

# Literature Review: The Relationship between Dietary Diversity with Stunting in Underfive Children

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## Literature Review: The Relationship between Dietary Diversity with Stunting in Underfive Children

### Tinjauan Literatur: Hubungan antara Keragaman Pangan dengan Stunting pada Balita

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#### ABSTRACT

**Background:** Stunting is a global health problem in children under five. Failure to grow, develop, and metabolize due to stunting can threaten a child's future. The diversity of food consumed daily can be a factor affecting the incidence of stunting.

**Objectives:** This literature aimed to determine the relationship between dietary diversity and the incidence of stunting in children under five.

**Discussion:** Ten articles met the criteria, with six articles stating that there was a relationship between dietary diversity and stunting, stating that the more diverse the food groups consumed, the less probability of children under five getting stunted.

**Conclusions:** This study concludes that dietary diversity is related to the incidence of stunting in children under five. This research can be used as a reference to maximize the availability of dietary diversity, especially in the locus area of stunting.

#### INTRODUCTION

Stunting is a world health problem experienced by more than a quarter (26%) of approximately 165 million children under the age of 5 worldwide. Indonesia ranks fifth with the most significant number of stunting<sup>1</sup>. In Southeast Asia, the prevalence of stunting has reached 14.9 million<sup>2</sup>. Stunting is when a toddler has a shorter length or height than his age. Stunting can be measured by length or height above -2 SD (standard deviance) of the WHO growth median in children under five<sup>3</sup>. Data from the Indonesian Nutrition Status Monitoring (PSG) in 2017, the stunting rate in children under five years is higher in the infant group (29.6%) compared to those under five years old (20.1%)<sup>4</sup>. Stunting not only has an impact in the short term but will also affect the subsequent life of toddlers. Among the impacts caused by stunting are a decrease in growth and development decline, cognitive abilities, intelligence, and endurance, and increased non-communicable diseases<sup>5</sup>.

Stunting can be interpreted as a condition of failure to thrive (body and brain) in children due to malnutrition for an extended period, from the fetus in the womb to the beginning of a child's life (the first 1000

days of birth). Inadequate access to nutritious food, inadequate consumption of vitamins and minerals, and poor diversity of food sources and animal protein are the causes of stunting<sup>6</sup>.

Public health related to nutrition depends on the quality of food consumed. Food quality describes all the nutrients the body needs in regulating the amount of food consumed and the ratio of types of food balanced in one plate. The more diverse and balanced the type and content of food consumed, the better the nutritional quality. No food has complete nutritional content or the right amount and type<sup>7</sup>. Several studies on food diversity and stunting say there is a relationship between diversity in food consumption and stunting in toddlers aged 6-24 months<sup>7</sup>. Research in the Cibungbulang Health Center area with a sample of 90 respondents said that 24.4% of children were stunted, and there was a relationship between food diversity and stunting<sup>8</sup>. Consumption of less diverse foods will impact the quality of nutrients and can result in a lack of fulfillment of daily nutrients. Lack of intake of these nutrients will hinder growth and trigger malnutrition, increasing the chance of stunting. Based on the description above, the authors were interested in

compiling a literature review on the relationship between dietary diversity and stunting in children under five.

## DISCUSSIONS

Table 1 shows the results of the relationship between food diversity and stunting events in toddlers. The search results for literature articles found ten relevant articles. A total of 6 articles stated a relationship between dietary diversity and stunting, while four others said there was no relationship between dietary diversity and stunting.

Stunting is a condition of failure to thrive in children under five years of age (babies under five years of age). Multidimensional causes, including malnutrition at gestational age and poor parenting practices, limited ANC services, inadequate clean water and sanitation, and lack of household access to nutritious food cause stunting<sup>9</sup>. One of the nutritional problems several developing countries face is the lack of food diversity<sup>10</sup>. Food diversity is a type of food group that includes staple foods, side dishes, vegetables, fruit, water, and various types of food in each food group. The more diverse types of food consumed, the easier it is to meet nutritional needs<sup>11</sup>.

In this literature, six articles reported that there was a relationship between dietary diversity and stunting. In line with the results of this study, research conducted in Cimayang Village, Banten, stated that diversity in food consumption was associated with stunting in toddlers aged 6-24 months<sup>7</sup>. Another study shows that dietary diversity was associated with stunting. Poor dietary diversity is a risk factor for stunting<sup>12</sup>. A cross-sectional study in Aligarh also stated that dietary diversity was associated with stunting<sup>13</sup>. Research in the country parts of Myanmar<sup>14</sup> and Northwest Province, South Africa<sup>15</sup> found that stunting was related to food diversity. In Tanzania, 31% of children aged 6-23 months were found to be stunted.

A decrease in the amount of food consumed causes the occurrence of stunting. In addition, the consumption of animal protein was found in this study to reduce stunting<sup>16</sup>. Consuming a variety of foods can reduce the prevalence of stunting. Higher dietary diversity and variety of foods such as corn, fish, legume, and poultry appear to be beneficial for children's developmental growth of children <5 years of age in the Nouna area of Burkina Faso<sup>17</sup>.

Increasing the variety of food for children reduces the risk of stunting and promotes growth<sup>18</sup>. Higher dietary diversity was found to reduce the incidence of stunting and underweight in preschool children aged 4-5 years<sup>15</sup>. A study differentiates the relationship between food diversity in stunting toddlers based on where they live. The study results showed that

the diversity of foods for stunting toddlers in urban and rural areas was not much different<sup>19</sup>. Mothers of toddlers and their families needed to provide a more diverse diet for toddlers, especially types of fruit and vegetables, eggs, nuts, and seeds, and introduce various animal proteins such as meat and chicken liver.

Contrary to research that explains that dietary diversity was related to stunting, some studies stated there was no association between dietary diversity and toddler stunting. In this literature review, four articles stated that dietary diversity was not related to the incidence of stunting in toddlers. Research by Wirawan and Rahmawati (2016)<sup>20</sup> said there were differences in the types of food diversity used. In the research conducted, food diversity was collected based on food diversity at the household level, which was aimed at capturing the ability of households to access a variety of foods. In contrast, in several studies on the nutritional status of children under five, food diversity was used at the individual level (Individual Dietary Diversity Score). Individual dietary diversity score (IDDS). Research by Melaku et al. (2018) also stated that there was no relationship between dietary diversity and stunting caused by differences in sample size, sampling, and method analysis. They were mainly related to the method of analysis. Research by Nurmayasanti and Mahmudiono (2019) also stated that food diversity was not related to stunting or non-stunting probably because of several reasons: stunted mothers or caregivers have been exposed to information at the Integrated Service Post (Posyandu) about stunting and its prevention or efforts to grow to catch up with its growth, including providing food with balanced nutrition and mothers of toddlers, most of whom are homemakers, have much time to prepare food for toddlers and can regularly come to the Posyandu to monitor the growth of toddlers. This result was in line with research conducted by analyzing data from the 2012 Comprehensive Nutrition Survey in the State of Maharashtra, India, which surveyed 2,630 households where no relationship was found between the diversity of children's diets and stunting<sup>21</sup>.

On the contrary, in a literature review study by Purwoko, Triana, and Cahyaningrum (2020), as many as 17 articles stated that food diversity in toddlers was mostly stunting in the non-diverse category<sup>22</sup>. Data disaggregated by age showed that dietary diversity positively correlated with anthropometric status (HAZ) in children aged 24 months to 59 months<sup>23</sup>. Food diversity significantly affects stunting. Accordingly, there was an association between household-level food diversity based on energy consumption. The highest risk factors influencing stunting are exclusive breastfeeding and food diversity<sup>24</sup>.

**Table 1.** Relationship between food diversity and stunting incidence in toddlers

| Article title   | Sample   | Method   | Assessment method  | Results   |
|---|--|--|--|---|
| Mother's dietary diversity and association with stunting among children <2 years old in a low socioeconomic environment: A case-control study in an urban care setting in Dhaka, Bangladesh <sup>25</sup> | Mother of 296 children aged < 2 (148 in case group and 148 in control group) in Sait House Dhaka, Bangladesh                 | - Design: Case-control<br>- Exposure: a variety of foods within the 10 food groups 24 hours prior to measurement<br>- Outcome: Stunting<br>- Analysis: Chi-square test/Fisher exact test and Logistic regression | - Dietary diversity was measured using a questionnaire about 10 food groups consumed in the previous 24 hours. Food diversity was grouped into $\geq 5$ food groups, and consumption < 5 food groups<br>- The case group was toddlers who are not wasting/underweight and have a length-for-age (LAZ) < -2 SD. The control group was a wasting/underweight toddler who had a LAZ $\geq -1.00$ z score  | Children whose mothers consumed <5 food groups were 1.7 times more likely to be stunted than children whose mothers consumed $\geq 5$ food groups (p-value= 0.04)   |
| Child dietary diversity and food insecurity as a potential correlate of child anthropometric indicators in the context of the urban food system in the cases of north-central Ethiopia <sup>26</sup>      | 512 mothers with children aged 6 - 59 months in north-central Ethiopia   | - Design: Cross-sectional<br>- Exposure: Diversity of food with 7 food groups diversity of food<br>- Outcome: Stunting<br>- Analysis: Generalized Linear Model (GLM)   | - The diversity of children's diets was measured using the food groups recommended by IYCF, the Child Dietary Diversity Score (CDDS) consumed in the previous 24 hours and categorized as inadequate (0-3 food groups), moderate (4-5 food groups), good (6-7 food group).<br>- Body length in children <24 months (not yet able to stand / <85 cm) was measured using a long wooden sliding board with the help of 2 measuring devices. Children $\geq 24$ months were shaved using a height measuring board with the Frankfort position and precision of 0.1 cm. | Z-score height-for-age has a negative relationship with children's dietary diversity ( $\beta = -0.36$ )  |
| Dietary diversity and nutritional status among children in rural Burkina Faso <sup>27</sup>   | 251 children aged 6 - 59 months in rural Burkina Faso  | - Design: Cross-sectional<br>- Exposure: Diversity of food with 11 food groups consumed over the last 7 days<br>- Outcome: Stunting<br>- Analysis: Bivariate linear regression or logistic regression            | - Dietary diversity was measured using 11 food groups consumed during the last 7 days.<br>- Body length was measured lying on the back for children aged <24 months and standing for children >24 months (Shirtboard, weight and measure, Olney, MD, USA)  | - Children with high dietary diversity have high HAZ<br>- High food diversity can increase the z-score from 0.14 SD to 0.25 SD (p-value= 0.009) per increase in food diversity<br>- Children with high food religiousness could reduce the risk of stunting 0.82 times (P = 0.07) per increase in food diversity. |
| Household dietary diversity and child stunting in East Java, Indonesia <sup>28</sup>  | 768 households with children under 5 years in 8 urban and rural areas, both coastal and mountainous, in East Java, Indonesia | - Design: Cross-sectional<br>- Exposure: Dietary groups called the Household Food Diversity Score (HDDS)<br>- Outcome: Stunting  | - Dietary diversity was measured by the 12 food groups consumed in the previous 24 hours. The child's height is measured using a Vktech Stature Meter or microtoise with a precision of 0.1 cm.  | High dietary diversity was associated with a lower likelihood of stunting (p-value=0.03)  |

| Article title  | Sample  | Method  | Assessment method  | Results   |
|--|---|---|--|---|
| Feeding practices and growth among young children during two seasons in rural Ethiopia. <sup>28</sup>  | 320 children aged 6-12 months in the harvest season and 312 children aged 6-12 months in the pre-harvest season in a rural area of southwest Ethiopia | <ul style="list-style-type: none"> <li>- Analysis: Logistic regression</li> <li>- Design: Cross-sectional</li> <li>- Exposure: Food diversity across the seven food groups was measured in the previous 24 hours</li> <li>- Outcome: Stunting</li> <li>- Analysis: Linear regression and logistic regression</li> </ul> | <ul style="list-style-type: none"> <li>- Food diversity is obtained by summarizing the food groups consumed in the previous 24 hours by children with 7 food groups.<sup>25</sup></li> <li>The child's body length was measured using a board in a recumbent position and recorded with a precision of 0.1 cm (SECA 210, Hamburg, Germany)</li> </ul>  | Dietary diversity had a positive relationship with the long-for-age (LAZ) z score in the harvest season (p-value= 0.03) |
| Dietary diversity, parenting and stunting in toddlers aged 24-59 months <sup>29</sup>  | 100 children aged 24-59 months in Bayat District, Klaten Regency  | <ul style="list-style-type: none"> <li>- Design: Cross-sectional</li> <li>- Exposure: Variety of foods with 9 food groups</li> <li>- Outcome: Stunting</li> <li>- Analysis: Chi-square and logistic regression</li> </ul>   | <ul style="list-style-type: none"> <li>- Dietary diversity was measured using the previous 24-hour withdrawal method, and the data obtained were included in the HDDS (Individual Dietary Diversity Score) questionnaire, which consisted of 9 food groups. These results were categorized into foods that do not vary when the score is 0-5 and safe when the score is more than five food groups.</li> <li>- Height was measured using a microtoise with a precision of 0.1 cm.</li> </ul> | There was an association between dietary diversity and stunting (p-value= 0.029, OR = 3.213)                            |
| Food Availability and Diversity and Economic Level as Predictors of Toddler Nutritional Status <sup>30</sup>   | 115 families with toddlers in 57 districts in Malang  | <ul style="list-style-type: none"> <li>- Design: Cross-sectional</li> <li>- Exposure: A variety of foods with 12 food groups</li> <li>- Outcome: Stunting</li> <li>- Analysis: Pearson/Spearman and Fisher exact test</li> </ul>  | <ul style="list-style-type: none"> <li>- Dietary diversity was measured using the 24-hour withdrawal method. The results were collected through the HDDS questionnaire and categorized into HDDS scores &lt;9 food groups and HDDS scores ≥9 food groups.</li> <li>- Height was measured using the German SECA microtoise brand model 206, and body length was measured with the German SECA model 2010 longboard</li> </ul>   | There was no relationship between TB/U z-score and HDDS   |
| Associations of childhood, maternal and household dietary patterns with childhood stunting in Ethiopia: Proposing an alternative and plausible dietary analysis method to dietary diversity scores <sup>30</sup> | 3,788 mothers with children under 5 years of age in Ethiopia  | <ul style="list-style-type: none"> <li>- Design: Cross-sectional</li> <li>- Exposure: A variety of foods with 12 food groups</li> <li>- Outcome: Stunting</li> <li>- Analysis: Chi-square and Poisson regression model</li> </ul>   | <ul style="list-style-type: none"> <li>- Dietary diversity was measured using 12 food groups taken using the 24-hour withdrawal method and categorized into HDD S5 and &gt; 5 HDD scores.</li> <li>- The height or length of the child was measured using a wooden plank with a precision of 0.1 cm recommended by UNICEF. Children aged ≥24 months were measured in a standing position, and children aged &lt;24 were measured in a supine</li> </ul>                                      | HDD scores had no relation with stunting (p-value= 0.624)   |



| Article title  | Sample  | Method   | Assessment method  | Results  |
|--|---|--|--|--|
| Socioeconomic Status and Food Diversity in Stunting and Non-Stunting Toddlers Aged 24-59 Months in the Work Area of the Wilangan Health Center, Nganjuk Regency <sup>1</sup> . | 28 toddlers aged 24-59 months in each case group and control group (N = 56) in Nganjuk District | - Design: Case-control<br>- Exposure: Food Diversity (IDDS)<br>- Outcome: Stunting<br>- Analysis: Chi-square   | position.<br>Dietary diversity was measured using the Individual Dietary Diversity Score (IDDS) form in which the data was obtained from 3x24 hour withdrawals (2 weekdays and 1 weekend) and was categorized into various if the IDDS score ≥4 and did not vary when the IDDS score <4.   | 17<br>There was no association between dietary diversity and the incidence of stunting (p-value= 1,000), and it was not a risk factor for stunting under five (OR = 1,000) |
| Association between household dietary diversity and nutritional status of children (6-36 months) in Wenchi Municipality, Brong Ahafo Region, Ghana <sup>2</sup> .              | 590 mothers of children aged 6-36 months in Wenchi Town, Brong Ahafo Region, Ghana              | - Design: Cross-sectional<br>- Exposure: A variety of foods with 12 food groups<br>- Outcome: Stunting<br>- Analysis: Chi-square and logistic regression | - Dietary diversity was measured using the 24-hour withdrawal method. The results were calculated with the Household Dietary Diversity Score (HDDS) and were categorized as low if the HDD score was 1-5 food groups and high if the HDD score was 6-12 food groups.<br>- The child's height/length was measured lying on the back for children less than 24 months using an infantometer and measured standing for children aged 24 months and over with a precision of 0.1 cm in both measurements | There was no relationship between HDD and stunting categories (p-value= 0.409)   |

The advantage of this literature review was that it could formulate more deeply regarding the relationship between diversity and the incidence of stunting, which has been carried out in several studies both in Indonesia and outside Indonesia. The weakness of this literature review was that the studies studied came from various countries, so they have different characteristics, such as the type of food that was the basis for assessing food diversity. Then the research literature used two different approaches, the cross-sectional and case-control approaches to produce a further research analysis of each approach method. This research was limited to food diversity and did not explicitly discuss the frequency and quantity of the type of food consumed.

#### CONCLUSIONS

Based on the several studies described, out of 10 articles, six proved the relationship between dietary diversity and stunting, so this literature review study concludes that dietary diversity was related to stunting. The results of this study can be used as a reference for efforts to prevent and reduce stunting in toddlers by optimizing the availability of food diversity, especially in stunting locus areas.

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