

## Correlation between stunting children aged 6-7 years in term of nutritional status and the eruption of permanent first molar

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### ABSTRACT

**Introduction:** Stunting is one of the nutritional problems that occur in Indonesia. Stunting is a condition where height is not following age. Physical growth is often used as an indicator to measure nutritional status. Permanent first molars are the first to erupt and normally erupt at 6-7 years old. Nutrition plays an important role in the growth and development of children. Since nutrition is one of the factors that influence tooth eruption, this study aimed to analyse the correlation between stunting children aged 6-7 years in terms of nutritional status and the eruption of the permanent first molar. **Methods:** This research used observational analytic correlation with a cross-sectional approach. Sampling was done using the cluster random sampling method to select elementary schools and total sampling to select children. The research was conducted at three elementary schools in the Jatinangor region. The number of samples was 200 children. The samples were measured for height and examination of the eruption status of permanent first molars. **Result:** It was found that 42 children were stunted. 12 children had not erupted their permanent first molars at all. There were 36% stunted children aged 6 years and 64% children aged 7 years. The results of the analysis using the Spearman rank correlation test obtained a correlation coefficient with  $r=0.185$  and  $p\text{-value}=0.242$  which showed the very weak strength and positive direction of the correlation. **Conclusion:** There is no correlation between nutritional status and eruption of permanent first molars in stunting children aged 6-7 years in the Jatinangor region.

**Keywords:** nutritional status; stunting; tooth eruption; permanent first molar

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### INTRODUCTION

The growth and development of children are influenced by the nutritional status and health of the mother during pre-pregnancy, during pregnancy, and during breastfeeding. The first 1000 days of life is a sensitive period or window

of opportunity, which is calculated from 270 days for the fetus in the womb and 730 days for the life of the newborn.<sup>1</sup> During the early stages of child growth and development, good nutritional intake is required.<sup>1</sup> If at this time the child experiences nutritional problems, the consequences will be permanent and cannot be corrected.<sup>2,3</sup> WHO

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(World Health Organization) states that children's physical growth is characterized by increasing anthropometric measurements. Physical growth is often used as an indicator to measure nutritional status. This is influenced by the intake of nutrients consumed in the form of food.<sup>3</sup>

One thing that must be considered and cannot be ignored by parents, especially when the child is in a golden period of growth is nutritional status, in this case, the process of growth and development of the child's teeth. Nutrition is an important environmental factor influencing the eruption of primary teeth. The eruption of primary teeth can be delayed due to malnutrition.<sup>4,5</sup> Malnutrition in children not only causes delays in the eruption of primary teeth but also can cause the delayed eruption of permanent teeth due to delayed eruption of primary teeth.<sup>6</sup> Stunting and underweight children had a delayed eruption of permanent teeth compared to children of normal weight and height, while overweight children showed an accelerated eruption.<sup>7</sup> Delayed permanent tooth eruption may be one of the manifestations of chronic nutritional deficiencies, making it a valuable indicator of poor overall development in children.<sup>7</sup>

Data from the WHO, United Nations Children's Fund (UNICEF), and the World Bank in 2016 stated that there are 155 million children worldwide who are stunted.<sup>8</sup> Stunting is one of the nutritional problems that occur in Indonesia.<sup>9</sup> Multiple nutritional problems occur in Indonesia, where there is both excess and deficiency of nutrition. This has an impact on the decline in the quality of human resources and is one of the causes of death in Indonesia.<sup>10</sup> Based on the results of the 2010 Indonesian Basic Health Research (RISKESDAS) showed the prevalence of stunting at the age of 6-12 years according to height-for-age (TB/U) nationally was 35.6% consisting of 15.1% very stunted and 20.5% stunted. The results of the 2010 Riskesdas were conducted in West Java, there are 13.9% very stunted children aged 6-12 years and 20.3% stunted categories according to height based on age (TB/U). The results of the 2010 Riskesdas also showed that according to gender, the prevalence of stunting among boys was 36.5% higher than girls, namely 34.5%. The prevalence of stunting children living in urban areas is 29.3%, which is lower than that of children living in rural

areas, namely 41.5%. The prevalence of stunting seems to be getting lower with the increase in the education of the head of the household. The prevalence of stunting appears to be decreasing with increasing household economic status.<sup>11</sup> The latest Riskesdas results in 2018 stated that the stunting rate in children under five had decreased compared to 2013. However, the results of Riskesdas 2018 did not show the stunting rate in children aged 6-7 years.<sup>12</sup>

Stunting is a linear growth disorder caused by prolonged malnutrition during growth and development period, in which this condition shows a lower height based on age and gender than normal.<sup>13</sup> Improper nutritional intake has a visible impact on the growth pattern of children in general and in particular, that will be seen in the eruption of permanent teeth in the oral cavity. Lack of nutrient intake in stunting children can have an impact on delays in tooth eruption. However, excess nutrients will also have an adverse effect during tooth growth and development.<sup>4</sup> At the stage of growth and development of teeth, there are not a few cases of children who experience problems with tooth eruptions due to inadequate intake of nutrients. This can cause abnormalities in tooth growth and development.<sup>10</sup>

Data regarding the effect of nutrition on the eruption of permanent teeth are limited, especially in Indonesia. Permanent first molars are the first to erupt and normally erupt at the age of 6-7 years.<sup>14</sup> This permanent first molar is the largest of the teeth and is very important for stimulating jaw growth at an early age.<sup>14,15</sup> Our previous initial surveys in four elementary schools in Jatinangor region based on registry data from the teacher showed 30% of the total number of grade 1 children are stunted (preliminary study data). Jatinangor area is a developing rural area next to Bandung city of Indonesia. This condition may represent the study of the eruption of permanent first molars in stunting children in Indonesia. This study therefore, was aimed to analyse correlation between stunted children aged 6-7 years in term of nutritional status and the eruption of permanent first molars.

## **METHODS**

This research is an observational correlational

analytic study with a cross-sectional approach. The research was conducted from December 2019 to January 2020. The population in this study were all elementary school children in grade 1 aged 6-7 years in the Jatinangor area. The sample in this study were children who belonged to the stunting category at the age of 6-7 years at selected elementary schools in the Jatinangor area. Sampling was carried out by using a cluster random sampling method to select elementary schools and total population sampling for samples of elementary school children. The elementary schools selected were SDN Cipacing 1, SDN Mekarsari, and SDN Cibeusi as samples in this study. The minimum sample size was 38 children.

The inclusion criteria of this study were children aged 6-7 years, willing to be research subjects as evidenced by the signing of informed consent by the parents of children, and children who had a height-for-age Z-score <-2 SDS from WHO. The exclusion criteria of this study were children who had congenital disorders (such as Down's syndrome, cleft lip, and cleft palate), children who had hormonal disorders that interfere with tooth eruption, and children who were taking drugs for a long time.

The tools and materials used in this study were research information sheets, children data sheets, informed consent sheets signed by parents of children, dental eruption status forms, nutritional examination sheets for filling in the results of height and age measurements, microtoise for measure standing height, disposable dental inspection tools: sonde, tweezers, mouth mirrors, and excavators, disinfectants (70% alcohol), trays, towels, cotton roll, flashlights, masks, gloves, stationery and WHO AnthroPlus software, which uses the WHO Growth reference 2007.

The examination of nutritional status was measured using anthropometric measurements based on height-for-age. Data that has been filled in the form (name, gender, date of birth, height, and date of examination) were entered into WHO AnthroPlus software to get a standardized value (Z-scores) and obtain the nutritional status status of stunting (height-for-age Z-scores <-2) and normal (height-for-age Z-scores ≥-2). Stunting children were assigned to very stunted (height-for-age Z-scores <-3) and stunted (height-for-age Z-scores ≥-3 and <-2) to examine the eruption

status of their permanent first molars. The number of erupted permanent first molar teeth was scored by counting all permanent first molar teeth that had erupted, which was defined as any permanent tooth surface that had pierced the gingival. Data analysis used Spearman's correlation to examine the correlation between nutritional status and eruption of the first permanent molars. This research has been reviewed and approved by the Research Ethics Commission (KEP) Universitas Padjadjaran (No.1445/UN6.KEP/EC/2019).

## RESULTS

After assessing the nutritional status with height for age, it was found that 42 children were stunted. children who were stunted were then assessed for

Table 1. Characteristics of research respondents

Respondent characteristics	Frequency	%
<b>Gender</b>		
Male	18	43
Female	24	57
<b>Age</b>		
6	15	36
7	27	64
<b>Nutritional status</b>		
Stunted	42	0
Very stunted	0	100

the eruption status of their permanent first molars. Table 1 shows the characteristics of the research subjects. In this study, 42 children were stunted, of which 18 (43%) were male and 24 (57%) were female. There are more female stunted children than male stunted children. There were 15 stunted children aged 6 years (36%) and 27 children aged 7 years (64%). There were more stunted children aged 7 years than stunted children aged 6 years. All children have a stunted nutritional status and no children have very stunted nutritional status.

Table 2. Eruption status of permanent first molars against nutritional status in stunted children

Examined teeth	Nutritional status Stunted			
	Erupted	%	Had not erupted	%
16	18	42.86	24	57.14
26	21	50.00	21	50.00
36	26	61.90	16	38.10
46	26	61.90	16	38.10

Table 2 shows that children with stunted nutritional status are more likely to have erupted permanent first molars than those who have not yet erupted. The results showed that 12 children had not erupted their permanent first molars at all. In the maxillary first molars, 18 children had erupted teeth 16 and 24 children who had

not erupted. The same number of children who had erupted and had not erupted yet teeth 26, were 21 people. In the first molars, namely the lower jaw, the eruption status of tooth number 36 and tooth number 46 is the same, where tooth number 26 has erupted and child number 16 has not erupted.

Table 3. Eruption status of permanent first molars for gender in stunted children

Examined teeth	Gender							
	Male				Female			
	Erupted	%	Had not erupted	%	Erupted	%	Had not erupted	%
16	6	14.29	12	28.57	12	28.57	12	28.57
26	8	19.05	10	23.81	13	30.95	11	26.19
36	12	28.57	6	14.29	14	33.33	10	23.81
46	12	28.57	6	14.29	14	33.33	10	23.81

Table 3 shows that the eruption of permanent first molars in female children was faster than the male children. Stunted male and female children experienced more eruption of mandibular first molars than those of maxillary first molars. The mandibular first molars of teeth

36 and 46 had the same eruption status, namely 12 male children who had erupted and 6 who had not erupted. Besides that, 14 female children had erupted mandibular first molars, and 10 children who had not erupted. Eruptions were most seen in female children of mandibular first molars.

Table 4. Eruption status of permanent first molars against age in stunted children

Examined teeth	Age							
	6 years				7 years			
	Erupted	%	Had not erupted	%	Erupted	%	Had not erupted	%
16	5	11.90	9	21.43	13	30.95	15	35.71
26	8	19.05	7	16.67	13	30.95	14	33.33
36	8	19.05	9	21.43	18	42.86	7	16.67
46	8	19.05	9	21.43	18	42.86	7	16.67

Table 4 shows the eruption status of permanent first molars in stunting children aged in stunted children 6 and 7 years. The highest rate of eruption of molars was in children aged 7 years, namely the permanent mandibular first molars. Children aged 7 years have a higher eruption rate of permanent first molars than children aged 6 years. However, in the maxillary permanent first molars, namely teeth 16 and teeth 26, more

children who had not experienced tooth eruption were stunting children aged 7 years. In Children aged 7 years obtained there are 15 (35.71%) children who have not erupted teeth 16 and 14 (33.33%) children who have not erupted teeth 26. In children aged 6 years, it was concluded that 9 (21.43%) children who had not erupted teeth 16 and 7 (16.67%) children who had not erupted teeth 26.

Table 5. The results of the correlation between rank Spearman nutritional status and eruption of permanent first molars

	Correlation coefficient	p-value
Spearman rank correlation nutritional status with permanent first molar eruption	0.185	0.242

Table 5 shows the results of the Spearman rank correlation test using SPSS software. The correlation coefficient is 0.185 which is a very weak strength and positive direction of the correlation. However, the spearman rank correlation statistical test shows that the p-value is not significant.

## DISCUSSION

The results showed there was no correlation between nutritional status and eruption of permanent first molars in stunted children aged 6-7 years in the Jatinangor region (Table 5). There were more stunted children whose first permanent molars had erupted than those who had not yet erupted. This is appropriate with research conducted by Sukma et al.<sup>16</sup> which states that there is no correlation between nutritional status and third molar eruption. Collecting data in this study also through the cross-sectional method. Besides that, the results of this study also showed that the eruption of mandibular teeth was more than that of the maxillary teeth. However, in this study, researchers assessed the nutritional status of respondents based on BMI (Body Mass Index), namely BB/TB<sup>2</sup>.

Research conducted by Sitinjak et al.<sup>8</sup> also stated that there was no relationship between nutritional status and eruption of mandibular permanent first molars in children aged 6-7 years at SD Negeri 12 Manado. In this study, nutritional status was assessed based on BMI-for-age and height-for-age. The eruption status was rated by the eruption of mandibular first molars, namely teeth 36 and 46. The percentage of stunted children at SD Negeri 12 Manado was lower than the percentage of stunted children in this study, which was only 10%. The same thing was also found in this study that the number of female stunted children was more than male stunted children (Table 3).

Other studies presented that there was a correlation between nutritional status and tooth eruption. Research conducted by Lailasari et al.<sup>17</sup> stated that there is a relationship between nutritional status and the number of eruptions of permanent teeth in children aged 6-7 years in Tanjungsari District, Sumedang Regency. In this research in Tanjungsari, nutritional status was assessed based on BMI involving 57 respondents whose age was the same as this study, namely 6-7 years. This study not only examines the eruption status of permanent first molars but also examines the eruption status of permanent teeth as a whole. In this study, the number of male and female respondents was balanced, which was different from this study where the number of female

respondents was more. Other research conducted by Zakiyah et al.<sup>14</sup> stated that there was an effect of nutritional status on the eruption of permanent first molars in grade 1 elementary school children in the District Administrative City of Jember. In this study, the researchers took more samples and were male to homogenize the sample. This gender affects the eruption time of the child's teeth.

In this study, the results showed that stunted children experienced the normal eruption of teeth, only 12 children (28.57%) had not experienced permanent first molars eruption. This is unusual because many studies have stated that stunted children usually experience delays in tooth eruption due to lack of nutritional intake from the womb which interferes with the child's development. In this study, stunted children did not experience the delayed eruption of permanent first molars (Table 2). This is because tooth eruption is influenced by many factors. This study only assessed the factor of tooth eruption in terms of nutrition obtained from anthropometric measurements, namely the height of the children at one time (cross-sectional), so that the data shows the conditions at the time of research. Other factors such as genetics, preterm birth, socioeconomic conditions, hormonal and systemic abnormalities were not measured, so it is difficult to determine the factors most influencing the eruption of permanent first molars in stunting children.

The literature states that nutrition is a factor influencing tooth eruption, but the effect of nutrition on eruption is only 1%.<sup>8</sup> The biggest factor affecting tooth eruption was genetics, which was 78%.<sup>8,18</sup> The results in this study are in line with those conducted by Suresh et al.<sup>19</sup> In Chennai, India, which states that there was no relationship between nutritional status and the eruption time of a person's teeth. Research conducted by Majunatha et al.<sup>20</sup> In India states that the level of tooth calcification is more influenced by genetics. Genetic factors played a greater role in the eruption of permanent first molars in the respondents of this study.

This study shows the eruption of permanent first molars in girls is faster than in boys (Table 3). This is appropriate with research conducted by Marjianto et al.<sup>21</sup> Which states that in girls permanent teeth erupt more rapidly than boys. The faster eruption of permanent teeth in girls is



due to the faster onset of maturation compared to boys.<sup>21</sup> Contrary to this, there is research conducted by Verma et al.<sup>22</sup> which states that boys erupt earlier than girls, but the primary teeth in boys and girls are complete at the same time.

The first permanent teeth normally erupt at 6-7 years of age preceded by the eruption of the mandibular permanent first molars. This is consistent with this study, where the average child has experienced the eruption of permanent first molars. In children who had erupted permanent first molars, it was seen that the mandibular first molars erupt earlier than the maxillary first molars (Table 4). However, this is contrary to research conducted by Verma et al.<sup>22</sup> which stated that the eruption sequence of maxillary permanent first molars was faster than that of mandibular permanent first molars.<sup>22</sup>

Adequate nutrition is needed to achieve good growth and development. Food that is not good in quality and quantity will cause malnutrition.<sup>23</sup> Stunting occurs as a result of malnutrition and recurrent disease for a long time in the fetal stage until the first two years of a child's life.<sup>24</sup> The assessment of the nutritional status of stunting in this study used anthropometric measurements of the children's height and age. Other factors that influence the occurrence of stunting cannot be interpreted. Other data such as the child's height at birth, height, and occupation of parents, drugs that have been consumed, diseases that have been suffered, and whether or not they have been hospitalized cannot be used as a reference. Not all of the children data sheets that were distributed to parents were filled in by the children's parents. Response rate from parents in this study about 55%. Parents of children should be briefed in advance about the procedures for filling out the questionnaire so that researchers get complete and valid data.

Parents' education affects child development, especially the mother's education. Low maternal education has a risk of delays in child development because mothers do not know how to stimulate their child's development. Mothers with higher education are more open to receiving information from outside about good childcare practices, maintaining health, and children's education. Economic status is another factor that can affect the development of their children,

especially intelligence, perhaps due to family limitations in providing various play facilities so that children receive less stimulation.<sup>23</sup> It is necessary to do further research on other factors that support the occurrence of stunting in children that can interfere with child development. The limitation in this study is data sheets that were distributed to parents can't support the result of this study.

## CONCLUSIONS

There is no correlation between nutritional status and eruption of permanent first molars in stunted children aged 6-7 years in the Jatinangor region.

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