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Household food security, dietary diversity and nutritional status of children 6-59 months old in Lombok Tengah, Indonesia

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ABSTRACT

Background: Chronic nutritional problems have become a general health issues and consequences of food insecurity. It is considered a high priority for public health impact and the associated nutritional risks. Consequences of food security can be categorized into three distinct areas: developmental outcomes, chronic illness among children and infant health outcomes. Food insecurity may experience developmental delays and an increased risk chronic illness. This research aims to evaluate the condition of food security and household dietary diversity and nutritional status of children in Central Lombok.

Methods: A cross-sectional study method was applied to a selection of households in Central Lombok, West Nusa Tenggara, Indonesia, with a sample size of 391 randomly selected households.three researcher collected, analyzed and tabulated the data obtained using demographic profile sheet, 24-hour dietary recall, Food security in households is measured by the Household Food Access Scale (HFIAS) and Household Dietary Diversity Score (HDDS), and as well as for anthropometric measurements categorization.

Results: Prevalence of stunting in children was 42.5%, while children with low food diversity consumption (<4 food groups) were 2.1%. Significant relationship was found between age of toddler and food security ($p < 0.001$), household size and household food security ($p < 0.005$), dietary diversity and food secure ($p < 0.001$), Energy intake and Household food insecurity access scale ($p < 0.002$), Carbohydrate intake and household food insecurity access scale ($p < 0.001$), energy intake and weight for age z-score ($p < 0.002$), fat intake and weight for age z-score ($p < 0.002$), carbohydrate intake and weight for age z-score ($p < 0.002$).

Conclusions: In summary, the condition in Central Lombok with the high incidence of child stunting, followed by households that have low consumption of dietary diversity.

KEYWORDS

Food availability, nutritional insecurity, risk of malnutrition, poverty, food and agriculture.

INTRODUCTION

Many things can affect and the most common is if there is insufficient nutritional intake starting from the beginning of life for proper growth and insufficient nutritional intake is certainly affected by food security and dietary diversity in the household. Food insecurity and malnutrition are a threat to human health in all its forms[1,2]. In many developed and developing countries, especially in the Asian region, food insecurity is a major nutritional problem that is common among low-income households[3]. Nutrition is the cornerstone that influences and determines the health of all people, rich and poor alike. Conversely, malnutrition makes us all more vulnerable to disease and premature death[4,5]. Food insecurity is always associated with low income, poverty, inadequate and unbalanced diet and poor weight status at the household level[6]. Food insecurity is associated

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with disrupted eating patterns, poor diet quality and undernutrition across age groups and demographics[7]. It is a devastating problem, especially for the poor and underprivileged, as poverty is a major cause of household food insecurity and, consequently, undernutrition, which remains one of the most important and pressing health problems affecting children and adults[2,4]. Toddlers aged 0-59 months are more vulnerable to the adverse effects of food insecurity, given their high nutritional requirements for growth and their dependence on others for food[8]. The survey data shows that children's stunting is confirmed by 37% of Central Lombok. The main factors that cause malnutrition in children are having poor eating habits, foods consumed low in calories and other important nutrients and continuous infectious diseases. Several researchers have found a strong relationship between household food security and children with malnourished status[5]. Stunting, which is the term used for the height for age index, is a measure of how much children grow before and after they are born. If a child is below the average height for their age, it can indicate that they didn't get the nutrition and/or healthcare they needed while they were growing. Wasting is when a person has lost a lot of weight quite recently and it's usually because they haven't had enough to eat or because they're sick. The anthropometric index weight for height is a way to measure body weight relative to height. If a child is underweight, it means their body mass is relative to their age. It's influenced by a child's height and weight, so it's a mix of stunting and wasting[9].

This study was conducted to evaluate food security and household dietary diversity as a determinant of nutritional status of children aged 6-59 months in Central Lombok, Indonesia.

METHODS

A cross-sectional study method was applied to a selection of households in Central Lombok, West Nusa Tenggara, Indonesia, with a sample size of 359 randomly selected households. An application for ethical approval was submitted to the Ethics Committee of Mataram Health Polytechnic Institution (LB.01.03/6/115/2023). To determine the state of food security in this study, it refers to the Household Food Insecurity Factor Scale (HFIAS). A set of questions has been developed by the Food and Nutrition Technical Assistance (FANTA)[9]. The household food insecurity access scale can be divided into four levels: severely food insecure, moderately food insecure, mildly food insecure and food secure. These questions elicit predictable responses to the experience of food insecurity that can be summarized and quantified on a scale. The HFIAS is made up of nine questions covering three broad themes: (i) anxiety and uncertainty about accessing food; (ii) inadequate quality (variety, preferences and social acceptability); and (iii) inadequate food intake and its physical consequences[10]. Meanwhile, to assess the diversity of food consumption in subjects using the Individual Dietary Diversity Score (IDDS). The IDDS has been validated as a tool for measuring dietary diversity[11] and as a monitor of seasonal variations in food access.The tool measures household dietary diversity using 12 food groups and includes a 24-hour household dietary recall to adequately reflect the quality of the household diet. The survey encompasses twelve food groups: white roots and tubers, cereals, fruits, fish and seafood, meat, eggs, oils and fats, milk and dairy products, sweets, pulses, nuts and seeds, and spices and condiments. The maximum score that can be attained on the HDDS is '12', with each food group being assigned a value of '1'. A household's minimum score is '0'. It is thus possible to interpret the score as an indicator of the diversity of a household diet, with higher scores denoting greater diversity and lower scores indicating a more limited diet.

Anthropometric measurements were taken to determine the nutritional status of the children. Children were considered stunted if the z-score calculation of height/length for age was less than -2 standard deviations (-2 SD). Anthropometric data on weight and height were collected from children within the age range of 6–59 months. The height of the child was measured using a measuring board. Their weight was measured using a Salter Spring scale. The height of infants aged 6–23 months was measured in a recumbent position. For children aged 24 months and older, height was measured in a standing position. The weight of infants and children was measured to the nearest 10 mg. The measurement was taken using UNICEF's standard instruments of weighing scale and height board and was routinely checked and adjusted to maintain its accuracy. Subsequent to each weighing procedure, the indicator was meticulously calibrated against a zero reading.

Table 1. Child growth standards

Indeks	Threshold (Z-Score)	Nutritional Status Category
Weight for age (WAZ)	WAZ < -3 SD -3 SD < WAZ < -2 SD -2 SD < WAZ < +1 SD WAZ > +1 SD	Severely underweight Underweight Normal Overweight
Height for age (HAZ)	HAZ <-3 SD -3 SD < HAZ < -2 SD -2 SD < HAZ < +3 SD HAZ > +3 SD	Severely stunted Stunted Normal Tall
Weight for Height (WHZ)	WHZ < -3 SD -3 SD < WHZ < -2 SD -2 SD < WHZ < +1 SD > +1 SD > WHZ > +2 SD > +2 SD > WHZ > +3 SD WHZ > +3 SD	Severely wasted Wasted Normal Risk of overweight Overweight Obese

Frequencies and percentages were calculated for categorical variables, and chi-squared analysis was used to assess the relationship between exposure and outcome variables.

RESULTS

A total of 400 households with at least one child aged 6-59 months were included in the survey. Data was missing for 9 children, so the final analysis was based on 391 mother-child pairs, giving a response rate of 97,6%. The mean age of children under five was 28 years (SD 3,1) and the majority of 258 (65,98%) children under five were in the 25-59 age group. Of the respondents, 203 (51,9%) children under five were male. The mean family size was 2,4 with an SD of 1,3 of the respondents, 304 (77,7%) had a family size of less than four people (Table 2). The dietary diversity score in this study was 5,3 (95% CI = 4,7–5,4) with a good IDDS score category (97,4%), and that they consumed at least four (4) food groups in the last 24 hours before the survey. Prevalence of stunting (42,5%) in children aged 6-59 months is based on observations on the research population.

Table 3. shows that children with low dietary diversity and food consumption come from the households which have severe food insecurity. The measurement of household food insecurity status was conducted utilizing the Food and Nutritional Technical Assistance (FANTA) Household Food Insecurity Access Scale (HFIAS) instrument.

This instrument comprises a series of nine occurrence questions designed to ascertain the severity of food insecurity (access) and nine occurrence questions. These latter questions are posed as follow up to each occurrence question, with the objective of determining the frequency with which the condition occurred one month prior to the survey.

The survey revealed that more than half (235) (60,1%) experienced food insecurity to a certain degree during the one

Table 2. Characteristics of toddler's migrant family

Variable	Category	Frequency	Percentage	P-Value
Age of toddler	6 - 24 months 25 – 59 months	133 258	34,01 65,98	<0,001*
Gender of toddler	Male Female	203 188	51,9 48,1	0,212
Household Size	Small (<=4 people) Medium (<=5-6 people) Large (<=7 people)	304 75 12	77,7 19,2 3,1	<0,005*
Father's occupation	Migrant	391	100	N.A

Table 3. Bivariate analysis of association between Individual dietary diversity score and Food Security

Category	IDDS						p-value
	Low (< 4 Types of Food Groups)		High (≥ Types of Food Groups)		Total		
	n	%	n	%	n	%	
Food Insecurity							0,001**
Food secure	19	12,2	137	87,8	156	39,9	
Mildly food insecure	40	19,8	162	80,2	202	51,7	
Moderately food insecure	3	9,4	29	90,6	32	8,1	
Severely food insecure	1	100	0	0	1	0,3	
Total	63	16,1	328	83,9	391	100	

** value is statistically significant at p<0.05.

month period prior to the survey. Within this group 202 (51,7%) were classified as mildly food insecure, 32 (8,1%) were moderately food insecure, and 1 (0,3%) were severely food insecure. Significant association shown between incidence of food insecurity in households and diversity of food consumption in toddlers aged 6-59 months (p < 0,001).

As demonstrated in Table 4, the recommended amounts of various nutrients were matched. The mean daily energy consumption deficit (less than 80%) was 45,8%, normal (90-119%) 26,3% and excessive (more than 120%) 26,3% respectively. A higher percentage of protein consumption at level excessive (79,5%) and a higher percentage of fat consumption at level deficit (69,6%) and a higher percentage of carbohydrate intake at level deficit (53,2%). Significant association shown between energy and carbohydrate consumption and household food insecurity access scale in children aged 6-59 months (0,001).

As demonstrated in Table 5, the recommended amounts of various nutrients were matched. The mean daily energy consumption deficit (less than 80%) was 45,8%, normal

Table 4. Bivariate analysis of association between HFIAS and nutrition intake

Variable	Household food insecurity access scale (HFIAS)										p-value
	Food Secure		Mildly food insecurity		Moderately food insecurity		Severely food insecurity		Total		
	n	%	n	%	n	%	n	%	n	%	
Energy											
Deficit <80%	58	37,2	109	54,0	17	53,0	1	100	179	45,8	
Normal 90-119%	48	30,8	46	22,8	9	28,1	0	0	103	26,3	0,002
Excessive ≥120%	50	32,1	47	23,3	6	18,8	0	0	103	26,3	
Total	156	100,0	202	100,0	32	100,0	1	100,0	391	100,0	
Protein											
Deficit <80%	16	8,9	25	12,4	6	18,7	0	0	47	12	
Normal 90-119%	12	7,7	19	9,4	2	6,2	0	0	33	8,4	0,287
Excessive ≥120%	128	82,1	158	78,2	24	75	1	100	311	79,5	
Total	156	100,0	202	100,0	32	100,0	1	100,0	391	100,0	
Fat											
Deficit <80%	105	67,3	144	71,3	22	68,7	1	100,0	272	69,6	
Normal 90-119%	25	16,0	38	18,8	8	25,0	0	0	71	18,2	0,118
Excessive ≥120%	26	16,7	20	9,9	2	6,2	0	0	48	12,3	
Total	156	100,0	202	100,0	32	100,0	1	100,0	391	100,0	
Carbohydrates											
Deficit <80%	67	42,9	122	60,4	18	56,3	1	100	208	53,2	
Normal 90-119%	50	32,1	43	21,3	11	34,4	0	0	104	26,6	0.000
Excessive ≥120%	39	25,0	37	18,3	3	9,4	0	0	79	20,2	
Total	156	100,0	202	100,0	32	100,0	1	100,0	391	100,0	

Table 5. Bivariate analysis of association between nutrition status and nutrition intake

Variable	Weight for Age Z-Score (WAZ)								p-value
	Underweight		Normal		Overweight		Total		
	n	%	n	%	n	%	n	%	
Energy									
Deficit <80%	40	37,4	135	49,6	10	83,4	185	47,3	
Normal 90-119%	28	26,2	73	26,8	2	16,7	103	26,3	0,002
Excessive ≥120%	39	36,4	84	23,5	0	0	103	26,3	
Total	107	100,0	272	100,0	12	100,0	391	100,0	
Protein									
Deficit <80%	12	11,2	35	12,8	0	0,0	47	12,0	
Normal 90-119%	7	6,5	23	8,5	3	25,0	33	8,4	0,519
Excessive ≥120%	88	82,3	214	78,7	9	75,0	311	79,5	
Total	107	100,0	272	100,0	12	100,0	391	100,0	
Fat									
Deficit <80%	65	60,8	195	71,7	12	100	272	69,6	
Normal 90-119%	24	22,4	47	17,3	0	0	71	18,2	0,002
Excessive ≥120%	18	16,8	30	11,0	0	0	41	12,3	
Total	107	100,0	272	100,0	12	100,0	391	100,0	
Carbohydrates									
Deficit 80-89%	46	43,0	152	55,9	10	83,3	208	53,2	
Normal 90-119%	31	29,0	71	26,1	2	16,7	104	26,6	0,003
Excessive ≥120%	30	28,0	49	18	0	0	79	20,2	
Total	107	100,0	272	100,0	12	100,0	391	100,0	

(90-119%) 26,3% and excessive (more than 120%) 26,3% respectively. A higher percentage of protein consumption at level excessive (79,5%) and a higher percentage of fat consumption at level deficit (69,6%) and a higher percentage of carbohydrate intake at level deficit (53,2%). Significant association shown between energy and carbohydrate consumption and household food insecurity access scale in children aged 6-59 months (0,001).

This research did not find any association between dietary diversity and stunting. The main impact of food insecurity is that it causes inadequate food intake in children. Second, household food insecurity provides opportunities related to the lack of food variety, resulting in low dietary diversity.

The results of this study show that these rates are comparable to the regional rates, SDKI. However, the rates, especially the prevalence of wasting (27,4%), were slightly higher in this study. Underweight was also very high compared to the regional rate (9,6%). The high prevalence of malnutrition, especially underweight, in this study may be due to the fact that most households in the study area are

migrant families. Data were collected from these families. Chi square test and Pearson correlation showed no significant relationship between individual intake of energy and weight for age Z-score (0,002), intake of fat and weight for age Z-score (0,002), and intake of carbohydrate and weight for age Z-score (0,003) respectively.

Chi-square test and Pearson correlation showed no significant relationship between individual dietary diversity score and Height for age z score at p = 0,759, respectively.

Table 6. Bivariate analysis of association between nutritional status and individual diversity score

Variable	Height for age										p-value
	Severely Stunted		Moderately Stunted		Normal		Tall		Total		
	n	%	n	%	n	%	n	%	n	%	
IDDS											
Low (< 4 types of food group)	0	0	3	5,7	50	94,3	0	0	53	100	0,759
High (≥ 4 types of food group)	32	9,5	113	33,4	188	55,6	5	1,5	338	100	
Total	32	8,2	116	29,7	238	60,9	5	1,3	391	100.0	

** value is statistically significant at p<0.05.

DISCUSSIONS

The dietary intake of the study participants exhibited significant variability, with the total energy consumption of the participants falling below the recommended intake range. With regard to macronutrient distribution, the majority of participants exhibited excessive consumption of protein, inadequate intake of carbohydrate, and inadequate intake of fats. In order to ensure adequate nutrient intake, it is imperative to consume a variety of foods. The availability and affordability of highly processed foods are considered important drivers of poor nutrition[12]. These results are in line with previous research, which stated that food insecurity in households has association with the dietary diversity consumed by children under five years old[13]. Mei C.F (2020) findings no significant relationship between household food security status and weight status[14]. In recent research, it was stated that children come from households with food security significantly more likely to consume adequate food than children come from the households which have food insecurity[15].

The issue of food insecurity is a consequence of two factors: the unavailability of food, and the households' inability to access the available food. Food inaccessibility constitutes a significant issue within Lombok Tengah households, signifying that the majority of households are devoid of the necessary resources to procure food. It is evident that a significant proportion of the research population experienced feelings of anxiety and uncertainty. It is also worth noting that nearly three-quarters of the households expressed concerns and uncertainty about their next meal. It has been suggested by some studies, including one by Bukhaman et al (2020), that food insecurity may possibly have a significant impact on mental health, possibly resulting in feelings of anxiety and depression[16]. Johnson's (2021) findings indicate that food insecurity can be a contributing factor to various health concerns, including suboptimal dietary intake, compromised mental well-being, and an increased likelihood for the development of chronic diseases, particularly among the female demographic. This phenomenon is believed to be a result of the state of anxiety, stress, and stigma that accompanies food insecurity[17]. It is evident that substandard nutrition may impede an individual's ability to meet the recommended dietary requirements essential for optimal bodily function and a healthy lifestyle, as substantiated by the research conducted[18].

The present study identified an association between total consumption of food and household food insecurity as measured by the adapted food security index. This association was found to be of interest, although it should be noted that similar findings have been recorded in other research. Rossen L.M. et al. (2016) also reported that there was no significant relationship between food insecurity and dietary intake among a nationally representative sample of 5,136 US children aged between 2 and 15 years old, as measured by the National Health and Nutrition Examination Survey (NHANES)[19].

In the present study, the results of the anthropometric measurements indicated that a significant proportion of the subjects were of normal (HAZ) and thus presented a low risk

of developing. This study found that having a varied diet was really important for helping children in Lombok Tengah grow healthy and strong. It's really great to see that for younger children, having a varied diet also helps to reduce stunting. The authors posit that dietary diversity is generally associated with the nutritional status of children. Furthermore, they contend that this association remains when controlling for factors relating to household wealth and welfare[20]. Although the prevalence of underweight is similar to the national figures, it is very low compared to the prevalence of underweight reported in other studies conducted in Oromia (30,9%)[21], Tigray (38,3%)[22], Western Gojam (49,2%)[23], Somale (47,7%)[24] and Jimma (34,2%)[25]. The data for this study were collected from migrant families, and food insecurity tends to be higher among migrant families than among farming families, so there will be an increase in child acute malnutrition. But it's important to remember that even in places where there's more variety in people's diets and better nutrition, there's still a chance of chronic malnutrition. So for all you mummies and daddies out there, if your little ones aren't exclusively breastfeeding, it might be worth considering introducing more variety into their diet. This could be a great way to help reduce stunting and underweight in children under three.

The present study revealed an absence of correlation between dietary diversity and the occurrence of stunting or malnutrition. While the current study highlights a relatively high overall intake of animal protein, it also acknowledges the potential for children with lower dietary diversity to be at higher risk of micronutrient deficiencies that could contribute to chronic malnutrition and stunting. In most of the literature mentioned above, the families surveyed were different from those in the current study, and this may be the reason for the difference in proportions[26]. Studies conducted by previous researchers have proven that there is a positive association related to food diversity in individuals with nutritional status conditions in children[27]. The limitation of this study is the lack of relationship between individual dietary diversity and nutritional status of children in the study area, so it may indicate that even though children come from food insecure households, they still protect their children from the negative effects of food insecurity by prioritizing the nutritional intake of their children more than adults.

CONCLUSIONS

The lack of diversity in children's diets in Lombok Tengah, Indonesia, is a major issue. A lack of a diversified diet prevents children from obtaining the nutrients needed for optimal development. This is a key factor driving the high prevalence of stunting in this group. It is imperative that parents/caregivers are encouraged to incorporate indigenous and locally available foods into their children's diet, with a view to increasing the variety of nutrients. To this end, it is recommended that local and affordable food options be made available, thus providing examples of a diverse diet. It is recommended that future nutrition education initiatives place a greater emphasis on encouraging the consumption of a wide range of foods from diverse food sources in order to promote optimal growth and development.

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