Analysis of relationship between caries index and stunting in preschool children in Indonesia

Arsad Arsad | Muhammad Tahir | Akmal Hidayah | Fadli Fadli

Abstract A condition known as stunting results from a persistently low nutritional intake during the first 1000 days of life. It is characterized by a height based on age that is less than two standard deviations from the World Health Organization’s (WHO) median standard. There are two categories for stunting: short (Z Score < -2 SD) and very short (Z Score < -3 SD). Stunting results in a number of oral health issues, including delayed milk tooth eruption, atrophy of the developing salivary glands, reduced salivary flow, and an elevated risk of dental caries. The aim of this research is to analyze the relationship between the caries index and stunting in preschool children (3-6 years) in Indonesia. This research is a cross-sectional study with a sample of 98 children taken randomly in Sidenreng Rappang Regency, Indonesia. Determination of nutritional status based on anthropometric measurements, such as height and weight measurements based on age groups. The Decay Missing Filled-Teeth (DMF-T) examination is conducted by looking at teeth that are decayed, filled and missing. Furthermore, the severity of dental caries is categorized into low (DMF-T 0-2.6), medium (DMF-T 2.7-4.4), and high (DMF-T > 4.5) with data analyzed using the chi-square test. The results of measuring nutritional status showed that 78 children (79.6%) experienced stunting. There are 17 children (17.34%) with DMF-T scores in the low category, 7 children (7.11%) in the medium category, and 26 children (26.53%) in the high category. The results of bivariate analysis show p = 0.000 so that there is a significant relationship between stunting and the severity of dental caries in preschool children in Sidenreng Rappang Regency. It is necessary to increase health promotion efforts related to stunting and dental health through health education activities that involve the role of parents in choosing food intake and maintaining the cleanliness of children's teeth and mouths.

Keywords: DMF-T, dental caries, nutritional intake, stunting

1. Introduction

Stunting is a condition of malnutrition associated with chronic inadequate nutritional intake and is presented by height based on age less than -2 standard deviations (< -2SD) from the median standard of the World Health Organization (WHO) (Maulana et al., 2022). Toddlers aged 24-59 months are included in the nutritionally vulnerable group, which is classified as the group of people who are vulnerable or most easily suffer from nutritional disorders (Hayati et al., 2020). Linear growth disorders or stunting occur mainly in the first 2 to 3 years of life, and this is a reflection of the interaction effect between lack of energy intake and nutritional intake. The process of growth and development of primary teeth when a child is 2 years old will fully erupt properly, and the age of 5 years is the border age where milk teeth will start to fall out. Children’s cognitive development is a period when the brain will experience critical physical development and growth; if children experience nutritional problems such as inadequate nutritional intake, this can cause them to fail to grow in childhood or stunting and affect the tooth growth process (Ayuningtyas et al., 2018).

The prevalence of stunted children, as stated by the WHO, suggests that Indonesia is among the third highest countries in the Southeast Asia region (SEAR), with an average prevalence of 36.4% in 2005-2017. The prevalence figures obtained from the 2018 Basic Health Research (Riskesdas) data show that the prevalence rate of stunted children in Indonesia is 30.8%. Children who are stunted or do not grow normally may experience a number of oral health issues, including delayed milk tooth eruption, atrophy of the salivary glands, reduced salivary flow, and a higher risk of dental cavities (Kementerian kesehatan, 2018).

Dental caries is a chronic disease that occurs in hard tooth tissue and includes enamel, dentin and cementum; this disease is caused by enamel demineralization caused by bacteria found in plaque, which can ultimately lead to tooth damage and cavity formation (Ramdiani et al., 2020). In general, dental caries are influenced by four factors: host or tooth factors, agents or microorganisms, substrate and time (Ramdiani et al., 2020). The severity of caries in primary teeth can be assessed using a measurement indicator such as the def-t index (decayed, exfoliation, or filling) (Shabrina & Hartomo, 2020). The def-t
index is used to calculate the number of primary teeth experiencing caries. The dental caries score in children with malnutrition is higher because the salivary glands develop through atrophy, which causes saliva flow to decrease and subsequently reduces saliva buffering and self-cleansing, which in turn can increase the risk of dental caries (Setiawan et al., 2022).

The results of previous research showed that the def-t index in the group of children suffering from stunting was included in the very high category and corresponded to the highest percentage in the high and very high categories; thus, these findings are quite significant and were greater than the caries index of def-t in children with normal nutritional status (Large & Marshman, 2022). Therefore, it is necessary to conduct research to determine a caries index for stunted children using the def-t index and to determine the nutritional intake of stunted children. This study aimed to analyzing the relationship between caries severity and nutritional status in stunted children.

2. Materials and Methods

This research used a survey method with a cross-sectional approach. The sample in this study included 98 preschool children in the Sidenreng Rappang Regency. Body height was measured using a Microtoise stature meter. Then, a caries examination is conducted, which is recorded on the examination status card with the def-t index to determine the condition of the teeth and mouth, especially the amount of caries in the child.

Chi-square test analysis was used to examine the relationship between short nutritional status (stunting) and dental caries (DMFT) in preschool children. This research received an ethical certificate from the Research Ethics Committee of the Muhammadiyah Institute of Health and Science Technology - Sidrap.

3. Results

A total of 98 children were included, 8.20% and 56.10% of the respondents were aged 4 and 5 years, respectively. The average gender is male at 53.10%. It is also stated that boys are more susceptible to malnutrition than girls are. This may be due to the belief that boys finish breast milk more quickly than they should be when they are given MPASI earlier. As a result, boys feel hungry more easily, so that children will consume more MPASI. The less breast milk a child gets, the more vulnerable the child is to disease, which can hinder the child’s growth (Table 1).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Years</td>
<td>8</td>
<td>8.20</td>
</tr>
<tr>
<td>5 Years</td>
<td>55</td>
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<tr>
<td>6 Years</td>
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<td>35.70</td>
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<tr>
<td>Gender</td>
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<tr>
<td>Male</td>
<td>52</td>
<td>53.10</td>
</tr>
<tr>
<td>Female</td>
<td>46</td>
<td>46.90</td>
</tr>
</tbody>
</table>

Table 2 shows that 98 children were included in this study. A total of 79.60% of the respondents had stunted children, and 20.40% had not stunted children. Therefore, the stunted children in this study were more common. Therefore, this can influence the occurrence of dental caries by 23.47%, with DMF-T values in the low category, 14.29% in the medium category, and 41.84% in the high category.

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Caries Index</td>
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</tr>
<tr>
<td>Normal</td>
<td>20</td>
<td>20.41</td>
</tr>
<tr>
<td>Low</td>
<td>23</td>
<td>23.47</td>
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<tr>
<td>Medium</td>
<td>14</td>
<td>14.29</td>
</tr>
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<td>High</td>
<td>41</td>
<td>41.84</td>
</tr>
<tr>
<td>Category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>20</td>
<td>20.40</td>
</tr>
<tr>
<td>Stunting</td>
<td>78</td>
<td>79.60</td>
</tr>
</tbody>
</table>

The results of measuring nutritional status showed that 78 children (79.6%) experienced stunting, as shown in Table 3. There were 17 children (17.34%) in the low category, 7 children (7.114%) in the medium category, and 26 children (26.53%) in the high category. The results of bivariate analysis were p=0.000; thus, there was a significant relationship between stunting and the severity of dental caries in preschool children in the Sidenreng Rappang Regency. Therefore, it is necessary to increase health promotion efforts related to stunting and dental health through health education activities involving the role of parents in choosing food intake and maintaining the cleanliness of children’s teeth and mouths.
The prevalence of stunting begins to increase at the age of 3 months, after which the stunting process slows down when the child is approximately 3 years old. There are differences in the interpretation of stunting conditions between the two age groups of children. Children under 2-3 years old describe a process of failure to grow or stunting that is still ongoing or occurring. Moreover, children aged more than 3 years are considered to have experienced growth failure or stunted growth (Zulkarnain et al., 2022).

In this study, 8.20% and 56.10% of the respondents were aged 4 and 5 years, respectively. The average gender is male at 53.10%. It is also stated that boys are more susceptible to malnutrition than girls are. This may be due to the belief that boys finish breast milk more quickly than they should be when they are given MPASI earlier. As a result, boys feel hungry more easily, so that children will consume more MPASI. The less breast milk a child gets, the more vulnerable the child is to disease, which can hinder the child's growth.

Comparing with normal children, stunted children have a greater incidence of primary tooth caries. Research has shown that the average DCT caries index score in stunted children is 8.23, which is almost 3 times greater than the average score in normal children (3.3) (Rafisa et al., 2023). In line with previous research showing that the average def-t index score for stunted children is twice as high as that for normal children (Dewanti & Yani, 2022), this will influence anxiety in children and parents (Fadli et al., 2020). Stunted children who suffer from primary tooth caries have a mean level of moderate to high severity of caries, which is more common than a low severity. This is supported by research results that state that as many as 87% of stunted children have high caries rates and 13% have low caries rates. Other research has shown that 81.25% of children have high caries (Sheetal, 2013). Consistent with the preceding assertion, the study's findings also demonstrated that, of the stunted children in the Sidenreng Rappang Regency, 79.60% were unstunted and 20.40% were stunted. As a result, there were more stunted kids in this study. Consequently, this can have a 23.47% impact on the incidence of dental caries, with DMF-T values falling into the low, 14.29%, and high categories, respectively. The results of bivariate analysis were p=0.000; thus, there was a significant relationship between stunting and the severity of dental caries in preschool children in the Sidenreng Rappang Regency. Therefore, it is necessary to increase health promotion efforts related to stunting and dental health through health education activities involving the role of parents in choosing food intake and maintaining the cleanliness of children's teeth and mouths.

High levels of caries are associated with stunted children according to causal factors related to the first 1000 days of life (1000 FDL). This means that malnutrition in mothers and malnutrition in children before the age of 2 cause children to become stunted. Nutritional deficiencies during the first 1000 days of life also disrupt the growth and development of a child's primary tooth structure (Abdat & Chairunas, 2022). Therefore, the incidence of primary tooth caries in stunted children is greater than that in normal children. Malnutrition in children can interfere with the growth and development of primary tooth structure. The caries level in stunted children is greater than that in normal children (Cuong et al., 2022).

The reason why stunted children have a high caries index is the role of the host, which is correlated with the development of caries lesions. In the process of caries, the quantity of tooth-forming structures and hypoplasia can potentially cause the oral cavity atmosphere to become more cariogenic due to the increased demineralization of thin protective enamel and saliva, which play a very important role in self-cleaning. This finding proves that some stunted children generally exhibit caries in their posterior teeth, which are susceptible to caries due to deep pits and fissures, allowing food debris and bacteria to easily accumulate there (Yohana et al., 2022). Dental caries can disrupt a child's nutritional condition, possibly causing digestive disorders, difficulty eating and disorders. Therefore, there is a relationship between dental caries and nutritional status (Turton et al., 2022). Infection can cause a decrease in appetite and decreased absorption, which results in a decrease in micronutrients in the body. The incidence of infection that causes a decrease in appetite is related to the occurrence of dental caries. The consequences of dental caries include pain, which ultimately interferes with chewing function. Disruption of masticatory function affects an individual's nutritional intake and nutritional status. If nutritional status is disturbed, there is a risk of stunting.
The caries index in stunted children revealed that the def-t score was high, with the highest percentage being in the very high caries severity category. Stunted children also exhibit deficient nutritional intake, such as insufficient intake of vitamins, calcium, iron and protein. Calcium deficiency greatly affects the degree of dental caries in stunted children because calcium deficiency will affect linear growth if the calcium content in the bones is less than 50% of the content normal. Thus, there is a significant relationship between stunting and the severity of dental caries in preschool children in the Sidrapang Rappang Regency. Therefore, it is necessary to increase health promotion efforts related to stunting and dental health through health education activities involving the role of parents in choosing food intake and maintaining the cleanliness of children's teeth and mouths, especially calcium deficiency which greatly influences the degree of dental caries in stunted children.

Ethical considerations

This research was approved by the Ethics Committee of Muhammadiyah Sidrap Institute of Health Technology and Science (number: 094/EC/Kep/II.3. AU/F/2023) and takes into account the principles of the research process.

Conflict of interest

The authors declare no conflicts of interest.

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