



Research Article

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RELATIONSHIP BETWEEN HOUSEHOLD FOOD SECURITY AND NUTRITIONAL STATUS OF TODDLERS IN FLOOD-PRONE AREAS OF SURAKARTA

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ABSTRACT

Flooding poses numerous negative consequences, particularly for the food security of households in areas prone to flooding. The nutritional health of children under five is directly affected by household food security, highlighting the strong connection between the two. The study was carried out in flood-prone areas within the Pasar Kliwon District of Surakarta, specifically in the villages of Sangkrah and Semanggi. This observational research used a proportional random sampling method to select participants. The respondents were heads of households or mothers, along with their children under five years of age. The collected data includes socio-economic factors such as income, gathered through interviews using a questionnaire. The HFIAS questionnaire was employed to assess household food security, while nutritional status was evaluated through anthropometric measurements. Z-scores were calculated using the WHO-Anthro software, with WAZ and BAZ indicators serving to assess nutritional status. Statistical analyses, including the Fisher Exact test and Chi-Square test, were applied to examine correlations between variables. The results indicate that most households participating in this study are classified as food secure, and the majority of children under five are neither underweight nor wasted. While a positive link was identified between household income and food security, no significant correlation was observed between income and the nutritional status of children under five, as measured by WAZ or BAZ scores. Additionally, no relationship was found between household food security and the nutritional status of children under five based on WAZ or BAZ assessments.

KEYWORD

Food Security, Nutritional Status, Toddler

INFORMATION

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1. INTRODUCTION

Flooding occurred in the areas along the Bengawan Solo Riverbank in February 2021 (Prabowo, 2021), November 2022 (Sulistyowati, 2022) and in February 2023 (Kementerian PUPR RI, 2023). The flood took place along the banks of the Bengawan Solo River, affecting areas such as Semanggi, Sangkrah, Joyosuran, and nearby regions within the Pasar Kliwon District. Flooding is known to cause numerous negative consequences, particularly for the

food security of households residing in flood-prone zones. These effects disrupt food security by impacting food availability and access, household income, infrastructure, and agricultural production (Thecla et al., 2018).

In 2019, Surakarta City was ranked 47th in food security, but its position dropped to 48th in 2020 and further declined to 53rd in 2021 out of 98 cities in Indonesia, according to the 2022 Food Security Statistics Book (Kementan RI, 2022). The level of food security in a region can be assessed by examining the availability of food. Higher food availability in a region indicates stronger food security, while lower availability signals weaker food security (Jayarni & Sumarmi, 2018). The percentage of the population experiencing insufficient food consumption (PoU) in Central Java Province has actually risen. In 2019, the rate stood at 11,61%, increasing to 11,80% in 2020, and climbing further to 12,34% in 2021, placing it in the category of moderate food insufficiency. Similarly, Indonesia's national food security score, as measured by the Global Food Index, dropped from 61,4 in 2020 to 59,2 in 2021 (Kementan RI, 2022). This indicates that the issue of insufficient food intake or the inefficiencies in the food security system among Indonesia's population remains unresolved.

The nutritional status of individuals is the outcome or reflection of a family's or household's food security system (Adhyanti et al., 2022). Nutritional status plays a crucial role in the development of a nation. There is a mutual relationship between a country's success and the nutritional well-being of its population. Improved nutrition contributes to a nation's prosperity, while a nation's success also enhances the nutritional health of its people. One way this can be assessed is through the effectiveness of the country's food security system. If food security falters, it can lead to new challenges that negatively impact the overall quality of life. (Kemenkes RI, 2015).

Toddlers are particularly at risk of food insecurity, as their development is highly sensitive to alterations in diet and environmental conditions. They are also susceptible to illnesses that can result in impaired growth. For this reason, the nutritional health of children under the age of five is often used as a key measure when evaluating food insecurity within a community. This perspective aligns with the statements made by the World Food Program (2005) in Betebo et al., (2017). The findings of the study demonstrate that inadequate food security at the household level can contribute to the Double Burden of Malnutrition, manifesting as malnutrition in toddlers, with wasting being a key indicator (Motbainor et al., 2015) and stunting (Adhyanti et al., 2022; Mahmudiono et al., 2018). Additionally, food insecurity is a contributing factor to the occurrence of underweight conditions in toddlers (Betebo et al., 2017; Moradi et al., 2019). Food insecurity is also linked to infectious illnesses in children under five, including respiratory infections and diarrhea (Ullah et al., 2019).

Household food security is strongly linked to the nutritional status of young children, with the quality of food security within a household significantly impacting whether toddlers have good or poor nutrition. This is in line with several studies which state that food security affects the nutritional status of toddlers (Adhyanti et al., 2022; Jayarni & Sumarmi, 2018; Riski et al., 2019; Rohaedi et al., 2016; Sutriningsih & Lasri, 2017). support this by highlighting that strong household food security, driven by the family's economic standing, can help prevent malnutrition in toddlers. However, this contrasts with findings from Drennen et al., (2019) and Sihotang & Rumida (2020), which suggest that household food security is not significantly associated with toddlers' nutritional status.

Given the inconsistent findings from prior research, this study is necessary to explore whether there is a relationship between household food security and the nutritional status of toddlers in flood-prone areas of Surakarta.

2. METHODOLOGY

Research Design. This research employs a descriptive observational approach to outline the variables involved. To examine the relationship between household food security and toddlers' nutritional status in flood-prone regions of Surakarta, a cross-sectional study design was implemented, measuring both variables simultaneously. The study was granted ethical approval by the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Universitas Muhammadiyah Surakarta, under license number 5242/B.1/KEPK-FKUMS/VII/2024.

Population and sample. The target population for this study consisted of all households with children under the age of 5 in the Sangkrah and Semanggi Villages, located in Pasar Kliwon, Surakarta. This included 546 toddlers and 14 Posyandu in Sangkrah, as well as 997 toddlers and 19 Posyandu in Semanggi. A total of 100 toddlers were selected as the sample for the study, using a proportional random sampling method. A proportional calculation was conducted to ensure a balanced number of toddlers between Sangkrah and Semanggi villages, minimizing any significant differences. The sample was then randomly selected from the posyandu in both villages, giving each individual an equal chance of being chosen. Inclusion criteria included toddlers aged 24-59 months without physical disabilities that could affect measurements. Exclusion criteria involved families that had recently moved or had not been residents for at least one year.

Data Collection Techniques. The nutritional status of toddlers was assessed through anthropometric measurements, with body weight recorded using a digital scale and height measured with a stadiometer. This study utilized Body Mass Index for Age (BAZ) and Weight for Age (WAZ) as the key nutritional status indicators. Socioeconomic information was gathered via interviews using a structured questionnaire. Additionally, household food security was evaluated through in-depth interviews employing the Household Food Insecurity Access Scale (HFIAS) questionnaire.

Tools or Instruments. Questionnaires were employed as instruments to collect socioeconomic data, including income. Anthropometric measurements were used to determine the nutritional status of toddlers by recording their height and weight. Height was measured with a stadiometer accurate to 0.1 cm, and weight was recorded using a digital scale with a precision of 0.1 kg. The nutritional status of toddlers was then evaluated using the WAZ and BAZ categories, with z-scores calculated through WHO-Anthro software version 3.2.2. Household food security data was gathered using the HFIAS questionnaire developed by the FANTA project. [Ashari et al., \(2019\)](#) assessed the HFIAS for validity and reliability, reporting a Cronbach's Alpha value of 0.84.

Data Analysis Methods. The data was analyzed using statistical methods, specifically the Chi-Square test and Fisher's Exact test when the Chi-Square test criteria were not met. A correlation test was performed with SPSS version 20 software to determine whether a relationship existed (p -value $< 0,05$) or if no significant relationship was present (p -value $\geq 0,05$).

3. RESULTS AND DISCUSSION

Food security is an essential aspect of life that cannot be overlooked. According to Law No. 18 of 2012 on Food, food security refers to a condition where the country can adequately provide for the food needs of its population on an individual level. This concept is based on three key aspects: sufficient food supply (availability), equitable distribution of food across all regions

(accessibility), and a consistent, reliable food supply that can be accessed at any time and place (stability). A household or population is considered to have strong food security if all three of these aspects are met. In the context of households, food security means having access to food that meets the necessary standards in terms of quantity, quality, safety, and affordability (Kementerian PUPR RI, 2011).

Household food security can be influenced or linked to various factors, including income (Sitanaya et al., 2019), the number of family members, the occupation and education level of the household head (Hidayat & Utami, 2019), food spending (Khoirunnisa et al., 2020), and environmental conditions such as climate and natural disasters (Thecla et al., 2018). In addition, the availability of sufficient food sources in the household can impact the nutritional well-being of toddlers. Food security, which can be affected by economic, political, and social challenges, including natural disasters, can disrupt the balance of food availability within families and contribute to the spread of infectious diseases. This, in turn, may have a detrimental effect on the nutritional status of toddlers (Sutriningsih & Lasri, 2017).

3.1. Respondent Characteristics

Table 1. Distribution of Respondent Characteristics

Characteristics	Frequency (n)	Percentage (%)
Toddler Age (Months)		
24 - 35	36	36,0
36 - 47	35	35,0
48 - 59	29	29,0
Gender of Toddlers		
Female	49	49,0
Male	51	51,0
Average Family Income per Month		
< UMK Surakarta	54	54,0
≥ UMK Surakarta	46	46,0
Household Food Security		
Food insecurity	43	43,0
Food Security	57	57,0
Nutritional Status		
Weight for Age (WAZ)		
Underweight	14	14,0
Not Underweight	86	86,0
Body Mass Index for Age (BAZ)		
Wasted	6	6,0
Not Wasted	94	94,0

As shown in Table 1, the majority of toddlers in this study, 36,0%, were aged between 24 and 35 months. The research also revealed that 51,0% of the participants were male. Most of the respondents, 54,0%, had incomes below the Surakarta City Minimum Wage (UMK). Additionally, 57,0% of respondents were categorized as having household food security, with the majority being in the food-secure category. Moreover, 86,0% of toddlers were not underweight, and 94,0% were not classified as wasted.

This study concentrated on toddlers aged 24 to 59 months. This particular age group was chosen because by the age of 2, children are typically encouraged to participate in family meals, offering a better insight into the household's food security situation. Furthermore, as noted by Hermina & Prihatini (2011), children aged 2 to 5 years are capable of expressing

their preferences for food and beverages, leading to a more varied diet for toddlers in this age range. Since food insecurity is linked to the capacity to meet nutritional needs, households with incomes below the Surakarta minimum wage (UMK) face a higher risk of experiencing food insecurity. [Hidayat & Utami \(2019\)](#) suggest that families able to fulfill their basic living needs are more likely to access better quality food, thereby enhancing their food security levels. Additionally, household income and food security indirectly affect the nutritional status of toddlers. Food-insecure households are at greater risk of malnutrition among their members, particularly toddlers, as demonstrated by studies linking household food security to toddler nutritional status ([Adhyanti et al., 2022](#); [Riski et al., 2019](#)).

3.2. Subject Responses to HFIAS Questionnaire

The study utilized the Household Food Insecurity Access Scale (HFIAS) questionnaire to assess household food security. Developed by the Food and Nutrition Technical Assistance (FANTA) project—a partnership between the U.S. Agency for International Development (USAID) and Family Health International 360 (FHI 360)—the HFIAS is a widely used tool for evaluating food security at the household level. It was selected for this study due to its simplicity and cost-effectiveness compared to other assessment methods. HFIAS primarily focuses on the household's access to food, including its availability within the home.

The HFIAS questionnaire is divided into three domains, which are broken down into nine questions. The first domain, covering anxiety and uncertainty regarding food availability in the household, is addressed by question 1. The second domain, focusing on low food quality (including diversity and choices of food types), is covered by questions 2, 3, and 4. Lastly, the third domain, which deals with insufficient food intake and its physical consequences, is addressed by questions 5 through 9 ([Coates et al., 2007](#)). The nine closed-ended questions with "Yes" or "No" responses are scored and then summed up. In this scoring system, a "No" answer is assigned a score of 0, while "Yes" answers are categorized further: a score of 1 is given for "rarely" (occurring once or twice in the past four weeks), 2 for "sometimes" (occurring 3-10 times in the past four weeks), and 3 for "often" (occurring more than 10 times in the past month). These individual scores are summed to provide a total score. Households with scores between 0 and 1 are considered food secure, while those scoring between 2 and 27 are classified as food insecure.

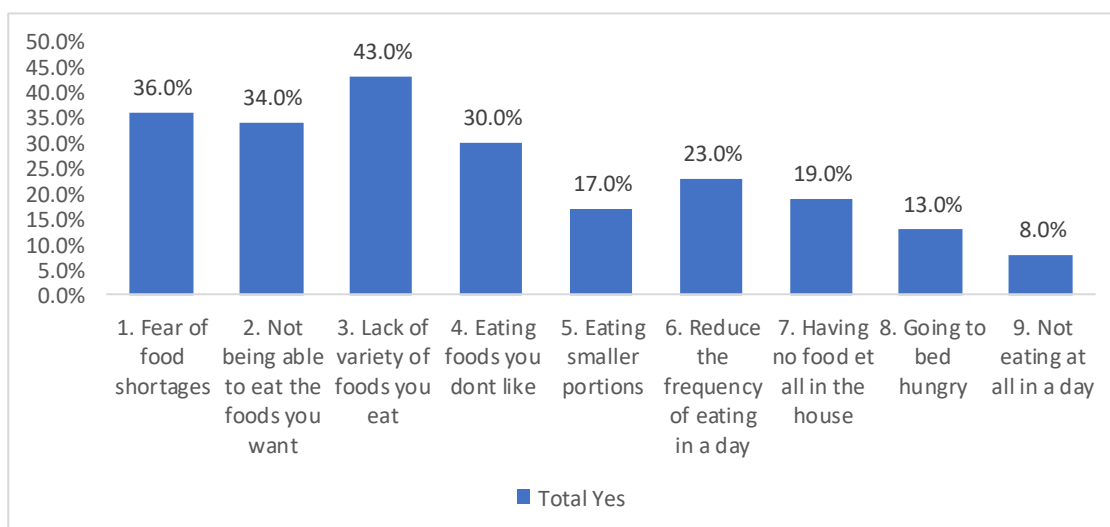


Figure 1. Distribution of Subjects Responses to the HFIAS Questionnaire

According to Figure 1, the highest number of respondents, 43,0%, answered "Yes" to question item number 3. This question addresses the lack of variety in daily food consumption due to limited resources or the inability to purchase a diverse range of foods. Food variety is an important indicator of food security. This is further supported by the research of [Sutyawan et al. \(2019\)](#), which demonstrates a strong connection between food consumption diversity and household food security. The study highlights how access to a wider range of nutritious and diverse foods contributes to improved household food security.

Moreover, the lack of variety in food consumption can be linked to income levels. This is evident in the data from Table 1, which shows that the majority of respondents (54,0%) have incomes below the Surakarta minimum wage (UMK). This correlates with the number of respondents who reported consuming less diverse foods. Research by [Lestari & Setyaningsih \(2018\)](#) also supports this, highlighting that family income is a key factor influencing the diversity of food consumed by toddlers. [Hutagaol & Sinaga \(2022\)](#) also support this finding in their research, indicating that higher income levels can promote greater food diversity. This is because increased income enhances purchasing power, which is influenced by fluctuations in food prices.

3.3. Relationship Analysis

3.3.1. Relationship Between Income and Household Food Security

Table 2. Relationship Between Income and Household Food Security

Income	Household Food Security				Total	P-value	OR 95% CI	
	Food Insecurity		Food Security					
	n	%	n	%				n
< UMK Surakarta	34	63,0	20	37,0	54	100,0	0,00	5,989
≥ UMK Surakarta	9	19,6	37	80,4	46	100,0		(2,801 – 17,435)
Total	43	43,0	57	57,0	100	100,0		

Table 2 reveals that 63,0% of food-insecure households are from families earning below the Surakarta minimum wage (UMK), while 80,4% of food-secure households belong to families with incomes at or above the UMK. There is a significant relationship between family income and household food security, as demonstrated by the Fisher Exact correlation test, which yielded a p-value of 0,00, indicating significance ($p < 0,05$). Additionally, the odds ratio (OR) of 5,989 (95% CI 2,801–17,435) suggests that households with incomes below the UMK are approximately 5,98 times more likely to experience food insecurity.

The connection between these two variables lies in the fact that households with higher incomes can fulfill both food and non-food needs. As a result, these households tend to spend a smaller proportion of their total income on food compared to non-food expenses. A household is considered food secure when its food expenditure accounts for less than 60% of the total income ([Sitanaya et al., 2019](#)).

The findings of this study are consistent with previous research, which also suggests that income plays a significant role in determining household food security ([Hidayat & Utami, 2019](#); [Saputro & Fidayani, 2020](#); [Sitanaya et al., 2019](#)). Higher household spending on food indicates lower food security. This is because when a significant portion of income is

dedicated to food expenses, even minor disruptions in income or increases in food prices can significantly impact the household's ability to obtain adequate food (BPS, 2018).

3.3.2. Relationship Between Income and Nutritional Status of Toddlers

Table 3. Relationship Between Income and Nutritional Status Based on WAZ

Income	Nutritional Status Based on WAZ				Total	P-value	
	Underweight		Not Underweight				
	n	%	n	%			
< UMK Surakarta	7	13,0	47	87,0	54	100,0	0,746
≥ UMK Surakarta	7	15,2	39	84,8	46	100,0	
Total	14	14,0	86	86,0	100	100,0	

Table 3 shows that 87,0% of toddlers from families with incomes below the Surakarta minimum wage (UMK) are classified as not underweight, which is slightly higher than the 84,8% of toddlers in families with incomes at or above the UMK. The results indicate that both families with incomes below and above the Surakarta minimum wage (UMK) have a higher number of children under five who are not classified as underweight. The Chi-Square correlation test further supports this, with a p-value of 0,746 ($p > 0,05$), confirming that no significant relationship exists between these two variables.

Table 4. Relationship Between Income and Nutritional Status Based on BAZ

Income	Nutritional Status Based on BAZ				Total	P-value	
	Wasted		Not Wasted				
	n	%	n	%			
< UMK Surakarta	4	7,4	50	92,6	54	100,0	0,370
≥ UMK Surakarta	1	2,2	45	97,8	46	100,0	
Total	5	5,0	95	95,0	100	100,0	

Similar to the data presented in Table 3, Table 4 reveals that 92,6% of toddlers from families earning below the Surakarta minimum wage (UMK) are not classified as wasted, which is only slightly lower than the 97,8% of toddlers from families earning at or above the UMK. These findings indicate that the majority of toddlers, regardless of family income being below or above the UMK, are not wasted. Additionally, the correlation analysis using the Fisher Exact test shows no significant relationship between these two variables. This is further supported by a p-value of 0,370, which exceeds the 0,05 significance threshold.

The findings of this study could be attributed to various factors influencing the nutritional status of toddlers, which remains classified as good even in low-income families. One such factor is the mother's awareness of how to provide meals that fulfill the nutritional requirements of toddlers using ingredients that are both affordable and readily accessible. This aligns with the findings of Hikmah & Arni (2021), who suggest that in families with lower incomes but normal toddler nutritional status, it is likely that the mother is skilled in providing nutritious meals on a budget by considering the nutritional value of affordable

foods. Nutritious options, such as vegetables, are not always costly and can be easily accessible.

Consistent with earlier studies, this research found no relationship between family income and the nutritional status of toddlers (Hikmah & Arni, 2021). Similarly, another study by (Ramadhan & Mardhiyah, 2022) also reported no significant link between household income and toddlers' nutritional status, as evaluated by WAZ and BAZ scores. Nonetheless, the findings of the study indicate that economic factors do not have an impact on the nutritional status of toddlers. Furthermore, the outcomes of this research could be affected by demographic factors and the geographic setting of the study. For children below the age of five, household income plays a critical role in shaping their nutritional well-being. Several other studies have also highlighted a connection between family income and the nutritional status of young children, as measured by the Weight-for-Age (WAZ) Z score (Hidayati, 2023).

3.3.3. Relationship between Household Food Security and Nutritional Status of Toddlers

Table 5. Relationship Between Household Food Security and Nutritional Status of Toddlers Based on WAZ

Household Food Security	Nutritional Status Based on WAZ				Total	P-value	
	Underweight		Not Underweight				
	n	%	n	%			
Food Insecurity	8	18,6	35	81,4	43	100,0	0,263
Food Security	6	10,5	51	89,5	57	100,0	
Total	14	14,0	86	86,0	100	100,0	

Table 5 reveals that in food-insecure households, 81,4% of children under five are not underweight, while 18,6% are. Similarly, in food-secure households, 89,5% of children under five are not underweight. These findings indicate that both food-insecure and food-secure households tend to have a higher proportion of children who are not underweight. A Chi-Square correlation test confirms that there is no significant relationship between household food security and toddlers' nutritional status, as measured by the WAZ score ($p > 0,05$).

Table 6. Relationship Between Household Food Security and Nutritional Status of Toddlers Based on BAZ

Household Food Security	Nutritional Status Based on BAZ				Total	P-value	
	Wasted		Not Wasted				
	n	%	n	%			
Food Insecurity	2	4,7	41	95,3	43	100,0	1,00
Food Security	3	5,3	54	94,7	57	100,0	
Total	5	5,0	95	95,0	100	100,0	

Table 6 indicates that 95,3% of toddlers from food-insecure households are classified as not wasted, compared to only 4,7% who are wasted. Interestingly, this percentage is slightly higher than that of food-secure households, where 94,7% of toddlers are not wasted.

Moreover, the Fisher Exact test results suggest no correlation between the toddlers' nutritional status, as measured by the BAZ, and household food security. This conclusion is supported by a p-value of 1,00 ($p > 0,05$), confirming the lack of significant association.

This research reveals that many households classified as food poor still have children under five with normal nutritional status. According to UNICEF's 1990 framework, the influence of food security on the nutritional status of young children is regarded as indirect. Thus, food security tends to first influence factors like nutrient intake, which eventually affects overall nutritional status. Safitri et al. (2017) demonstrated that toddlers from food-insecure households experienced higher calorie and protein intake, as indicated by positive correlations in their analysis. Additionally, (Anggraeni et al., 2021) found a clear link between energy and protein consumption and the nutritional status of toddlers. Consequently, it is likely that in this study, food insecurity primarily impacted toddlers' food intake but did not substantially alter their nutritional status, as indicated by the WAZ and BAZ scores.

Additionally, a study by Tayie et al., (2021) in the USA found that toddlers from households that are neither fully food insecure nor entirely food secure, but often experience anxiety about family food conditions, tend to have better nutritional status than those from food-secure households. This may be due to their ability to adopt coping strategies that increase energy intake in situations where food availability is limited. This may also explain the higher rates of overweight and obesity among children or toddlers in food-insecure households.

The absence of a link between household food security and the nutritional status of children under five in this study aligns with findings from research conducted by (Drennen et al., 2019; Sihotang & Rumida, 2020) Recent studies conducted by (Hartini et al., 2024) further support these findings. Nevertheless, these findings contradict other studies that have identified a connection between food security and children's nutritional status (Adhyanti et al., 2022; Riski et al., 2019), as well as the nutritional status of toddlers as measured by Weight-for-Age (WAZ) (Hidayati, 2023). According to research conducted by Ali et al., (2019) suggests that strong household food security, largely shaped by the family's economic standing, plays a key role in preventing malnutrition in young children. Similarly, findings from (Moradi et al., 2019) indicate that food insecurity poses a significant risk factor for underweight in toddlers.

4. CONCLUSION

There is a significant relationship between household food security and income ($p=0,00$). However, no statistically significant correlation was found between income and the nutritional status of children under five, as indicated by the WAZ ($p=0,746$) and BAZ ($p=0,37$) scores. Additionally, the analysis of WAZ ($p=0,263$) and BAZ ($p=1,00$) revealed no connection between food security and the nutritional status of children under five. Contrary to theoretical expectations and several previous studies that identified a link between household food security and the nutritional status of young children, this study discovered the opposite result.

In this study, as well as in general, the reliance on questionnaires is heavily influenced by respondents' views. Therefore, future researchers are encouraged to consider using the Food Expenditure Share (PPP) or Energy Adequacy Level (TKE) indicators. These metrics could offer a more objective assessment of the household food security being evaluated.

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