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## **Feeding Patterns and Stunting Incidence among Toddler in Coastal Community in Gresik**

**Siti Safinatun Najah<sup>1</sup>, Adistha Eka Noveyani<sup>1\*</sup>, Tri Damayanti Simanjuntak<sup>1</sup>, Dwi Martiana Wati<sup>2</sup>, Ricko Pratama Ridzkyanto<sup>3</sup>**

<sup>1</sup>Epidemiology Department, Faculty of Public Health, Universitas Jember, Jember, Indonesia

<sup>2</sup>Biostatistics Department, Faculty of Public Health, Universitas Jember, Jember, Indonesia

<sup>3</sup>Health Policy and Administration Department, Faculty of Public Health, Universitas Jember, Jember, Indonesia

\*Corresponding Author: Email: [adistha.en@unej.ac.id](mailto:adistha.en@unej.ac.id)

### **Abstract**

**Introduction:** Despite the plentiful availability of protein from fish and other essential food sources in coastal communities, coastal communities still face the issue of undernutrition. This study aimed to assess the association between feeding practices among toddlers and the incidence of stunting in the coastal area.

**Methods:** We conducted a community-based case-control study in Gresik. We assessed the feeding patterns (feeding practice, food quality, and food safety) of 90 children aged 24–59 months using a structured questionnaire. We generated frequencies and percentages and ran a bivariate test to determine factors associated with stunting using the Chi-Square test

**Results:** The mother's age among the case and control group was in the ideal age category (<20 and >35 years old). Most respondents among the case group and control group had low family income (less than the wage minimum of Gresik regency IDR 4.372.030,5). Most of the respondents in the case group (57.8%) had low education (junior high school or less). The feeding pattern variable consists of three aspects. In the aspect of food quality, most of the stunting group (62.2%) indicated that children had poor food quality. In the aspect of feeding practices, most of the stunting group (53.3%) indicated that the feeding practices provided were inadequate. In terms of food safety, most of the stunting group (68.9%) had good food safety. There is an association between aspects of food quality with the incidence of stunting ( $p$ -value = 0.003; OR = 3,647; 95% CI 1.524-8.728). There was no association between aspects of feeding practices ( $p$ -value = 0.138) and aspects of food safety ( $p$ -value = 0.141) with the incidence of stunting.

**Conclusion:** The feeding patterns of children, especially the food quality aspect, in the coastal area of Gresik Regency significantly influence their nutritional status, with a direct correlation between food quality and the incidence of stunting. There should be an increase in malnutrition interventions in this community, focusing mostly on educating individuals about improving child nutrition by utilizing the food sources that are already available.

**Keywords:** feeding practice, food quality, food safety, toddler, stunting

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## **Introduction**

Indonesia is currently one of the countries that is facing a triple burden of nutritional problems, namely stunting, wasting, and obesity as well as micronutrient deficiencies such as anemia. Stunting is a condition of a toddler who has a height or body length that is less than appropriate for his age, namely less than - 2 SD (Standard Deviation). Stunting conditions can occur due to chronic malnutrition over a long period, especially at the beginning of life<sup>1</sup>.

Globally, 22% or 149.2 million children under five suffered from stunting in 2020, while data on the prevalence of stunting in Southeast Asia in 2020 was 24.7%<sup>2</sup>. Based on data from the Integrated Toddler Nutrition Status Survey (SSGBI), in 2021 the prevalence of stunted toddlers in Indonesia is 24.4%. The prevalence of stunting in East Java based on the results of the 2021 Integrated Toddler Nutrition Survey is 23.5%<sup>3</sup>. Meanwhile, the prevalence of stunting in Gresik Regency based on the results of the Integrated Toddler Nutrition Status Survey (SSGBI) in 2021 is known to be ranked 16th out of a total of 38 regencies/cities in East Java with a stunting prevalence of 23.0%<sup>3</sup>. Based on existing data, the prevalence of stunting in Gresik Regency is still above the target of stunting prevalence set by the Indonesian government, namely 14%.

Based on the theory from WHO in 2013 regarding stunting, it is stated that the causes of stunting consist of 4 factors, namely family and household factors, inappropriate feeding, breastfeeding, and infectious diseases. Improper feeding factors consist of 3 aspects, namely poor-quality food, inadequate feeding patterns, and food safety aspects. Inadequate food includes foods that have low nutrients, low diversity of food types, and complementary foods that contain low energy. Inadequate feeding patterns include low frequency of feeding, inadequate feeding during illness and after illness, and inadequate feeding in quantity. Food safety includes contaminated food and drink, poor hygiene, and unsafe food storage and preparation<sup>4</sup>. The pattern of feeding children is important to support children's

growth and development because food contains the nutrients the body needs<sup>5</sup>.

Feeding patterns in each region are of course different. Each region has a diversity of natural resources that can be utilized. As is the case in coastal areas, coastal areas have abundant marine product resources that can be utilized to provide nutrition to support children's growth and development<sup>6</sup>. Based on research by Femidio and Muniroh (2020), people living in coastal areas have different consumption patterns from other areas. This is because people who live in coastal areas have a greater opportunity to consume high-protein seafood such as fish because of sufficient access and availability. If this is utilized properly, then people on the coast will more often consume foods that contain high-quality protein and can be beneficial for children's nutrition<sup>7</sup>.

The opportunity for coastal communities to consume high-protein seafood is not utilized properly, this is because poverty is still a barrier. Most coastal communities prefer to resell products obtained from the sea to increase their income<sup>8</sup>. Based on research conducted by Krisman Umbu Henggu, et al (2021) on the coast of East Sumba, it is said that coastal communities who consume 2-5 kg/capita/month of fish are higher with a percentage of 56.80% compared to communities who consume more than 5 kg of fish. /capita/month. This difference in the quantity of fish consumption is because fishermen tend to use fish by selling it to meet household economic needs and only a small portion is consumed<sup>9</sup>.

In coastal communities, the causes of malnutrition problems are poverty and lack of education, as well as inadequate food availability. The main cause of malnutrition in coastal areas is a lack of nutritional intake or the food consumed does not have sufficient nutrition for the body. This nutritional deficiency will have an impact on the growth conditions of children under five<sup>10</sup>. Another study from Femidio and Muniroh (2020) in a coastal village in Probolinggo Regency stated that there was a difference in protein adequacy rates for stunting and non-stunting toddlers with an

OR of 12.5. This means that toddlers who have a low level of protein adequacy have a 12.5 times greater risk of stunting than toddlers who have a sufficient level of protein adequacy<sup>7</sup>.

Ujungpangkah Primary Healthcare is a coverage area that is included in the northern coastal area of East Java. Based on a preliminary study conducted at the Ujungpangkah Primary Healthcare, it is known that the number of stunting in July 2022 was 211 children under five with a prevalence of 9.4%. Apart from that, Gresik Regency has implemented 10 Primary Healthcares that are focused on accelerating the reduction in stunting prevalence, one of which is the Ujungpangkah Primary Healthcare. Of the 10 Primary Healthcares, Ujungpangkah Primary Healthcare is the only Primary Healthcare located in the coastal area. Based on this, researchers want to conduct research regarding the association between feeding practices for toddlers and the incidence of stunting in the coastal area of the Ujungpangkah Primary Healthcare, Gresik Regency.

## Methods

### *Study setting, design, and sampling*

A community-based case-control study was conducted from January to December 2023 in Ujungpangkah Subdistrict, Gresik district, East Java Province, Indonesia. Ujungpangkah Primary Healthcare's coverage area includes the northern coastal area of Gresik District. Based on a preliminary study conducted in Ujungpangkah Primary Healthcare, it is known that the number of stunting in July 2022 was 211 children under five with a prevalence of 9.4%. Additionally, Gresik Regency has prioritized 10 Primary Healthcare facilities to expedite the reduction in stunting prevalence, one of which is Ujungpangkah Primary Healthcare, the sole facility located in the coastal region among the 10 designated. The study was conducted in the northern coastal area of Gresik District because we did not find the proportions among cases and controls of there was neither a study done of children ages 24-59 months in East Java Province, Indonesia.

Cases were stunted children aged 24 to 59 months: height-for age z- score below -2SD from the median height of the WHO reference population. While Controls were children aged 24 to 59 months without stunting. Sample size was calculated using Epi info version 7, 95% CI, 80% power, the case-to-control ratio of 1:1, and accounted for 10% of contingency for non-response. The total sample size was 90 (45 cases and 45 controls). Respondents of case and control were selected by simple random sampling technique out of thirteen rural villages. All children aged 24 to 59 months were measured for their z-score of height for age and categorized as stunted and not stunted to generate sampling frames for cases and controls by a census conducted before the actual data collection. Then simple random sampling method (generated by randomlist.com) was used to recruit cases from each village. A control was selected from the next house (neighbor) using a code of house number in ascending order. If two or more eligible controls were found in the same household, then one of them was selected randomly.

### *Measurements*

The age of the children was estimated using the Program of Immunization registration book or immunization card when possible and by asking the mother. Data were collected using a structured questionnaire via face-to-face interviews with participant's mothers or caretakers. In this study the following independent variables or factors were assessed: monthly income, parental age (mother), employment status, maternal background study, feeding patterns (feeding practice, food quality, and food safety), while the dependent variable is stunting status. The category of stunting status is stunting (Z-Score < -2SD) and not stunting (Z-Score  $\geq$  2 SD); the category of feeding patterns (feeding practice is poor and good; food quality poor and good; and food safety poor and good); the category of maternal background study is Basic (Elementary-Junior High School) and High (Senior High School-University); the category of monthly income is low (< regency wage minimum of Gresik regency IDR 4.372.030,5) and high

(≥regency wage minimum of Gresik regency IDR 4.372.030,5); the category of the employment status of mother is working and not working; and the category of mother age is ideal (20-35 years old) and not ideal (<20 and >35 years old).

The questionnaire was initially prepared in the local language. The data were collected by two data collectors who are studying public health after two days of training. Filled questionnaires were checked daily for completeness by researchers.

### Data analysis

Data were checked for completeness, edited, coded, and exported to SPSS 16.0 statistical software for analysis. Frequencies and cross-tabulations were used to check consistency. Descriptive statistics were used to summarize participants' characteristics. In this study, feeding pattern was assessed by three variables (food quality, feeding practice, and food safety). Each variable consists of 16 questions with this option: 0= Never; 1= Rarely (1-3 Times/month); 2= Frequently (1 time or more/week). The scoring of food quality is interpreted based on the results of the normality test. If the data is normally distributed, the categorization is determined using the mean value: Poor Food Quality < Mean Value and Good Food Quality ≥ Mean Value. If the data is not normally distributed, categorization is determined using the median value: Poor Food Quality < Median Value and Good Food Quality ≥ Median Value. So were the scoring of feeding practice and food safety. After cleaning data for inconsistencies and missing values, descriptive statistics were done. Correlation analysis between feeding patterns (feeding practice, food quality, and food safety) with stunting status was analyzed by the Chi-Square test. Odds ratios (95% confidence intervals) were calculated to determine the risk ratio between stunting and independent variables. The results were presented in table and narrative.

## Results

Respondent characteristics consist of the mother's age, employment status, family income, and educational background in the working area of the

Ujungpangkah Primary Healthcare, Gresik Regency. the distribution based on maternal age shows that the majority in the case group and control group at the ideal age category, 35 respondents (77.8%) in the case group, while in the control group, there were 38 respondents (84.4%). In the employment status variable for the case group and control group, most respondents were not working, 39 respondents (86.7%) in the case group and 36 respondents (80%) in the control group. Most of the respondents in the case group and control group had low monthly income, 30 respondents (66.7%) in the case group and 25 respondents (55.6%) in the control group. In terms of maternal education, some of the case group respondents' mothers had low education, 26 respondents (57.8%), while in the control group, respondents who had low education were 11 respondents (24.4%) (table 1).

### Feeding Patterns

Feeding patterns were identified by three aspects: food quality aspects, feeding practice aspects, and food and beverage security aspects in stunted children (case group) and non-stunted children (control group) in the working area of the Ujungpangkah Primary Healthcare, Gresik Regency. The distribution of children's feeding patterns in the aspect of food quality shows that most children in the case group had poor food quality, namely 28 respondents (62.2%), while in the control group children there were 14 respondents (31.1%) who had poor food quality. In the aspect of feeding practices, it shows that most children in the case group had inappropriate feeding practices, namely 24 respondents (53.3%), while 17 respondents (37.8%) had inappropriate feeding practices in the control group. Most of the respondents in the case group had safe food and drink safety, namely, 31 respondents (68.9%), while most children in the control group had safe food and drink safety, 37 respondents (82.8%) (table 2).

*Association between Feeding Patterns Aspects (Food Quality, Feeding Practice, and Food safety) and Incidence of Stunting*  
a. *Association between Food Quality Aspects and Stunting Incidents*

Statistical analysis shows that p-value is  $0.003 \leq 0.05$ , meaning that there is an association between aspects of food quality with the incidence of stunting in toddlers in the working area of the Ujungpangkah Primary Healthcare, Gresik Regency, with an Odds Ratio (OR) 3.647, meaning that poor quality food has a 3,647 times higher risk of causing stunting in toddlers compared to good quality food (table 3).

*b. Association between aspects of feeding practices and the incidence of stunting*

Statistical test analysis obtained p-value is  $0.138 > 0.05$ , meaning that there is no

association between aspects of feeding practices and the incidence of stunting in toddlers in the working area of the Ujungpangkah Primary Healthcare, Gresik Regency (table 4).

*c. Association between Food safety Aspects and Stunting Incidents*

Statistical test results obtained p-value is  $0.141 > 0.05$ , meaning that there is no association between food safety aspects and the incidence of stunting in toddlers in the working area of the Ujungpangkah Primary Healthcare, Gresik Regency (table 5).

Table 1. Distribution of Respondent Characteristics in the Case Group and Control Group in the Ujungpangkah Primary Healthcare Working Area, Gresik Regency (n=90)

Characteristics	Case		Control	
	n	%	n	%
Mother's age (years old)				
Non ideal (< 20 and >35)	10	22,2	7	15,6
Ideal (20-35)	35	77,8	38	84,4
Employment status (mother)				
Working	6	13,3	9	20,0
Not working	39	86,7	36	80,0
Monthly Income				
Low (< regency wage minimum of Gresik regency IDR 4.372.030,5)	30	66,7	25	55,6
High ( $\geq$ regency wage minimum of Gresik regency IDR 4.372.030,5)	15	33,3	20	44,4
Educational Background				
Basic (Elementary-Junior High School)	26	57,8	11	24,4
High (Senior High School-University)	19	42,2	34	75,6

Table 2. Identification of Feeding Patterns in the Case Group and Control Group in the Ujungpangkah Primary Healthcare Working Area, Gresik Regency (n=90)

Pola Pemberian Makan	Case		Control	
	n	%	n	%
Food Quality (Median = 30)				
Poor (<30)	28	62,2	14	31,1
Good ( $\geq$ 30)	17	37,8	31	68,9
Food Practice (Median = 34)				
Inadequate (<34)	24	53,3	17	37,8
Adequate ( $\geq$ 34)	21	46,7	28	62,2
Food safety (Median = 22)				
Not secure (<22)	14	31,1	8	17,8
Secure ( $\geq$ 22)	31	68,9	37	82,8

Table 3. Associations between Food Quality and the Incident of Stunting in Toddlers in the Working Area of the Ujungpangkah Primary Healthcare, Gresik Regency

Variable	Case		Control		p-value	OR	95% CI
	n	%	n	%			
Food Quality (Median = 30)							
Poor (<30)	28	2,2	14	31,1	0,003	3,647	1,524-8,728
Good (≥30)	17	7,8	31	68,9			

Table 4. Association between Feeding Practices and Stunting Incidents in Toddlers in the Working Area of the Ujungpangkah Primary Healthcare, Gresik Regency

Variabel	Case		Control		p-value	OR	5% CI
	n	%	n	%			
Feeding Pattern (Median = 34)							
Inadequate (<34)	24	53,3	17	37,8	0,138	1,882	0,812-4,362
Adequate (≥34)	21	46,7	28	62,2			

Table 5. Association between Food safety and Stunting Incidents in Toddlers in the Working Area of the Ujungpangkah Primary Healthcare, Gresik Regency

Variabel	Kasus		Kontrol		p-value	OR	95% CI
	n	%	n	%			
Food safety (Median = 22)							
Not Secure (<22)	14	31,1	8	17,8	0,141	2,089	0,775-5,627
Secure (≥22)	31	68,9	37	82,2			

## Discussion

### Respondents Characteristics

Based on the research results, most mothers are unemployed. This condition aligns with research conducted by Wanimbo dan Wartinarsih (2020) which stated that most respondents are unemployed. The mother's employment status determines the mother's behavior in providing nutrition for the children. Mothers who don't work have more time to pay attention to the nutritional needs of toddlers and take care of toddlers so that their growth and development can be better controlled. Meanwhile, mothers who work tend to have little time for their children, so the nutrition is not properly monitored and the mother's attention to her child's growth is reduced<sup>11</sup>. However, based on the research results, most of the mothers of the stunting group had basic education as the academic background (had completed their education up to elementary or middle school). The mother's education level can

influence the mother's speed in absorbing information regarding the child's growth needs. Mothers who have a high level of education will easily absorb and understand information and can use technology that can be used to access information about children's growth and development when compared to mothers who have low education<sup>11</sup>. The level of education of coastal communities is influenced by the socio-economic conditions that exist in coastal communities. The daily conditions of fishermen can also influence perspectives regarding education, inadequate or mediocre living reduces children's enthusiasm and ambition to continue their education, so children are required to marry immediately to reduce the burden of their parents' responsibilities<sup>12</sup>. The results of this research are in line with the research<sup>13</sup> which stated that most of the stunting case group (60.4%) had a low level of maternal education. Another study by

Jalilah et al., (2022) stated that most of the stunting group had a low level of education. Most of the respondents had low income (less than the minimum wage for Gresik Regency, IDR 4,372,030.5). Income is only from the father, who is working in the informal sector with irregular and unstable income. Most jobs in the Ujungpangkah Primary Healthcare work area are fishermen whose daily catch is uncertain. The fisherman's catch will later be sold as a source of income. If fishermen get a small catch, the income they get is also small, and vice versa, so the income is unstable and tends to be low. The results of this research are in line with the research of Putri et al., (2022) that the stunting group had low incomes below the minimum wage, this is because most respondents' jobs are fishermen whose main livelihood is very dependent on natural conditions, so their income fluctuates and relatively low. Mothers who live in this coastal area show that the culture of the local community influences them, mothers tend to be bound by their status as wives who only take care of household matters, less opportunity for productive economic activities. Wives in coastal areas have an important role in dealing with and overcoming their husband's erratic income to improve the welfare of their household, one of which is by having a side job without abandoning their responsibilities as a wife to improve the family economy<sup>15</sup>.

#### *Feeding Patterns*

The feeding pattern based on WHO theory<sup>4</sup> consists of three aspects, namely the food quality aspect, the feeding practice aspect, and the food safety aspect. The food quality aspect shows that most of the case group had poor food quality, while most of the control group had good food quality. Based on research, the staple food most often consumed is rice. The type of vegetable that children often like is carrots, however, there are several respondents whose children do not consume vegetables. Side dishes that children often like are tofu, tempeh, and eggs. Several respondents also said that they rarely consume fish and meat, apart from that most respondents do not consume fruit every day. The results of this study are in

line with research<sup>16</sup> which shows that most respondents who have poor consumption patterns have children in the stunting category.

In the aspect of feeding practices, the results show that in the case group, most of the respondents had inappropriate feeding practices, while in the control group, most respondents had proper feeding practices. Respondents have provided the appropriate type of food and frequency of eating. Apart from that, when the child is sick, respondents always follow the child's wishes to consume snacks as a substitute for the main meal or the respondent provides food that the child likes but does not pay attention to the nutritional needs that are lost when the child is sick to be fulfilled again after the child has recovered. This is in line with research by<sup>17</sup> which shows that most toddlers in the stunting category have inappropriate feeding practices.

In the aspect of food safety, research results show that most of the case group and control had good food safety regarding household drinking water and food management behavior. They have consumed drinks that are suitable for drinking. Apart from that, most respondents in selecting food ingredients and food processing were suitable for consumption by the family.

#### *Association between Food Quality Aspects and Stunting Incidents*

There is an association between food quality and the incidence of stunting in toddlers in the coastal area. This is because there are still many respondents who provide food according to their children's wishes, so the food given is not diverse and does not have good nutritional quality. Based on conditions in the field, it was still found that several children were accustomed to consuming only rice and vegetable soup every day, this shows that at the research location, there were still a small number of respondents who practiced food diversity. Apart from that, respondents rarely consume vegetables and fruit almost every month because those are expensive.

Most respondents' husbands' occupations are fishermen, but most fish

caught are sold only in small portions, or even fish that are not suitable for sale are usually consumed by respondents, so even though the resources in coastal areas contain lots of high animal protein nutrients, they are rarely utilized. This can cause growth and development disorders in children. Apart from the fact that the majority of catches are sold, there are several children under five who refuse to be given animal protein, especially fish, the lack of provision of animal protein is due to the lack of variation among mothers in processing fish so that children feel bored and the majority of mothers choose to process food in a practical and fast way without paying attention to the child's attractiveness towards food.

The results of this research are in line with research conducted by <sup>18,19</sup> which stated that there is an association between feeding patterns and the incidence of stunting. A low feeding pattern can have a 6.496 times risk of stunting in toddlers compared to a high feeding pattern (95% CI 2.486-16.974). The most dominant factor causing stunting is consumption patterns. The incidence of stunting is caused by a lack of energy and protein in children. Types of food that are diverse and have sufficient nutritional value are very important for children to prevent malnutrition.

The insufficient use of coastal resources at the research site is in line with research <sup>7</sup> conducted in the coastal area of Probolinggo Regency which can support the use of natural resources with high animal protein which states that the level of protein adequacy has a significant association. Toddlers with a low level of protein adequacy are 12.50 times more likely to experience stunting than toddlers with a sufficient level of protein (95% CI 2.828-55.254). Based on this research, it is stated that people who live in coastal areas have a great opportunity to consume foods that are high in animal protein, so it is hoped that nutritional problems will not occur frequently. Another research conducted by <sup>20</sup> states that there is a significant association between food diversity and the incidence of stunting in toddlers. Children who consume a non-diverse diet have a 3 times greater risk of

experiencing stunting compared to children who consume a diverse diet (95% CI 1.122-8.129).

Based on WHO theory <sup>4</sup>, food quality aspects consist of micronutrient content in food, food diversity, and nutritious food. Lack of consumption of vegetables and fruit will cause micronutrient deficiencies which can cause growth disorders. The micronutrients that most influence the incidence of stunting are calcium, zinc, and iron intake. Micronutrient intake in toddlers will have a direct effect on toddler growth and prevent the occurrence of infectious diseases. Lack of iron and zinc will reduce immunity in toddlers, making them vulnerable to infectious diseases. Toddlers who are frequently exposed to infectious diseases will experience growth and development problems. Apart from that, calcium deficiency will affect bone growth that is not optimal, causing stunting, this is because calcium is a micronutrient needed for bone growth <sup>21</sup>. Apart from that, deficiencies in other nutrients such as protein can cause physical growth disorders in children. Food that has a high source of protein is needed by children to fulfill nutritional needs so that it can support the child's growth and development process and can reduce the occurrence of stunting <sup>22</sup>.

Good food quality can be seen from the diversity of food consumed daily. The variety of types of food consumed will affect the quality and completeness of the nutrients that children need. The more diverse the food consumed, the easier it is to meet nutritional needs. Diversity in food consists of staple foods, side dishes, vegetables, and fruit. The more diverse the food consumed, the easier it is for the body to obtain various other substances that are beneficial for health. This is because burning carbohydrates, protein, and fat produces the energy the body needs. These three nutrients are found in many foods consumed daily. Therefore, to meet energy needs, good quality food is needed for consumption. Food intake will affect a child's nutritional status, nutritional status will be optimal if the necessary nutrients are met so that it will affect optimal physical growth <sup>23</sup>. Another factor is mothers with low education are more likely to have



stunted children compared to those with higher education<sup>24</sup>. This is because lower educational levels are often associated with lower income, which can lead to poorer nutrition and less access to healthcare services. Additionally, mothers with lower educational levels may have less knowledge about proper nutrition and child development.

#### *Association between aspects of feeding practices and the incidence of stunting*

There is no association between feeding practices and the incidence of stunting in toddlers in this coastal area. In terms of quantity, stunted toddlers are indeed more likely to have inappropriate feeding practices, but conditions in the field show that respondents already know about proper feeding practices. The frequency of eating for children aged 24-59 months given by respondents is 3 times a day. Consistently, respondents provide gradual textures to children starting from the age of 6 months, they are given smooth porridge and at the age of 24-59 months, children are given family food.

Based on research results, the feeding practices carried out by respondents when children are sick and after illness are to always fulfill the child's wishes to consume the food they want and let the child eat any food without paying attention to whether the food is nutritious or not. This is because respondents prioritize practical steps when giving food to children. Apart from that, there are differences in responsive feeding practices for some respondents in the stunting group and the non-stunting group. In the stunting group of children, respondents were less knowledgeable about how to get children to finish their food without coercion, while in the group of children without stunting, respondents knew more about how to persuade children to finish their food, such as by increasing children's interest in food.

The results of this research are in line with research by<sup>25</sup> which states that there is no association between feeding practices and the incidence of stunting. Apart from that, it is in line with research conducted by<sup>26</sup> which states that there is no association between feeding practices and the incidence of stunting with a p-value

of 0.823. Another study by<sup>5</sup> stated that there was no association between the type of food and the amount of food on the incidence of stunting.

The results of this study are not in line with the research of<sup>27</sup> which states that there is an association between feeding practices and the incidence of stunting. Apart from that, other research conducted by<sup>28</sup> stated that there is an association between feeding practices and the incidence of stunting. Both studies found that feeding practices are one of the causes of stunting. Good feeding practices are feeding children that are adapted to the child's age and needs so that health problems do not occur.

Based on WHO theory (2013), aspects of feeding practices consist of frequency of feeding, type of food, amount of food, feeding during and after illness, and responsive feeding. The frequency of feeding children must be by established rules to achieve nutritional needs so that the energy needed by the body is met. The frequency of giving food to children needs to be increased according to their age because the energy required increases as the child gets older. The frequency of feeding for children aged 2-5 years is recommended 3 times a day starting with breakfast, lunch, and dinner (Regulation of Ministry of Health of the Republic of Indonesia, 2014). The types of food consumed by children aged 24-59 months are the same foods as family members. However, the consistency of the food is improved as the child gets older, starting from being given soft pureed food at the age of 6 months, before the age of 12 months he is introduced to family food with a softer texture so that at the age of 12 months and above children can be given family food (Ministry of Health of the Republic of Indonesia, 2020b).

The intake of sick children and after illness must be maintained to meet the energy needs lost during the child's illness to speed up the recovery process and reduce the occurrence of malnutrition. Feeding sick children is the same as feeding healthy children, namely 3 times a day. If the child does not want to eat, the mother is advised to continue providing food intake to the child and continue to try

to ensure that the child continues to eat to meet energy needs to prevent nutritional deficiencies in children which can result in stunting<sup>31</sup>. Another study stated that specific feeding practices that were identified as contributing to stunting included the provision of instant baby food and instant steamed porridge as complementary foods, a feeding schedule of small portions 2-3 times per day, inadequate dietary variety, and iron deficiency. These practices were observed among mothers in Jakarta and were associated with the feeding practices of toddlers experiencing stunting<sup>32</sup>.

In addition, it is recommended that the practice of feeding children be carried out actively or responsively to attract children's interest in food so that it will influence the quality and quantity of nutrients consumed by children. Mothers must be responsive to signs that the child is ready to eat. One of how responsive feeding is shown is by continuing to encourage the child to eat without any coercion. This is because if children are left to eat alone, they are easily distracted and the child does not feel full so their energy needs are not met if this happens continuously it can cause the child to become malnourished (Ministry of Health of the Republic of Indonesia, 2022).

#### *Association between Food safety Aspects and Stunting Incidents*

There is no association between food safety aspects and the incidence of stunting in toddlers in the working area of the Ujungpangkah Primary Healthcare, Gresik Regency. This is because most respondents in the case group and control group have the safe food safety category. Based on the conditions at the research location, most respondents already know and apply the principles of food and drink safety. The food ingredients used daily by respondents are fresh food ingredients which are directly processed, before the respondents process the food ingredients into dishes, the food ingredients are washed first. Meanwhile, in storage, respondents stored raw food ingredients separately from cooked food ingredients. Raw food ingredients are stored in the refrigerator using a closed container, while cooked food ingredients are served in a

clean and closed container. Apart from that, most respondents already use clean water for daily needs. Clean water used for personal purposes, washing cooking ingredients, washing cooking utensils, washing clothes is well water and PDAM water, while water used for drinking water is water that is treated by cooking and refilling water.

The results of this research are in line with research by<sup>34</sup> which states that there is no association between the habit of washing hands with soap, food processing, and drinking water processing on the incidence of stunting in toddlers. Another research conducted by<sup>35</sup> stated that most respondents in their household had appropriate food processing. Based on this research, all households had proper food management and consumed proper drinking water.

The results of this study are not in line with the research of<sup>36</sup> which states that there is an association between household drinking water and food management and the incidence of editing. This research states that there are still many respondents who have poor household drinking water and food management habits because many respondents still practice open defecation which can pollute water sources. Apart from that, food processing is still not appropriate, which can cause infectious diseases.

Food safety is one aspect that must be considered in feeding patterns. Based on WHO theory<sup>4</sup>, food safety aspects consist of contaminated food and drink, poor hygiene, and unsafe food storage and preparation<sup>11</sup>. The safety of food and drink for children can be guaranteed through several things, such as mothers having to get their children used to washing their hands before eating or mothers having to get them used to washing their hands before feeding them, using clean eating utensils, not mixing cooked food with raw food, washing fruit and vegetables before consumption, and store food in a safe place<sup>37</sup>. Apart from that, to ensure the safety of drinks, it is recommended to use clean water for sanitation and hygiene purposes. Water for hygiene and sanitation purposes can be used for personal needs such as bathing, brushing teeth, washing, cooking

ingredients, eating utensils, and clothes. Apart from that, water for sanitation and hygiene purposes can be used as raw material for drinking water. Using clean water for daily needs aims to avoid diseases caused by poor water quality<sup>38</sup>. Lack of clean water can trigger infectious diseases such as diarrhea and worms, so children will experience impaired absorption of nutrients which can result in deficiencies of the nutrients needed by the body. Infectious diseases that last for a long time can cause stunting in children<sup>39</sup>.

## Conclusion

The mother's age among the case group and control group was in the ideal age category (<20 and >35 years old). Most respondents among the case group and control group had low family income (less than the wage minimum of Gresik regency IDR 4.372.030,5). Most of the respondents in the case group (57.8%) had low education (junior high school or less). The feeding pattern variable consists of three aspects. In the aspect of food quality, most of the stunting group (62.2%) indicated that children had poor food quality. In the aspect of feeding practices, most of the stunting group (53.3%) indicated that the feeding practices provided were inadequate. In terms of food safety, most of the stunting group (68.9%) had good food safety. Analysis of the association between food quality aspects and the incidence of stunting in toddlers with a p-value is 0.003 and OR of 3.647. Toddlers who had poor food quality were 3,647 times more likely to cause stunting. Meanwhile, the aspects of feeding practices and food safety aspects are not related to the incidence of stunting in toddlers with p-values of 0.138 and 0.141.

These findings suggest that the feeding patterns of children, especially the food quality aspect, in the coastal area of Gresik Regency significantly influence their nutritional status, with a direct correlation between food quality and the incidence of stunting. We suggest Ujung Pangkah Primary Healthcare provide training and practice related to healthy and affordable toddler diets by utilizing coastal area resources that are easily accessible but have good nutritional quality to meet

children's nutritional needs. So that mothers of toddlers have good knowledge regarding variations in healthy and affordable toddler meal menus and can provide appropriate food to their toddlers.

## Ethics approval

The ethical clearance was obtained from the University of Jember's Faculty of Dentistry's Ethics Commission (certificate number: 1908/UN25.8/KEPK/DL/2023, date of approval March 06th, 2023). Written consent was obtained from mothers/caretakers of under-five children.

## Availability of data and materials

The authors confirm that the data supporting the findings of this study are available within the article

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## Author Contribution

SSN contributed to the development of study design, data collection, data analysis, and manuscript writing. AEN and TDS contributed to the study design, data analysis, manuscript writing. All authors commented on the manuscript and gave approval for the final version to be published.

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