



Determinants of Feeding Patterns with Stunting in Children in the Coastal Area of Bengkulu City

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Abstract

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BACKGROUND: The age of 0–2 years is a golden period for human growth and development known as the “golden age,” characterized by rapid growth. This period is the First 1000 Days of Life (HPK). The proper diet greatly affects the nutritional status of children.

AIM: The purpose of the study was to determine child feeding patterns with the incidence of stunting in children in the Coastal area of Bengkulu City.

METHODS: This study was an analytical observational study with a cross-sectional design. The research sample was children under five aged 6–24 months in the coastal area of Bengkulu City as many as 75 children were selected using the accidental sampling technique. Children’s nutritional intake using the Semi Food Frequency questionnaire for energy, protein, fat, carbohydrates, calcium, iron, zinc, and phosphorus. Nutritional intake data were processed by nutrisurvey. Data analysis with Chi-square test and the level of significant 0.05.

RESULTS: The frequency of food consumed by children 6–24 months in the form of mashed food 2 times a day was 54.2%, soft food 3 times a day was 54.5%, and family food 3 times a day was 82.5%. The percentage of children with energy, protein, fat, and carbohydrate intake below the recommendation was much higher in normal children (in sequence 84.6%, 81.8%, 84.9%, and 86.3%) compare to stunted children (in sequence 15.4%, 18.2%, 15.1%, and 13.7%). Likewise, calcium, fe, zinc, and phosphor intake below the recommendation was much higher in normal children (in sequence 82%, 85.5%, 80.6%, and 82.1%) compare to stunted children (in sequence 18%, 14.5%, 19.4%, and 17.9%).

CONCLUSIONS: There was no relationship between the type of food, macronutrient and micronutrient intake with stunting. Education and counseling at Integrated Healthcare Center need to be carried out, regarding the importance of consuming the proper food and the proper frequency of eating, surveys of nutritional consumption and routine health checks for pregnant women and children under five.

Introduction

At the year of 2020, stunting cases in Indonesia were in second place after Timor Leste at 31.8% [1]. Even though stunting has decreased, it is still a nutritional problem. The influence factors of the stunting incidence in children aged 24–59 months were nutritional intake, environmental sanitation and history of infectious diseases [2]. Stunting is very complex and influenced by many factors such as caregiver gender, age, water source, and behavioral practices around hand washing access to food, quantity and quality/diversity, eating, and hygiene behavior [3].

Family-level factors are major drivers of children’s growth stunting in Rwanda [4]. From this study shown that breastfeeding and complementary feeding are almost no different from groups stunting with normal children; good parenting, health, and psychosocial stimulation are still lacking; the socioeconomic level of stunting children is lower than normal children. It is hoped that in the future prevention of intrauterine can

be carried out by maintaining quality intake and health status; keep the intake in a balanced nutritional status, especially aspects of animal protein; and maintaining environmental sanitation and optimal parenting from the family [5], [6]. The most influential factor on stunting in children aged 24–59 months is energy intake [7].

Maternal education, number of antenatal care visits, and place of delivery appear to be the most important predictors of child stunting in Ethiopia [8].

The likelihood of good child development increases with maternal education and decreases with stunting. The risk of stunting decreases with birth-length and maternal height, and increases with maternal age <20 y.o. or ≥35 y.o. at pregnancy [9] should develop an effective program to improve the maternal education and health and increase awareness of parents about the standard children’s height and weight according to their age and gender [10]. Predictors of malnutrition in children vary, including food insecurity and food supply and diversity [11], [12], child’s gender and age, parents’ education level [13], household

socioeconomic status [14], breastfeeding [15], water, sanitation, hygiene [16], and children's health including diarrhea [17], fever and cough [18], experiencing illness in the previous two weeks, lack of use of latrines, and lack of hand washing practices were predictors of underweight in children in Ethiopia [19].

Mother's characteristics also determine the nutritional status of children; maternal education has a significant relationship with the incidence of stunting ($p < 0.05$) that one of the causes of malnutrition is mother's knowledge in parenting and health care [20]. There is no relationship between feeding patterns and the nutritional status of children aged 12–24 months in working mothers [21], mother's knowledge about food choices, feeding, and seeking healthcare is very important to produce good nutrition. In contrast to the study [22], there is no relationship between maternal characteristics and poor nutritional status of children aged 6–59 months in Vietnam [23]. The factors that were significantly associated with acute malnutrition were male gender, premature birth, lower child age, high number of siblings and living in a household with inadequate food supply for a long time [24].

Based on the results of Basic Health Research showed 17.7% of infants under the age of 5 years (toddlers) still experience nutritional problems. This figure consists of toddlers who are malnourished by 3.9% and those who suffer from malnutrition by 13.8%. Meanwhile, in the 2019 National Medium-Term Development Plan (RPJMN), infants with nutritional problems are targeted to decrease [25] showed 17.7% of infants under the age of 5 years (toddlers) still experience nutritional problems. This consists of toddlers who are malnourished by 3.9% and those who suffer from malnutrition by 13.8%. Meanwhile, in the 2019 National Medium-Term Development Plan (RPJMN), infants with nutritional problems are targeted to decrease to 17%. The prevalence of stunting nationally has decreased to 30.8% (very short 11.5 and short 19.3%) compared to 2013 at 37.2% (very short 18.0% and short 19.2%), in 2010 amounting to 35.6% (very short 18.5% and short 18%) and in 2007 36.8% (very short 18.8% and short 18.0%); 9.8% very short toddlers and 18.2% short. Meanwhile in Bengkulu City based on the weighing results, it was found that toddlers were very short 3.29% and short 9.54%, while the Pasar Ikan community Health centers was very short 7.32% and short 22.5%. The working areas of the Fish Market Health Center and Padang Serai Health Center covered the areas along Bengkulu coastal.

The results of interviewed with 6 cadres of Posyandu toddlers found that not all parents of toddlers gave exclusive breastfeeding to their babies. Most parents of toddlers were also not able to provide complementary foods that are suitable for breastfeeding their children. In addition, parents of toddlers did not yet have confidence in proper feeding for children. As much as 20% of children's nutritional status is in the short category.

Methods

This study was an analytic observational study with a cross-sectional design. The research was conducted in the coastal area of Bengkulu City, at Padang Serai Health Center and Pasar Ikan Health Center. A sample of 75 mothers from 78 mothers who came to the integrated service post and had children aged 6–24 months were taken by accidental sampling technique. There were 3 mothers whose birth data were incomplete were excluded from the study. The instrument used has been tested before. The research questionnaire contains the characteristics of the children (age, sex, birth weight, birth length, infectious diseases, exclusive breastfeeding, diet, and eating frequency), family characteristics (mother's age, mother's height, number of children, mother's education level, mother occupation, and family income) and Anthropometric data for children is done by measuring body length with a length board and weight with a dacin. The children's diet included the frequency of eating and the type of food. Children's nutritional intake using the Semi Food Frequency questionnaire for energy, protein, fat, carbohydrates, calcium, iron, zinc, and phosphorus. Nutritional intake data were processed by nutrisurvey. Data analysis was performed using the chi square test with a significance level of 0.05. Ethical clearance was approved by ethics committee of the Health Polytechnic of the Bengkulu Health Ministry.

Results

The majority of the mother's age was at ≥ 20 –35 years (77.3%), most of mother's had height more than 150 cm. Most of education level of mothers were low (60%). The main job are housewives (89.3%). Most of family have children more than four (50.7%) and family income was 88% below the minimum wage (Table 1).

Table 1: Characteristic of family

Variable	n	%
Mother age		
<20–>35 year	17	22.7
≥ 20 –35 year	58	77.3
Mother's height		
<150 cm	10	13.3
≥ 150 cm	65	86.7
Mother's education		
Low	45	60.0
Height	30	40.0
Mother's occupation		
Jobless	67	89.3
Worked	8	10.7
Number of children		
>4	38	50.7
≤ 4	37	49.3
Family Income		
$\leq 2.040.407$	66	88.0
$> 2.040.407$	9	12.0

Table 2 shows that most of children age (64%) at 12–24 months, 52% male, almost all (92%) of the

birth weight more than 2500 g, birth length was 82.7% more than 48 cm, 80% children do not suffer from infectious diseases. Most of children (61.3%) are given exclusive breastfeeding, 52% had the right type of food and 78.7% also had appropriate frequency of eating.

Table 2: Child characteristic

Variable	n	%
Age		
6–9 months	15	20
9–12 months	12	16
12–24 months	48	64
Sex of child		
Boy	36	48
Girl	39	52
Birthweight		
<2500 g	6	8
≥2500 g	69	92
Birth Length		
<48 cm	13	17.3
≥48 cm	62	82.7
Infectious Disease		
Yes	15	20
No	60	80
Exclusive breastfeeding		
No	29	38.7
Yes	46	61.3
Food type		
Incorrect	36	48
Appropriate	39	52
Frequency of eating		
Incorrect	16	21.3
Appropriate	59	78.7

Table 3 shows that most of the frequency of food consumed by children in the form of crushed food were twice a day (54.2%) as much as soft food three times a day (54%), and family food 3x/day as much as 82.5%. The percentage of children with energy, protein, fat, and carbohydrate intake below the recommendation was much higher in normal children (in sequence 84.6%, 81.8%, 84.9%, and 86.3%) compare to stunted children (in sequence 15.4%, 18.2%, 15.1%, and 13.7%). Likewise, calcium, fe, zinc, and phosphor intake below the recommendation was much higher in normal children (in sequence 82%, 85.5%, 80.6%, and 82.1%) compare to stunted children (in sequence 18%, 14.5%, 19.4%, and 17.9%).

Table 3: Type and frequency of food consumed by children aged 6–24 months

Food type	2x	%	3x/d	%	5x/d	%
Crushed food	13	54.2	11	45		
Soft food	5	45.5	6	54		
Family meals	6	15	33	82.5	1	2.5

There was no relationship between feeding pattern (macronutrient and micronutrient intake) with stunting incidence. Children whose intake of macronutrient and micronutrient were insufficient were more likely than those with adequate intake not to be stunted (Table 4).

Discussion

Research showed that children's eating patterns in the coastal area of Bengkulu City based on eating frequency were mostly in the right category, this can be

Table 4: Relationship of feeding patterns with stunting incidence

Variable	Stunting incident		N	p value	OR (CI)
	Stunting	Not stunting			
Energy intake					
Low	8 (15.4)	44 (84.6)	52	1	1.212 (0.291–5.056)
Adequate	3 (13.0)	20 (87.0)	23		
Protein intake					
Low	6 (18.2)	27 (81.8)	33	0.526	1.64 (0.454–5.952)
Adequate	5 (11.9)	37 (88.1)	42		
Fat intake					
Low	8 (15.1)	45 (84.9)	53	1	1.126 (0.269–4.710)
Adequate	3 (13.6)	19 (86.4)	22		
Carbohydrate intake					
Low	7 (13.7)	44 (86.3)	51	0.737	0.795 (0.209–3.030)
Adequate	4 (16.7)	20 (83.3)	24		
Calcium intake					
Low	9 (18)	41 (82)	50	0.318	2.52 (0.502–12.893)
Adequate	2 (8)	23 (92.0)	25		
Iron intake					
Low	8 (14.5)	47 (85.5)	55	1	0.965 (0.229–4.064)
Adequate	3 (15)	17 (85)	20		
Zinc intake					
Low	7 (19.4)	29 (80.6)	36	0.425	2.112 (0.562–7.933)
Adequate	4 (10.0)	35 (90.0)	39		
Phosphorus intake					
Low	7 (17.9)	32 (82.1)	39	0.184	1.653 (0.444–6.155)
Adequate	4 (11.1)	32 (88.9)	36		

seen from the frequency of mothers feeding their children mostly 3 times a day. This was probably due to the fact that most of the mothers work as housewives so that mothers have many opportunities to provide food to their children. Paying attention to the children, good nursing practices, utilization of accessible health-care services, is influenced by the level of education of the mother which, in turn, affects stunting and other health related. This study also showed that most of mother's education level (60%) below junior high school (low education). Low maternal education, boy gender, prelacteal feeding, and children who were not fully immunized were factors that influenced underweight [26].

Mother's higher education level, usually above elementary school, had a significant and positive relationship with the Height Age Zscore (HAZ) and Weight Height Zscore (WHZ) scores [22]. Parents also play a direct role in children's eating patterns through their behavior, attitudes, and eating pattern. While, the previous studies showed that only 18.3% of children aged 6–12 months consumed four or more of the seven threshold foods for minimum dietary diversity recommended by the World Health Organization (WHO) [27]. Toddlers with mothers who have poor parenting will be 6 times at risk of experiencing stunting compared to toddlers who have good eating parenting patterns. This means that the influence of mother's knowledge of intake and eating patterns greatly determines the nutritional status of a toddler [21].

This study showed most of family income below 2,040,407 rupiah. Several studies have shown that income was related to the incidence of children's eating patterns [28]. Parental income affects children's diet [26] and parents' eating habits will affect children's eating patterns [29].

Diet is one of the factors that influence the occurrence of stunting in school children where the lack of protein and fat intake consumed by children results in

the nutritional status of school children [30]. A balanced nutritional diet is closely related to the nutritional status of a toddler because with the fulfillment of all intakes of both macro and micro nutrients in the body, a person's body will be able to metabolize well and be able to carry out activities well and smoothly [31].

This study showed that the type of food given to children was still inappropriate. For the age group 6–9 months, crushed food should be given, but in this study children were given soft food and family food. Children aged 9–12 months should be given mushy food, but there are still mothers, who provide mashed food and family food, as well as children aged 12–24 months are still given mashed food and mushy food, and only 42.6% give family food. In line with previous studies inadequate and/or inadequate dietary practices as well as early exposure to unfavorable living conditions are risk factors for malnutrition. Meanwhile, children who were given complementary feeding before 6 months experienced a greater risk of stunting [32]. The previous studies have shown that only 16% of children received an acceptable minimum diet, 25% received a variety of food groups, and 58% were fed a minimum meal frequency [21].

Prelacteal feeding and children who are not fully immunized are factors that influence underweight [26]. Mothers who did not start breastfeeding within 1 h were 6 times more likely to practice breastfeeding with mother's work, farmers practiced prelacteal feeding up to 4 times more than housewives [30].

Macronutrient intake is not a very influential factor in the incidence of stunting; this is related to other factors that influence the incidence of stunting itself, factors from the environment and family [33].

There are relationship between intake of macronutrients (carbohydrates, protein and fat) with the incidence of stunting. Intake of micronutrients is associated with stunting (iron and zinc) but calcium and Vitamin D intake are not associated with stunting [33]. This is also supported by research, which states that low intakes of energy, protein, iron, and zinc will be at risk of stunting where energy intake is less 16.71 times, protein intake is at risk 26.71 times, iron intake 4 times and zinc 9.24 times greater for the incidence of stunting [34].

Research showed that the incidence of stunting in children 6–24 months as much as 14.6%, when viewed by age group, it can be seen that the highest stunting rate is in the 12–24 month age group as many as 7 people (63.6%). The stunting rate in this study was lower than the study in Ethiopia, the prevalence of stunting was 29% in the younger age group (0–24 months) [26].

While the incidence of stunting was 33.7%, higher than previous study which stated that it was 12.7% and in Vietnam 9.8% [35]. Meanwhile, a study in Nigeria found that most of the stunting children were

aged 12–23 months [36]. Research in Bogor also showed that 73.9% of stunting children were aged 12–23 months [37]. While toddler 24–59 months who experienced stunting as much as 29,3% at Kabupaten Rejang Lebong [38].

Mothers who can read and write are 54% less likely to practice pre-feeding feeding than their illiterate mothers. Children whose mothers had a tertiary education were 3.57 times more likely to be stunted than children of mothers with no education [30]. The level of education cannot be used as a reference in determining the child's feeding pattern, this is because there are several factors that influence a person in maintaining a healthy action, namely internal and external factors. Internal factors include the mother's motivation to take the child to a health care facility and receiving good health information [34]. External factors influencing respondents include the role of a nutritionist at the health center who regularly visits the homes of mothers who have malnourished children in coordination with each child health care so that this results in increased knowledge about the health of the respondents even though most of the education levels are low [20].

Maternal education is a strong predictor of stunting in children after being linked by other factors at the level of the mother, household and community. Other factors including at child level, child birth weight and gender, maternal level, marital status, parity, pregnancy intention, and health-seeking behavior, and household level, socioeconomic status were also independently significantly associated with stunting. The education of a mother greatly determines the nutritional intake of the family because mothers who have high education will be directly proportional to sufficient knowledge of the fulfillment of the nutritional status of their children under five, meaning that maternal education is related to the nutritional status of toddlers (stunting) [39].

This study showed that there was no relationship between macronutrients intake (carbohydrates, fats, and protein) with stunting ($p > 0.05$). Provision of adequate intake of macronutrients can be influenced by food processing so that it affects the content in the food. This study is in line with which stated that the risk factors for stunting are the lack of Vitamin C intake and the level of energy, protein, Vitamin A, and calcium adequacy does not affect the incidence of stunting. Energy intake from protein, intake of zinc and iron also contributes. The function of protein is to form new tissue and body development, maintain, repair, and replace damaged body tissues. Even though the toddler's energy intake is fulfilled, the toddler has a protein intake deficiency [40].

Intake of energy, protein, fat, carbohydrates, calcium, Fe, zinc, and phosphorus was lower in stunted children compared to non-stunted children this riset. The prevalence of stunting in the low energy intake group was 1.212 times greater than the sufficient energy intake group.

Nutritional status in toddlers who experience stunting was not always related only to food intake and exclusive breastfeeding, indirect factors that affect the incidence of stunting in toddlers are maternal knowledge and access to clean water, where a mother who has good knowledge will be directly proportional to the fulfillment of nutritional intake family so that the family is healthy. Access to clean water can also affect the incidence of stunting and the cleanliness of latrines to avoid infectious diseases [41].

Nutritional status also plays a role in the occurrence of a disease. This is related to the immune response of a child. Respiratory disease is often associated with malnutrition and stunting in children [42]. Children who suffer from infectious diseases with a longer duration of time are more likely to experience stunting so that they are 2.3 times more likely to experience stunting compared to children who do not have a history [43]. One of the efforts that can be made by the government in preventing stunting is to start from an early age, namely by maturing the age of marriage where a mother who is economically, socially and reproductively ready means that they will also be ready to give birth to a healthy and capable generation compete with the general public [41].

Health education about stunting can also be carried out by the community health centers or integrated service post cadres if there are pregnant women who check their pregnancies so that pregnant women have received exposure to stunting and its prevention so that they can meet their nutritional intake needs starting from pregnancy until the age of 2 years or we often call the First 1000 Days of Life (1000 HPK) [41].

Mother's knowledge, mother's work related to family food self-reliance behavior. Family food self-reliance behavior is one of the most effective ways to prevent stunting in toddlers. Continuous education to the community regarding the importance of family food independence in preventing stunting in toddlers [44].

The role of health workers, parenting parents, and integrated service post visits is factors that influence the incidence of stunting. Parents should pay more attention to parenting to their children, with this attention, the child's nutritional intake will be fulfilled so that stunting is avoided. Active integrated service post activities from parents and the persistence of health workers in monitoring nutritional status can prevent stunting [45].

Conclusion and Recommendation

The food consumed by children 6–24 months were mostly in the form of crushed food (twice a day),

soft food (3 times a day), and family food. Most were given the proper type of food according to age and the frequency of the right food was given. Most of the toddlers are 12–24 months old, and the nutritional status of children is normal in the Coastal area of Bengkulu City. Most of the adequacy of energy and macro/micro nutrients for children 6–24 months in the coastal area of Bengkulu City was in the low category and below the recommended intake.

There was no relationship between the type of food, macronutrient intake (energy, protein, fat, and carbohydrates), and micronutrient intake (calcium, zinc, iron, and phosphorus) with stunting. Education/counseling at the posyandu about the importance of consuming the right food and the right frequency of food, surveys on nutritional consumption and routine health checks for pregnant women and children under five needs to be implemented.

To overcome the risk of stunting in children in the coastal area of Bengkulu City, it can be done through regular weighing every month at the integrated service post and counseling about the importance of consuming the right food and eating the right frequency as well as monitoring the growth and development of children under 5 years old by health workers and health checks routine for pregnant women by midwives. Empowerment of community leaders in the village and community health cadres should be carried out twice a year.

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