

## The association of complementary feeding with stunting in children aged 6 – 24 months in the working area of Talang health center, Solok regency, West Sumatra

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### Abstract

The problem of stunting in Solok regency exceeds the standard set by WHO, the prevalence is 40.1%, and be the highest one in West Sumatra. Children who gain stunting in the first 1000 days of life or during the age of two are more vulnerable to stunting after the child is two years old, therefore early screening and nutritional improvement are needed before the child is two years old.

This research aims to determine the relationship between history of complementary feeding encompass (age, texture, frequency, and portion of complementary feeding). The design of this research was a case control conducted at the Talang Health Center, Solok Regency, West Sumatra. The research sample consisted of 80 mothers and children aged 6-24 months, divided into 40 sample groups of stunting and 40 sample groups normal children. Sample taken by total sampling method for the case group and for the control matching with posyandu areas were the same as the cases and taken by simple random sampling. Data was collected by questionnaire. Analysis test used by chi-square.

The results of bivariate analysis related to stunting  $p$ -values obtained age of complementary feeding ( $p = 0.003$ ), the texture of complementary feeding ( $p = 0.042$ ), the frequency of complementary feeding ( $p = 0.001$ ), the portion of complementary feeding ( $p = 0.002$ ). This study concludes that there is an association of complementary feeding with stunting children aged 6 – 24 months in the work area of Talang health center, Solok regency.

**Keywords:** Stunting; Children; Complementary Feeding; Lack; Nutrition.

### 1. Introduction

Stunting defined as the failure of growth and development experienced by children due to lack of nutrition for a long time, recurrent infectious diseases, and inadequate psychosocial stimulation [1]. Stunting reflects chronic malnutrition and can have long-term impacts, including growth retardation, decreased cognitive and mental abilities, susceptibility to disease, low economic productivity, and low reproductive quality [2].

Globally 149.2 million (22.0 per cent) are children under the age of five suffering from stunting (SDG indicator in 2020) [3]. Indonesia is included in the second country with the highest prevalence of stunting under five in the Asian region Southeast / South – Eastern Asia Regional (SEAR) namely 31.8% in 2020 [4]. The prevalence of stunting in Indonesia is currently still low is at 24.4% which is the prevalence of stunting in 2024 targeted to fall to 14% [5]. The prevalence of stunting in West Sumatra in 2019 was 27.5% and experienced a decrease in 2021 to 23.3% even though the prevalence of stunting has decreased but has not reached the target by WHO at least 20% [6].

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Stunting in children under 2 aged was caused by multifactors that can occur in womb and after birth. The most important cause in the womb is associated with factors of health conditions and nutritional status of the mother, while the causes after births are caused by direct factors, namely intake and disease infection, and infant/child care patterns, as well as indirect factors and fundamental factors that influence the child's parenting style [7].

Complementary feeding is food that accompanies breastfeeding, given when the baby is exactly 6 months because breast milk is no longer able to meet nutritional needs. Complementary feeding containing nutrients given to infants during the weaning period, namely when other food or drink is given together with breastfeeding [8]. The children with their aged exactly 6 months old, can't even get breast milk meet the needs of energy, protein, iron, vitamin D, zinc, vitamin A in infants so that complementary feeding are needed to complement breastmilk deficiency of macro and micro nutrients [9]. Age 6-9 months is a critical period for introducing solid foods gradually as stimulation of oromotor skills. If over the age of 9 months have never been introduced to solid food, so it is possible to experiencing eating problems as toddlers increases. Hence the consistency the food given should be increased with age. Initially given mashed food in the form of fine porridge at the age of 6 months, then family food with a softer texture (modified family food) can introduced before 12 months of age. At the age of 12 months the child can be given the same food as the food eaten by other family members (family food) [8].

Children in Indonesia are more than 40 percent introduced to complementary feeding, which is too early, before they reach 6 months of age, and the food offered is often not meet the nutritional needs of infants [8]. Children who are given complementary feeding less than 6 months 6.54 times the risk of experiencing stunting compared to children who are given the right time at the age of 6 months [10]. Research conducted in Ethiopia obtained results of children who were not introduced to complementary feeding companion at the age of 6-8 months has a long z-score for the age of 0.48 SD lower at the age of 12-15 months (11).

## 2. Material and methods

This research uses a quantitative analytical survey method with case control design. This research was conducted from September to December 2022 in the working area of the Talang Health Center, Solok Regency, West Sumatra. The sample in this research used the total sampling technique method for the case group by looking at the inclusion and exclusion criteria, and for the control group was matched by area at the same integrated healthcare center cases and taken by simple random sampling method. The research sample consisted of 80 mothers and children aged 6-24 months, divided into 40 sample groups of stunting and 40 sample groups normal children. Data was collected by questionnaire. Analysis Univariate and Bivariate tested by chi-square.

## 3. Results

### 3.1. Analysis Univariate

**Table 1** Mean Age of Children, Body Length, and PB/U Z-Score of Stunting and Normal Children Aged 6 – 24 Months in the Work Area Talang Health Center, Solok Regency

| Mean  | Stunting<br>Mean ± SD | Normal<br>Mean ± SD |
|---|-----------------------|---------------------|
| Age of children (month)                     | 14.50 ± 4.87          | 14.93 ± 4.37        |
| Body length at the time of measurement (cm) | 69.66 ± 6.08          | 77.55 ± 6.01        |
| Z – Score                                   | -3.06 ± 1.05          | -0.31 ± 1.28        |

The results showed that the average age of the children was the same in the two groups, which was 14 months. The child's body length at the time of measurement has an average stunted child's body length of 69.66 cm while the average body length of a normal child is 77.55 cm. The average PB/U Z-Score for stunting children is -3.06 SD, while the average PB/U Z-Score for normal children is -0.31 SD.

**Table 2** Characteristics of Children Aged 6 – 24 Months and Mother Characteristics in the Work Area of the Talang Health Center, Solok Regency

| Characteristic of child        | Stunting (n %) | Normal (n %) |
|--------------------------------|----------------|--------------|
| Male                           | 24 (60.0)      | 25 (62.5)    |
| Female                         | 16 (40.0)      | 15 (37.5)    |
| Total                          | 40 (100)       | 40 (100)     |
| Characteristic of mom          | Stunting (n %) | Normal (n %) |
| Education                      |                |              |
| Elementry & Junior High School | 32 (80.0)      | 28 (70.0)    |
| Senior High School and Collage | 8 (20.0)       | 12 (30.0)    |
| Total                          | 40 (100)       | 40 (100)     |
| Occupation                     |                |              |
| Employed                       | 7 (17.5)       | 14 (35.0)    |
| Unemployed                     | 33 (82.5)      | 26 (65.0)    |
| Total                          | 40 (100)       | 40 (100)     |

### 3.2. Analysis Bivariate

**Table 3** The association of age complementary feeding with stunting

| Age Complementary Feeding | Stunting  | Normal    | p-value | OR (95% CI) |
|---------------------------|-----------|-----------|---------|-------------|
|                           | n (%)     | n (%)     |         |             |
| Inappropriate             | 25 (62.5) | 11 (27.5) | 0.003   | 4.394       |
| Appropriate               | 15 (37.5) | 29 (72.5) |         | (1.709–     |
| Total                     | 40 (100)  | 40 (100)  |         | 11.295)     |

**Table 4** The association of texture complementary feeding with stunting

| Texture Complementary Feeding | Stunting  | Normal    | p-value | OR (95% CI)    |
|-------------------------------|-----------|-----------|---------|----------------|
|                               | n (%)     | n (%)     |         |                |
| Inappropriate                 | 23 (57.5) | 13 (32.5) | 0.043   | 2.810          |
| Appropriate                   | 17 (42.5) | 27 (67.5) |         | (1.129– 6.991) |
| Total                         | 40 (100)  | 40 (100)  |         |                |

**Table 5** The association of frequency complementary feeding with stunting

| Frequency Complementary Feeding | Stunting  | Normal    | p-value | OR (95% CI) |
|---------------------------------|-----------|-----------|---------|-------------|
|                                 | n (%)     | n (%)     |         |             |
| Inappropriate                   | 21 (52.5) | 5 (12.5)  | 0.000   | 7.737       |
| Appropriate                     | 19 (47.5) | 35 (87.5) |         | (2.515–     |
| Total                           | 40 (100)  | 40 (100)  |         | 23.805)     |

**Table 6** The association of portion complementary feeding with stunting

| Portion Complementary Feeding | <i>Stunting</i> | <i>Normal</i> | <i>p-value</i> | OR (95% CI)             |
|-------------------------------|-----------------|---------------|----------------|-------------------------|
|                               | n (%)           | n (%)         |                |                         |
| Inppropriate                  | 20 (50.0)       | 6 (15.0)      | 0.002          | 5.667<br>(1.951–16.462) |
| Appropriate                   | 20 (50.0)       | 34 (85.0)     |                |                         |
| Total                         | 40 (100)        | 40 (100)      |                |                         |

## 4. Discussion

### 4.1. The association of age complementary feeding with stunting

WHO together with the Ministry of Health and the Indonesian Pediatrician Association (IDAI) have emphasized that children since birth up to 6 months old are only given exclusive breastfeeding. Therefore, complementary feeding can only be introduced to children when they were exactly 6 months old [12]. Complementary feeding can be functions as a training tool for babies to be able to determine the various types of food tastes that will be given after breastfeeding or entering the age of 2 years [13]. Giving solid foods too quickly, especially under 4 months of age, can put a children at risk of choking and can make their food unable to digest properly. The immature digestive tract works extra hard to process solid food so that it can cause the baby to experience diarrhea or constipation. Diarrhea is one of the causes of children getting infectious diseases, which is a risk factor for stunting. Infants younger than 6 months do not have complete protein digestion. The pancreas is not yet able to produce various enzymes in sufficient quantities before the age of 6 months. If forced to give a complementary feeding early the child will be at risk of experiencing intussusception. The condition of part of the intestine being folded and infiltrating other parts of the intestine, causing a blockage in the intestine [12].

After 6 months of age, the child's digestive system is more ready to accept food other than breast milk. They already have a chewing reflex, besides giving complementary feeding it is also a preparation or transition period to family food after the child is 1 year old. If the child is late to introduce complementary foods, it is feared that at a later age the child will have difficulty eating. It often happens, after the age of the baby, your little one eats by sucking because during infancy he was not trained to chew his food [14].

The results of the bivariate analysis using the chi-square test obtained  $p < 0.05$ , which means that there is a significant relationship between the initial age at which complementary feeding were given with the incidence of stunting in the working area of the Talang Health Center, Solok Regency. This is because mothers who have stunted children aged 6-24 months in the working area of the Talang Health Center, Solok Regency, stated that they had given food other than breast milk, such as pureed porridge, to their children when the children were 2 months old, assuming that their children were not full and crying all the time. The number of stunted children who were not given solids according to age (exactly 6 months) and had been given when the child was  $<6$  months, namely 17 children and the number of children who were given at age  $>6$  months, namely 8 children.

This research is in line with studies in three countries, namely China, India and Indonesia, in which they found that the majority of infants in 3 countries were introduced to complementary foods at the wrong time, namely too early (especially in urban/rural areas of China and Indonesia) or too late. late (India) compared to the WHO recommendation, which is appropriate for children aged 6 months [15]. This study is also in line with findings in the Chikwawa District in Malawi showing that 65% of infants receive complementary foods at 3 months of age, much earlier than WHO recommendations [16]. Strengthened by research in Semarang which found a significant relationship between the provision of complementary foods for breast milk and the incidence of stunting [17]. This study is also in line with research in Yogyakarta which found that the first time complementary feeding was given had a relationship with the incidence of stunting with grades (OR=2,867, 95%CI:1,453-5,656). This means that mothers who give their children complementary feeding early will be 2.8 times at risk of being stunted [18].

This study is different from research conducted in Central Lombok which stated that there was no relationship between the age of complementary feeding with stunting, the results were not significant due to the impact of the inappropriate age at which complementary foods were given on subjects that had been modified by other complementary factors, such as the amount and variety of substances, nutrition in complementary feeding [19].

#### **4.2. The association of texture complementary feeding with stunting**

The proper texture of solids for children 6-8 months is mashed, 9-11 months is soft, and 12-24 months is solid. The texture of solid food given that is not age-appropriate can indirectly affect children's nutrition. The texture of solids and levels that do not adjust to the age of the child can cause the child to take a long time to mash food because the texture is too dense, so that little food enters the body. Giving solid food without paying attention to the suitability of the texture will make children susceptible to diarrhea and dehydration, and if it lasts for a long time and is repeated it can affect the child's growth and development due to infection contributing to growth and development, which leads to stunting [20]. The texture of complementary feeding that given to children will indirectly affect the nutritional status of children. WHO states that the texture or consistency of complementary foods that are suitable for the age of the child and given in stages will provide optimal child growth. If the texture of the food given is not appropriate, it can have several impacts. If the texture of complementary foods is too dense, the child will need more time to chew, this will cause the child to eat smaller amounts in a longer time so that their food intake will be less [19,21].

Another case, if a child is given a food texture that is too liquid, then the risk of difficulty eating will increase later. In addition, the ability of the baby's gastrointestinal system during its development period varies so that the texture of food for babies needs to be adjusted according to their age. At the age of 6 months, the texture of food should be soft porridge, because the enzymes that children have to grind food are still in the process of forming, and children don't have teeth yet. Children who are not given a food texture according to their age will easily get diarrhea, so that it can indirectly affect their growth, including their linear growth [22].

The results of the bivariate analysis using the chi-square test obtained  $p < 0.05$ , which means that there is a significant relationship between the texture of complementary feeding with the incidence of stunting in the working area of the Talang Health Center, Solok Regency. This is because most of the stunted are given complementary feeding with a texture that is not in accordance with the recommendations of the World Health Organization (WHO) and the Indonesian Pediatric Association (IDAI).

The results of questionnaire interviews with mothers who have stunted children in the working area of the Talang Health Center, Solok Regency, found that some mothers did not provide age-appropriate textures, when the child was 12 months old, he should have entered complementary feeding with solid textures but had not been introduced. Mothers still give food with a pureed texture such as porridge, strained team rice with the excuse that the child is lazy to eat, and shortens the time for mothers to give food with a mashed texture, saves more time because it is easier to digest. This can have an impact on the ability to chew in children.

Research by (Emmett P.M., Hays N.P., Taylor C.M.) [23] states that a delay in introducing solid foods to children will cause children to become picky about food after 15 months of age. The mother said that the child prefers to be given formula milk so that when given rice porridge the child does not want to open his mouth, thinking that the child is full.

This research is in line with research in Semarang which found that there was a significant relationship between the texture of complementary feeding with the incidence of stunting with a value ( $p$ -value=0.015; OR=3.304). Children who are given MPASI textures that do not comply with the standards of the Indonesian Pediatric Association (IDAI) experience stunting 3,304 times compared to children who are given complementary feeding textures according to standards [24].

This research is inversely proportional to research in Central Lombok which states that there is no significant relationship between the texture of complementary feeding with the incidence of stunting, this is because more respondents provide a standard complementary feeding texture [19].

#### **4.3. The association of frequency complementary feeding with stunting**

Minimum meal frequency, namely the proportion of children who have received complementary feeding in the last 24 hours according to age and recommended by WHO and IDAI. A child is considered to have received appropriate feeding of frequency, according to IDAI is 6-8 months 2-3 times a day, 9-12 months 3 times a day and 12-24 months 3 times a day. For children who are not breastfeeding, the minimum frequency of meals received is 4 times a day. Additional nutritious snacks can also be given to children such as a piece of fruit and bread eaten between meals [14].

Minimum meal frequency and minimum dietary diversity are positively related to height in children 6-23 months and have the greatest effect on children's growth indicators [25]. The World Health Organization states that feeding infants and young children is a key area for improving child survival and promoting healthy growth and development. Inadequate feeding is mainly due to poor quality of macronutrients and micronutrients due to poor diversity, as well as

energy and nutrient density; secondly because of the frequency, consistency, and amount of food that is not right; and third by poor food and water safety, including contamination, poor hygiene practices, unsafe food storage and preparation [26].

The frequency of complementary feeding for children should be as frequent as possible because children can consume food little by little while their calorie intake and other nutritional needs must be collide. The frequency of complementary feeding that is sufficient or more can meet the consumption of food and nutrients needed by children according to their age [27].

The results of the bivariate analysis using the chi-square test obtained  $p < 0.05$ , which means that there is a significant relationship between the frequency of complementary feeding with the incidence of stunting in the working area of the Talang Health Center, Solok Regency. This is because most of the stunted are given complementary feeding for ASI at a frequency that is not in accordance with the recommendations of the World Health Organization (WHO) and the Indonesian Pediatrician Association (IDAI). Mothers who have stunted children say that children are given formula milk if the child is fussy and the child does not like to eat vegetables and prefers light foods such as so that the child eats less frequently and the portion is sometimes only 2 tablespoons.

This research is in line with research (Anggryni) [28], which stated that the factors causing the incidence of stunting were stopping breastfeeding  $< 6$  months and the frequency of breastfeeding was not sufficient, as well as providing complementary feeding  $< 6$  or  $> 12$  months, and the food given did not vary with frequency and age-appropriate texture. Emphasized in research conducted in Nigeria shows that toddlers who do not get food according to the minimum frequency of feeding have a greater chance of experiencing stunting (20.1%) than those who get food with a minimum frequency of feeding.

#### **4.4. The association of portion complementary feeding with stunting**

Providing MPASI per portion at the age of 6-9 months, namely 3 tablespoons to half a 250 ml bowl, ages 9-12 months, half a 250 ml bowl, ages 12-23 months, three quarters to one full bowl of 250 ml [14]. If the portion of complementary feeding is not appropriate and the type of food quality is not good, then food intake in children is reduced and will affect their linear growth [7].

The results of the bivariate analysis using the chi-square test obtained  $p < 0.05$ , which means that there is a significant relationship between the portion of complementary feeding with the incidence of stunting in the working area of the Talang Health Center, Solok Regency. This is because most of the stunted children are given complementary feeding in portions that are not in accordance with the recommendations of the World Health Organization (WHO) and the Indonesian Pediatrician Association (IDAI). This is because children in the stunting group experience the problem of being lazy to eat at the age of 11-23 months, some children only eat 2-3 tablespoons, which should be three-quarters to one full 250 ml bowl at this age. Children prefer to drink milk if they feel hungry and like instant food. To improve children's nutritional intake, it's a good idea for mothers to innovate foods that can increase children's appetite.

This research is in line with study of (Amalia. R.) [29] which stated that the provision of complementary feeding with time, texture, portion, and frequency of complementary feeding found a relationship ( $p=0.002$ ,  $OR=7.87$ ) with the incidence stunting in toddlers, which means mothers who do not provide complementary feeding that do not meet WHO standards are 7.87 times more at risk of stunting [29]. Damayanti said that a good and appropriate pattern of giving complementary feeding could be seen from the age at which foods was given, the frequency of giving, the number/portion and the texture of the foods given. If there is one of the four things that are not appropriate for the child's age, then it can be said that the pattern of giving the complementary feeding is not right [30].

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## **5. Conclusion**

- There is an association of age complementary feeding with stunting in children aged 6 – 24 months in the work area of Talang health center, Solok regency, West Sumatra.
- There is an association of texture complementary feeding with stunting in children aged 6 – 24 months in the work area of Talang health center, Solok regency, West Sumatra.
- There is an association of frequency complementary feeding with stunting in children aged 6 – 24 months in the work area of Talang health center, Solok regency, West Sumatra.
- There is an association of portion complementary feeding with stunting in children aged 6 – 24 months in the work area of Talang health center, Solok regency, West Sumatra.

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## Compliance with ethical standards

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### *Disclosure of Conflict of interest*

There is no conflict of interest statement in this research.

### *Statement of ethical approval*

This research obtained the ethical clearance from the Ethics Committee of the Medical Faculty Andalas University on date 05 Sept 2022 with license number 929/UN.16.2/Kep-FK/2022.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in this research and an inform consent was signed consciously.

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