

# Stunting and food insecurity among children from low socioeconomic family during COVID-19 pandemic in urban area in Selangor

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## ABSTRACT

**Introduction:** Food insecurity is often link with nutritional status. An increased rate of food insecurity can have a severe impact on children's growth. During the COVID-19 outbreak, little is known regarding its effect on food security and nutritional status, especially concerning vulnerable groups such as children. The purpose of this study was to assess household food security status, children's nutritional status along with their association, and the determinants of food insecurity during the COVID-19 pandemic.

**Materials and Methods:** This cross-sectional study was conducted from May to July 2022 in urban areas in Selangor among children aged less than two years old from B40 households using purposive sampling through both online surveys and face-to-face interviews. There were 112 children aged < 2 years old from B40 households participating in this study. The data obtained on maternal sociodemographic, Household Food Insecurity Scale (HFIAS), and children's anthropometric measurements were analysed by using the WHO Anthro Survey, descriptive analysis, Person's Chi-square test and Fischer's exact test.

**Results:** The prevalence of food insecurity was more significant than the prevalence of food secured, at 55.4% and 44.6% respectively. The stunting among the children rated at 34.8%, followed by 7.2% of the sample found underweight, 7.8% (BAZ) and 16.1% (BAZ) of them were wasted, and overweight & obese, proportionately. This study discovered that household size was the sole determinant of household food security status. This finding suggested that size of a household influenced the odds of a household being food insecure.

**Conclusion:** The findings of this study provide insights into how the COVID-19 pandemic have an impact on children's nutritional status especially those from low-income and bigger size households. Therefore, more thorough and effective interventions should be designed particularly targeting this urban poor community to enhance their nutritional status and health.

## KEYWORDS:

*Food security, stunting, underweight, children's nutritional status, pandemic COVID-19*

## INTRODUCTION

Food insecurity is defined as limited access to nutritionally adequate and safe foods. Food insecurity can affect a person's food intake, preventing them from consuming enough nutritious food to stay healthy. Food insecurity has been related to poverty and poor health outcomes for many years. As reported by the Malaysian Department of Statistics Malaysia, up to 40% of M40 households have fallen into the B40 category due to the impact of the COVID-19 pandemic. B40 household is defined as bottom 40% of Malaysians with household incomes of less than Ringgit Malaysia (RM) 4,850 and M40 household is defined as 40% of Malaysians in the middle-income group with household income between RM4,851 and RM10,970. As known, the COVID-19 pandemic negatively affects various sectors, including food security. It is believed that the COVID-19 pandemic will exacerbate this condition. Hence, it adversely impacts people's lives, especially the vulnerable population, including children. Exacerbation of the prevalence of household food insecurity (HFI) would negatively affect children's nutritional status particularly their growth status. According to a study conducted in Uttar Pradesh, HFI rose rapidly from 21.0% in December 2019 to 80.0% in August 2020, with 62.0% of families moving from food secure to food insecure during this difficult period.<sup>1</sup> Meanwhile in Malaysia, it is reported that during the COVID-19 pandemic, majority (93%) of the households are food-secured. Infant and childhood nutrition are critical for healthy growth and development. A child's nutritional status might impact their body response to illness,<sup>3</sup> including malnutrition. Malnutrition can lead to undernutrition, overweight and obesity, together with noncommunicable diseases.

According to a meta-analysis study conducted in 2021, it has been found that household food insecurity due to the pandemic COVID-19 will increase the prevalence of undernutrition in 118 low- and middle-income countries (LMICs). Due to the impact of COVID-19, it is estimated that there will be 9.3 million additions of wasted children and 2.6 million stunted children by 2022 in the 118 LMICs. It is also predicted that the prevalence of wasted and stunted children will increase approaching the year 2022.<sup>4</sup> Moreover, a study has shown that children in the United States, who faced food insecurity during the COVID-19 crisis, may have extreme effects on their health.<sup>5</sup> In addition, according to a cross-

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sectional study conducted among primary school children from low-income households in Kuala Lumpur concluded that being underweight, stunting and wasting are prevalent among low-income children owing to HFI.<sup>6</sup>

Since household food security status has such a significant impact on the nutritional status of children, and COVID-19 pandemic is likely to worsen the condition, more research needs to be done on this topic as the public and healthcare decision-makers would be more alert to the seriousness of this issue. Hence, this study aimed to assess food insecurity and growth status, and the determinants of food insecurity during the COVID-19 pandemic among children <2 years old from B40 households in urban areas in Selangor.

## MATERIALS AND METHODS

### *Design and Study Sample*

This cross-sectional study was conducted in low-income residential area throughout urban areas in Selangor from May to July 2022. Purposive sampling was utilised in this study. The target population in this study was mother-child (<2 years, specifically 6 to 23 months) pairs from B40 households (monthly income of less than RM4850) as respondents. The sample size was calculated by using the formula of  $n = Z^2pq/e^{2.7}$  with the addition of a 10% non-response rate,<sup>8</sup> the confidence level of 95%, 50% estimated sample population due to unknown prevalence in the study area, and a margin of error with a value of 0.05. The total sample size calculated is 427 participants, but only 112 participants managed to be recruited in this study due to time constraints and social distancing procedures. Healthy children aged two years and below who are from B40 households residing in urban areas in Selangor were eligible to participate in this study.

### *Research Instruments*

A bilingual (Bahasa Malaysia and English) structured questionnaire which consisted of maternal socio-demographic, household food security status, and anthropometric measurements of the children was used to obtain the data through face-to-face interviews. The face-to-face survey took place in low-income residential areas throughout urban areas in Selangor. The anthropometric measurement was measured physically. The children were weighed by using a digital infant weighing scale and platform measuring scale (if the child was able to stand erect). The stationary headboard and stadiometer were used to take the recumbent length.

The Household Food Insecurity Scale (HFIS) is a brief survey tool that assesses the household food insecurity level for the past thirty days. It is a simple and reliable instrument developed by the USAID-funded Food and Nutrition Technical Assistance II Project (FANTA) in partnership with Tufts, Cornell Universities, and other collaborators. This tool is a validated method that has been widely utilized in research from low- and middle-income countries to assess the household food insecurity level of a household.<sup>1,9,10</sup>

### *Statistical Analysis*

The characteristics of maternal socio-demographic includes age, race, employment status, education, household size, and

the number of household recipient. There are four categories of Household food insecurity which are; 1) Food Secure, 2) Mildly Food Insecure Access, 3) Moderately Food Insecure Access, and 4) Severely Food Insecure Access. The data on the nutritional status of the children were categorized based on the length-for-age (HAZ), weight-for-age (WAZ), weight-for-length (WHZ), and BMI-for-age (BAZ) Z-score, including stunted, severely stunted, underweight, severely underweight, wasted, severely wasted, possible risk of overweight, overweight, obese, and normal. The anthropometric measurement was processed through the WHO Anthro Survey to calculate the Z-score. Z-scores obtained were then analysed together with the maternal socio-demographic and household food security status by using Statistical Package for Social Scientists (SPSS) Version 26 for statistical analysis. Descriptive statistics were utilized to calculate and characterized the data in frequency and percentage. Pearson's Chi-square test and Fischer's exact test were used in determining the association between food insecurity and sociodemographic characteristics, along with the association between food insecurity with children's nutritional status. Pearson's Chi-square test and Fischer's exact test were used to analyse the determinants of food insecurity instead of the logistic regression, due to the small sample size. This was to ensure the accuracy of the results.

## RESULTS

A total of one hundred and twelve mothers with children below two years old from B40 households living in urban areas in Selangor were recruited in this study.

Table I shows the respondents' socio-demographic profiles. Majority of the mothers were aged between 29 to 39 years old (58.9%, n=66), with the remainder of 30.4% (n=34) and 10.7% (n=12) being within the age group of 18 to 28 and 40 to 49 years old, respectively. Most of the respondents are Malay (94.6%, n=106), with the remaining being non-Malay (3.6%, n=4 Indian and 1.8%, n=1.8 Chinese). Majorly, 99.1% (n=111) of the respondents are married. Almost half of the participants are employed (45.5%, n=51), with the remaining 39.3% (n=44) and 15.2% (n=17) being unemployed and self-employed, respectively. In addition, the majority of the respondents are the holder of a certificate or diploma (48.2%, n=54), followed by the holder of a bachelor's degree (32.1%, n=36, respectively). Overall, 84.8% (n=95) of the respondents have a household of fewer than six people and 15.2% (n=17) have a household with six and more people. Whilst half (50%, n=56) of the participants have no more than one person of the household income recipient, and the other half (50%, n=56) of the participants have more than one person of the household income recipient

As shown in Table II, the prevalence of food insecurity was 55.4% (n=62). According to the length-for-age (HAZ) WHO Growth Chart, stunting is characterized by a Z-score of -2 to a Z-score of -3, and the Z-score of below -3. Based on Table III, the normal growth status category dominated the current study, which was high at 65.2% (n=73), followed by the stunting rate at 34.8% (n=39) which is more than a quarter of the sample size. According to the weight-for-age (WAZ) WHO Growth Chart, underweight is defined as the Z-score of -2, a Z-score of -3, and the Z-score of below -3. Only 7.2%

**Table I: Demographic data of lecturers (N=300)**

Characteristics		Frequency (n=112)	Percentage (%)
Maternal age	18-28	34	30.4
	29-39	66	58.9
	40-49	12	10.7
Race	Malay	106	94.6
	Chinese	2	1.8
	Indian	4	3.6
Marital status	Married	111	99.1
	Single mother	1	0.9
Employment status	Employed	51	45.5
	Unemployed	44	39.3
	Self-employed	17	15.2
Education level	No formal Education	2	1.8
	Primary education	2	1.8
	Secondary education	18	16.1
	Certificate or diploma	54	48.2
	Bachelor's degree	36	32.1
Household size	Less than 6	95	84.8
	6 and above	17	15.2
Number of the household income recipient	Not more than 1 person	56	50
	More than 1 person	56	50

**Table II: Prevalence of household food insecurity (N=112)**

HFIAS Prevalence	Number of Households (n=112)	Percentage of Households (%)
Food secure	50	44.6
Mild food insecure	30	26.8
Moderate food insecure	19	17.0
Severe food insecure	13	11.6
Total	112	100

**Table III: Nutritional status of children according to WHO Growth Chart (N=112)**

Characteristics		Number of Children (n=112)	Percentage of Children (%)
Length-for-age (HAZ)	Normal	67	59.8
	Stunted	23	20.5
	Severely Stunted	16	14.3
Weight-for-age (WAZ)	Normal	6	5.4
	Normal	96	85.7
	Underweight	8	7.1
Weight-for-length (WHZ)	Normal (Risk of growth problem)	8	7.1
	Normal	78	69.6
	Wasted	3	2.7
	Severely wasted	2	1.8
	Possible risk of overweight	14	12.5
BMI-for-age (BAZ)	Overweight	2	1.8
	Obese	13	11.6
	Normal	67	59.8
	Wasted	6	5.4
	Severely wasted	2	1.8
	Possible risk of overweight	19	17.0
	Overweight	5	4.5
Obese	13	11.6	
Total		112	100

**Table IV: The relationship between household food security status and nutritional status for HAZ and WAZ growth charts (N=112)**

Variable	Length-for-age, HAZ n (%)				Weight-for-age, WAZ n (%)			
	Normal	Stunted	X <sup>2</sup> statistic	p-value	Normal	Underweight	X <sup>2</sup> statistic	p-value
Household Food Security Status								
Food secure	29 (25.9)	21 (18.8)	2.051	0.152	43 (38.4)	7 (6.3)	6.403	0.021*
Food insecure	44 (39.3)	18 (29.0)			61 (54.5)	1 (0.9)		

\*Analysed by Fischer's exact test and p<0.05, statistically significant is written in bold

**Table V: The relationship between household food security status and nutritional status for WHZ and BAZ growth charts (N=112)**

Variable	Weight-for-length, WHZ n (%)					BMI-for-age, BAZ n (%)				
	Normal	Wasted	Overweight & Obese	X <sup>2</sup> statistic	p-value	Normal	Wasted	Overweight & Obese	X <sup>2</sup> statistic	p-value
Household Food Security Status										
Food secure	37 (33.0)	5 (4.5)	8 (7.1)	7.219	0.020*	34 (30.4)	5 (4.5)	11 (9.8)	3.883	0.146*
Food insecure	55 (49.1)	0 (0.0)	7 (6.3)			52 (46.4)	3 (2.7)	7 (6.3)		

\*Analysed by Fischer's exact test and  $p < 0.05$ , statistically significant is written in bold

(n=8) of the children in this study was underweight, while majority of them have a normal growth status of 92.8% (n=104).

As shown in Table III, following the weight-for-length (WHZ) WHO Growth Chart, wasting is established as a Z-score of -2 to a Z-score of -3, and the Z-score of below -3, whilst overweight and obese are delineated by the Z-score of +2 to a Z-score of +3 and the Z-score above +3, respectively. The present study found that the prevalence of normal nutritional status among children below two years old is 82.1% (n=92), the majority of the sample. About 4.5% (n=5) is wasted, while 1.8% (n=2) and 11.6% (n=13) of the children are categorised as overweight and obese, proportionately.

In accordance with the BMI-for-age (BAZ) WHO Growth Chart, wasting is established as a Z-score of -2 to a Z-score of -3, and the Z-score of below -3, whilst overweight and obese are delineated by the Z-score of +2 to a Z-score of +3 and the Z-score above +3, proportionately. In this study, most of the children have a normal weight status with a prevalence of 76.8% (n=86), followed by wasting at 7.2% (n=8) and overweight and obese valued at 16.1% (n=18). According to Table IV and Table V, it is presented that there are no associations between household food security status with nutritional status in this study. Therefore, despite food security being an important factor in nutritional status, the current study finds that food security does not determine whether a child is stunted.

Findings from the present study indicates that household food security status was associated with being underweight. However, the current study found that food-secured children are more likely to experience underweight than children from food insecure households. In the current study, wasting, overweight, and obesity are not associated with household food security status. Therefore, although food insecurity is closely related to wasting, overweight and obesity, household food security status is not the decisive factor in determining wasting, overweight and obesity based on the current study's findings.

In this study, a few sociodemographic factors that have been analysed against household food security status, including, maternal age, race, marital status, employment status, education level, household size, and the number of household income recipients. However, as shown in Table IV, only household size was concluded as the significant determinant of food insecurity based on the current study's finding, with a p-value of 0.000.

## DISCUSSION

Compared to another study conducted among Bangladeshi from lower-income households.<sup>11</sup> It may be deduced that the reduced prevalence of food insecurity shown in this study may be caused by economic factors. As of 2017, Malaysia had a Gross Domestic Product (GDP) per capita of USD29,100, whereas Bangladesh had a GDP per capita of USD4,200 and is also one of the poorest countries in the world.<sup>12</sup> The 6.9 times lower GDP, significantly reduce the economic decision factors such as food price which affects its population's food security status. Hence, this explains the lower prevalence of food insecurity among low-income households among Bangladeshi as compared to the Malaysian population despite both countries' challenges in facing the COVID-19 pandemic.

It is found that from this study, the prevalence of stunting is higher as compared to a previous study, conducted in Indonesia among children below the age of two years old.<sup>13</sup> It can be inferred, relative to the previous study that the higher prevalence of stunting may be due to it being conducted during the COVID-19 pandemic. On top of worsening the economic crisis, the COVID-19 pandemic exacerbates undernutrition in both low- and middle-income countries.<sup>4</sup> This explains the higher stunting rate in this study which is conducted in an upper middle-income country, Malaysia.

The current study findings exhibit a much lower wasting prevalence compared to the previous study conducted in Pakistan at the rate of 15.49%.<sup>14</sup> A possible explanation for this might be due to distinct economic factors. Although both current and previous study was conducted in a low-income household, Malaysia is an upper middle-income country which offers various food assistance program to low-income households from both government and non-governmental organizations (NGOs). Such as *Bantuan Kehidupan Sejahtera Selangor* (BINGKAS) Selangor 2022, *Skim Tabung Warisan Anak Selangor* (TAWAS) and SMART Selangor Food Stamp, PEMULIH, Food Basket Programme, Cheka Movement Malaysia, Happy Bank Crew, and many more. These numerous accessibilities of the food support program in Malaysia may assist poor Malaysian households in combating undernutrition. Therefore, explaining the lower rate of wasting in the current study.

However, the prevalence of obesity and overweight in this present study is 16.1% (n=18). Excessive BMI can occur due to the impacts of poverty, which influence their food choices. In a study that was conducted in an poor urban community in Kuala Lumpur, Malaysia, it was reported that BMI increased as household income decreased.<sup>35</sup> Furthermore, according to

previous study, children who come from low-income household has a higher risk of being overweight and obese due to income inequalities resulting in more unhealthy food choices.<sup>15</sup> It may be suggested that unhealthy foods are much cheaper than healthy foods. Therefore, some might consume unhealthy snacks high in fat and calories to increase fullness which can contribute to obesity. Hence, this explains the higher rate of overweight and obesity in the current study.

There is no association between food-secured household status and nutritional status, particularly stunting found in this study which correlated with previous studies conducted in developing countries, including Ethiopia, Ghana, and Nepal.<sup>16-18</sup> However, some studies are also conducted in developing countries such as Pakistan, Bangladesh, and Nepal, which concluded that food insecurity is associated with stunting.<sup>19-21</sup> The factors contributing to stunting include lack of dietary diversity, inadequate breastfeeding practices, and poor child feeding and care which are closely related to food insecurity.<sup>22</sup> On top of household food insecurity was influenced by sociodemographics including employment status and household income, it was also associated with being underweight and this finding is consistent with the result of previous studies.<sup>17,19,23,24</sup> However, the current study found that food-secured children are more likely to experience underweight than children from food insecure households. A possible explanation for this might be that those children may or may not be due to being picky eaters which, resulted to inadequate food intake even total household income is sufficient. However, this is beyond the scope of this paper and will be discussed elsewhere.

It is found that in this study, wasting, overweight, and obesity, are not associated with household food security status. The absence of a correlation between wasting and food security corresponds with a previous study in Nepal.<sup>25-26</sup> In contrast, previous studies indicated a relationship between wasting, overweight, and obesity with food security status.<sup>27-30</sup> The rise in prevalence of overweight and obesity globally, is mostly due to environmental factors, lifestyle choices, and cultural context. Obesity also may occur in food insecure households as evidenced by both underweight and overweight coinciding within the same households.<sup>31</sup> Extensive evidence showed that larger portion sizes and excessive intake of sugar contribute significantly to the global rise in overweight and obesity rate.<sup>32</sup> Low-income households may choose unhealthy food choices in combating hunger, as unhealthy food choices can be cheap and affordable for low-income households. For instance, some may replace the portion of protein with carbohydrates on a meal plate as protein can be more costly than carbohydrates, which may promote the rate of obesity in children.

Sharing scarce meals among family members is a significant problem food-insecure households face. Household size plays a significant role in determining household food security. Bigger family households bear an additional load on food consumption and are more likely to face food insecurity, as compared to smaller households.<sup>33</sup> Large families frequently have limited access to food availability at home, which causes them to have inadequate food intake or limited mealtimes without considering the quality of their diet or dietary diversity.<sup>34-35</sup> Hence, it explains how household size remarkably affects food insecurity.

The strength of this study was the data collection was conducted within the transition from pandemic to endemic, and therefore could reflect how the COVID-19 pandemic may influence the nutritional status of food-insecure households. However, this study also has several limitations. First, this study used HFIAS, which fails to measure child hunger and this measurement could have a significant relationship between food insecurity, child hunger and nutritional status. The findings of our study are generalized to only some of the population of poor urban community in Malaysia as the sample was only recruited from a single geographical area. Moreover, this present study is cross-sectional and therefore, did not determine the causal inference.

## CONCLUSION

This study found that the majority (55.4%) of low-income households are food insecure, with more than a quarter (34.8%) of the children being stunted, 7.8% of them being underweight, 4.5% (WHZ) characterized as wasted, and 16.1% are overweight & obese. However, this study only revealed a relationship between status of household food security and being underweight. In addition, household size was the sole determinant of household food security status, which suggested that food insecurity status of a household was influenced by the number of family members in a household. This study recommends further research with a larger sample to be conducted to allow the data to be more representative of the population and enhance the accuracy of data analysis. Moreover, the current study suggests more involvement by the policymakers through allocating budgets, restructuring policies and legislative guidelines in combating food insecurity.

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## ETHICS APPROVAL AND INFORMED CONSENT

The Universiti Teknologi MARA (UiTM) Research Ethics Committee (REC) has approved this study which involved human participants, with the reference number of FERC/FSK/MR/2022/0079. Each participant was asked to give his or her consent beforehand.

## CONFLICT OF INTEREST

The authors declare 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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## AUTHORS CONTRIBUTION

Conceptualisation: SB, NM; data curation and formal analysis: NM; Methodology: SB, NM; writing original draft: NM, SB; writing review and editing: SB, NA, AV

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