finding aligns with similar studies on COVID-19 (Hermawati et al., 2022; Syafiq et al., 2022; Dewi et al., 2023). COVID-19 has significantly impacted family incomes, as demonstrated by the marked disparity in family income and food security. Food insecurity could have severe and long-lasting health consequences (Leddy et al., 2020). During COVID-19, the proportion of food-insecure families was twice as high as that of food-resilient families. Food insecurity was prevalent in several countries, with rates reaching 27% in Australia (Kent et al., 2022), California (Escobar et al., 2021), Nepal (Singh et al., 2021), and Bangladesh (Shuvo et al., 2022). Poverty and low income were the significant factors for food insecurity, significantly contributing to malnutrition and poverty in middle and lower-income communities. Food insecurity levels were assessed as low, moderate, or high based on individual perceptions and food purchases, according to studies by Elshahoryi et al. (2020) and Kakaei et al. (2022). Surveyed individuals reported that the primary impact of COVID-19 was a reduction in income. Most families received government-sponsored aid in food and money, resulting in decreased energy intake or reduced food consumption concerning overall expenses.

TABLE 2 Sociodemographic characteristic.

Variable	<i>n</i>	%	Mean ± DS	Min– Max
Mother's age group (years old)			38.5 ± 8.7	21–74
20–34	53	10.7		
35–49	72	33.6		
>49	15	34.3		
Father's age group (years old)			41.1 ± 9.9	21–59
20–34	42	30.0		
35–49	68	48.6		
>49	30	21.4		
<b>Mother's final education</b>				
Low (less than 12 years of schooling)	52	37.1		
Medium (more than 12 years of schooling)	88	63.9		
<b>Working status of mother</b>				
Yes	55	39.3		
No	85	60.7		
<b>Main job of father</b>				
Freelance worker/online motorcycle	38	27.1		
Entrepreneur/trader	43	30.7		
Private employee	59	42.2		
<b>Living with</b>				
Husband, wife, children	97	69.3		
Husband/wife	19	13.6		
Husband, wife, children, other family	24	17.1		
<b>Number of biological children (person)</b>				
1	38	27.1		
2	64	45.7		
≥ 3	38	27.2		
<b>Total family income (US\$)</b>				
≤193.5	81	57.9		
>193.5	59	42.1		
<b>Total food expenditure (US\$)</b>				
<64.5	35	25.0		
64.5–193.5	71	50.7		
>193.5	34	24.3		
<b>Social assistance from government</b>				
Yes	97	69.3		
No	43	30.7		
<b>Reducing total family income</b>				
Yes	102	72.9		
No	38	27.1		
Yes	111	79.3		
No	29	20.7		
<b>Percentage of food expenditure to total expenditure</b>				
High (>60% of total expenditure)	102	72.9		
Low (<60% of total expenditure)	38	27.1		

DS, Deviation Standard.



TABLE 3 The statement of family food availability during the pandemic.

Statement	Always (= 1)		Often (=2)		Sometimes (= 3)		Never (=4)		Mean $\pm$ SD
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Worried that the family's food will run out	8	5.7	38	27.1	47	33.6	47	33.6	2.9 $\pm$ 0.9
Cannot afford food during COVID-19	0	0.0	18	12.9	34	24.3	88	62.9	3.5 $\pm$ 0.7
Not able to provide balanced nutritional food	2	1.4	18	12.9	49	36.0	71	50.7	3.4 $\pm$ 0.7
	0	0.0	20	14.3	43	30.7	77	55.0	3.4 $\pm$ 0.7
Only able to provide small funds for children	0	0.0	11	7.9	28	20.0	101	72.1	3.6 $\pm$ 0.6
Had ever not eaten enough because we can	1	0.7	6	4.3	18	12.9	115	82.1	3.8 $\pm$ 0.6
not provide enough food for children	5	3.6	7	6.0	22	15.7	106	75.7	3.6 $\pm$ 0.7

TABLE 4 The household food security level.

Level	<i>n</i>	%
Insecure (severe, mild degrees, and without hunger):	93	66.4
Severe	35	25.0
Mild	30	21.4
Without hunger	28	20.0
Secure	47	33.6

The main findings of the present study are socio-demographic factors linked to family food insecurity, which are parental age, employment status, maternal education, number of biological children, family composition, income, total food expenses, government social aid, and the proportion of food expenditure to total income. These results are consistent with previous studies conducted in Tulungagung and Yogyakarta. The determinants of food security in Tulungagung include income, employment status, and type of social assistance, as noted by Dewi et al. (2023). Similarly, Hermawati et al. (2022) found that factors influencing food security in Yogyakarta were employment status, family income, and number of dependents. Engel's law states that increased income directly leads to increased food consumption. In this context, more than 75% of the participants had a food consumption ratio to non-food spending of less than 60%, resulting in their categorization as food insecure (Cirera and Masset, 2010).

Older parents were more likely to experience increased food insecurity, as indicated by the positive correlation between parental age and food insecurity. This correlation corresponds with a study conducted in several regions of Indonesia (Syafiq et al., 2022). Additionally, younger respondents (under 31 years) were twice as likely to experience food insecurity as their older counterparts, as supported by previous studies (Shuvo et al., 2022). Age correlated firmly with economic conditions within the family, as the more senior participants possessed more secure and enduring employment alongside a stable job status, which differed significantly from their younger counterparts (Abdullah et al., 2019). The difference in age-related food insecurity between the two studies may be due to the age groups in the previous analysis, which faced substantial job loss and income reduction, mainly in the younger productive age (21–35 years) and middle adulthood (36–50 years; Shuvo et al., 2022).

The parent's employment status significantly affected family food insecurity. Employed parents were found to have a lower proportion of family food insecurity when compared to those who were

unemployed. This suggests that employment results in a more favorable income, facilitating food purchases for families. This observation is consistent with other studies conducted by Tabrizi et al. (2018), Cordero-Ahiman et al. (2020), Movahed et al. (2022), Suresh et al. (2022), and Syafiq et al. (2022). Families experiencing job loss are more likely to face food insecurity, have insufficient food, and experience a decline in child nutrition (Farrington, 2021).

Lower levels of maternal education were significantly influenced by higher rates of food insecurity during COVID-19. This finding hindered access to nutritional knowledge, hindering efforts to maintain a healthy diet, which is crucial for boosting immunity and coping with difficult circumstances (Aman and Masood, 2020). Mothers' educational attainment also played a vital role in shaping judgments regarding food intake, highlighting their responsibility to establish and administer the food budget for the entire family (Astuti and Sulistyowati, 2013). Mothers with higher education are more aware of family health and nutrition, which is crucial for ensuring food security (Quandt et al., 2004).

The number of biological children influenced the food security in the present study, which agrees with the results of the studies by Ramesh et al. (2010) and Safarpour et al. (2014). Food insecurity was more prevalent among children in larger families, particularly those with three or more children. The greater the number of children, the greater the food that must be provided. Failure to meet these needs can lead to food insecurity (Nord, 2010).

Family income and family size or dependents were also affected by food security during COVID-19 in the current study. "Family dependents" refers to members who rely financially on the household, including employed and unemployed biological or non-biological relatives (Hanum, 2018). Households with more dependents tended to have higher expenditures, affecting food and non-food security (Hermawati et al., 2022). The Central Statistics Agency classified dependents into three groups: small families with 1–3 individuals, medium-sized families with 4–6 individuals, and large families with

TABLE 5 Differences in the proportion of household food security levels based on socio-demographic characteristics, monthly family expenditure, social assistance from the government, and the percentage of food expenditure to total expenditure.

Variable	Food insecure		Food secure		Total	p	OR	95% OR
	n	%	n	%				
<b>Mother's age group (years old)</b>								
<35	24	45.3	29	54.7	53		1	
35–44	42	76.4	13	23.6	55	*0.001	3.90	1.71–8.90
>44	27	84.4	5	15.6	32		6.53	2.18–19.54
<b>Father's age group (years old)</b>								
<35	15	35.7	27	64.3	42		1	
35–44	35	76.1	11	23.9	46	*0.001	5.73	2.27–14.46
>44	43	82.7	9	17.3	52		8.60	3.31–22.78
<b>Mother's final education</b>								
Academy/University	5	27.8	13	72.2	18		1	
Graduated from senior high school/equal	48	69.6	21	30.4	69	*0.001	5.94	1.88–18.80
Graduated from junior high school/equal	40	75.5	13	24.5	53		8.00	2.39–26.73
<b>Working status of mother</b>								
Yes	30	54.5	25	45.5	55		1	
No	63	74.1	22	25.9	85	*0.017	2.39	1.16–4.90
<b>The main job of the father</b>								
Employee	12	35.3	22	64.7	34		1	
Entrepreneur/trader	50	73.5	18	26.5	68	*0.001	5.09	2.10–12.35
Freelance worker/online motorcycle	31	81.6	7	18.4	38		8.12	2.76–23.92
<b>Living with</b>								
Husband, wife, children	72	62.1	44	37.9	116	*0.016	1	
Husband, wife, children, other family	21	87.5	3	12.5	24		4.28	1.21–15.18
<b>Number of biological children (pers.)</b>								
One	18	47.4	20	52.6	38		1	
Two	44	68.8	20	31.3	64	0.006	2.44	1.07–5.59
Three	31	81.6	7	18.4	38		4.92	1.74–13.90
<b>Monthly total family income</b>								
More than US\$ 193.5	31	52.5	28	47.5	59	0.003	1	1.43–6.08
Less than/equal US\$ 193.5	62	76.5	19	23.5	81		2.95	
<b>Reducing total family income during pandemic</b>								
No	13	34.2	25	65.8	38	0.001	1	3.08–15.87
Yes	80	78.4	22	21.6	102		6.99	
<b>Getting social assistance from government during pandemic</b>								
No	11	25.6	32	74.4	43	*0.001	1	6.61–38.29
Yes	82	84.5	15	15.5	97		15.90	
<b>COVID-19 has an impact on family income</b>								
No	9	31.0	20	69.0	29	*0.001	1	
Yes	84	75.7	27	24.3	111		6.91	2.82–16.98
<b>Percentage of food expenditure to total expenditure</b>								
Low (< 60% of total expenditure)	16	42.1	22	57.9	38	*0.001	1	2.82–16.98
High (>60% of total expenditure)	77	75.5	25	24.5	102		4.24	1.93–9.30

\*p<0.05 at significant level.

TABLE 6 Selected factors influencing household food security.

	B	S.E.	Wald	P	Ratio
<b>Mother's age group (years old)</b>					
35–44 vs. <35	0.757	0.784	0.933	0.334	2.132
>44 vs. <35	2.300***	0.871	6.981	0.008	9.977
<b>Mother's final education</b>					
Graduated from senior high school or more vs. graduated from junior high school or below	1.940**	0.832	5.442	0.020	6.958
<b>Getting social assistance from the government</b>					
Yes vs. no	3.808***	0.739	26.569	0.000	45.051
<b>Percentage of food expenditure to total expenditure</b>					
More than 60% vs. less than 60%	2.097***	0.776	7.299	0.007	8.142
Constant	−4.995***	1.158	18.593	0.000	0.007

Coefficient of Omnibus Mode = 122.23 with  $p=0.001$ ,  $-2LL=66.49$ , Cox and Snell R Square = 0.551 and Nagelkerke R Square = 0.765. \*\* $p < 0.05$ . \*\*\* $p < 0.01$ . Food security =  $-4.995 + 1.940$  (Mother's final education) + 3.808 (getting social assistance from the government) + 2.097 (percentage of food expenditure to total expenditure).

more than six individuals (Central Bureau of Statistic, 2000). Most respondents were medium-sized, consisting of parents with more than three biological children who cohabited with spouses, children, and other family members. The number of family dependents affects the level of food expenditure and household consumption patterns. The larger the household, the higher the likelihood of experiencing food insecurity, as it requires more money to meet the daily needs of additional individuals, including food and other necessities (Hanum, 2018). Higher-income households can allocate more funds toward food after fulfilling other financial obligations (Ashgar and Muhammad, 2013).

The food consumption to total expenditure ratio is positively influenced by food insecurity. Higher food expenditures were associated with reduced food security. Families experiencing food insecurity allocated more than 60% of their spending to food, while food-secure families allocated less than 60%. These findings align with previous research on family food security in Klaten Regency (Amaliyah and Handayani, 2011) and Langsa City, Aceh Province (Azharina et al., 2021). Households who spend more on food compared to other needs are at a higher risk of experiencing food insecurity. This situation often affects low-income families. These households tend to prioritize purchasing affordable food over nutritious options. Consequently, their expenditure on food is more significant than other items (Herdiansyah et al., 2024).

Social assistance from the government, private sector, or non-governmental organizations was a determinative factor in increasing family food security by 3.8 times compared to those lacking support. This assistance typically included essential food items such as biscuits, milk, rice, eggs, and cash. These findings are consistent with similar investigations (Lawal et al., 2022; Dewi et al., 2023; Lee et al., 2023). Social assistance in food, cash, and necessities can improve family food security amid the COVID-19 crisis (Diouf et al., 2022). As a result, this research recommends offering social assistance in the form of nutritious food, cash, and fundamental necessities for 6 months during COVID-19, especially for low-income families. This assistance should include items like milk, biscuits, and rice. Collaboration between the government, private sector, and NGOs is necessary to improve family food security and ensure adequate daily living assistance. Social assistance can reduce extreme poverty and

improve food security while increasing household resilience during times of crisis (FAO, 2013).

## 4.1 Limitation

Future studies must address several limitations in the present study. First, the study included participants from all socio-economic classes. Still, it has not been possible to determine the proportion of food security among those from low socio-economic groups. Second, the sample was limited to only 9 out of 63 villages in Depok, which may have limited the ability to represent food security on a city-wide level accurately. Third, the assessment of the relationship between energy, protein intake, and food insecurity among family members was impeded due to a need for more data on macronutrient intake. Fourthly, respondents' perceptions were evaluated through a questionnaire comprising 15 food security questions (never, do not know, often, and sometimes), which may introduce subjectivity. Fifth, recall bias can occur in the study when the data is collected retrospectively or after the event. However, the study has specific strengths worth highlighting. First, it was affected by the previous research on the factors affecting family food security in Depok City during the COVID-19 pandemic. Second, the primary data collection was carried out through structured interviews during home visits, which helped identify the socio-economic conditions contributing to food insecurity.

## 5 Conclusion

According to the findings of this study, urban households experienced mild-to-severe food insecurity during the pandemic. The risk of food insecurity was strongly influenced by various factors such as socioeconomic characteristics: parental age, employment status, maternal education, number of biological children, family size, income, food consumption, and government social assistance. In this context; government social assistance played a prominent role in enhancing food security. Households with government social assistance are 45 times more likely to have food security than



households without government social assistance. Therefore, government, private organizations, and local and international NGOs should provide social aid to enhance urban households' food security during the COVID-19 pandemic, especially for those who lost their jobs or income. Furthermore, it is recommended to research the impact of social protection on the food security of low-income households affected by COVID-19 in Depok City. Future studies should consider mild, moderate, and severe food insecurity factors. It is essential to examine how macro and micro-nutrient intake affects the nutritional status of undernourished children due to COVID-19.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

The studies involving humans were approved by the Health Research Ethics Commission of Agency for Health Research, Indonesian Ministry of Health. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

FF: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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