

Description of Permanent Teeth Eruption and Body Mass Index among Elementary School Children of 6 – 9 Years Old in Bandung City.

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Abstract

Background: The eruption time of permanent teeth is influenced by many factors, one of which is suspected to be nutrition. Nutritional status including deficiency or malnutrition is usually determined by using body mass index (BMI) which can affect the time and sequence of eruption of permanent teeth.

Research's aim: The aim of this study was to describe the BMI and the permanent teeth eruption among elementary school children of age 6 to 8 years old from 5 elementary schools in Bandung City.

Method: This research was a cross-sectional survey to assess an erupted and not erupted tooth among 228 participants comprised of 132 males and 96 females participants, and BMI data were gained by measuring the participant's body weight and height. The data obtained was analyzed by using SPSS v23.0.

Result: The majority of participants has a normal BMI with an average of 14 permanent teeth erupting and there is no difference between BMI and the number of permanent teeth eruptions among males and females participants. **Conclusion:** Statistical analysis shows that there is no significant correlation between BMI and permanent teeth eruption among elementary school children of age 6-8 years old in Bandung City.

Key word: tooth eruption; body mass index (BMI)

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I. Introduction

The prevalence of malnutrition in Indonesian children is high, based on National (Riskesdas) Data (2013) the thin prevalence in children with aged of 5-12 years is 11.2%. According to UNICEF (1998), there are two important factors that influence nutritional status, namely direct factors and indirect factors that are supported by another contributing factor which can affect nutritional status is that the level of food consumption.¹ According to WHO "Malnutrition is the cellular imbalance between the supply of the nutrients and the energy and the body's demand for them to ensure growth, maintenance, and specific functions". Malnutritional might affect tooth development because it will give an effect on the oral tissue as in other organ tissue.² Less intake of protein/ calorie and vitamin D/calcium phosphorus may evoke delayed permanent teeth eruption.³ Nevertheless, some previous researches provide the result remain conflicting. Some studies did not find any correlation between malnutrition and permanent teeth eruption, while others provide a significant relation between both.⁴

The timing and sequence of tooth eruption is a crucial factor in the maxillocraniofacial growth and development process for determining the age of the child. Tooth eruption is a continuous biological process in which the tooth grows outward in the jaw through the oral mucous so it will occupy the arch of upper jaw and lower jaw and finally contact each other. Some studies had shown that permanent tooth eruption will follow the exact sequence according to the age of the child starting from 5 to 13 years old of age except for third molar teeth that will begin to erupt at the age of 17 and 21 years old of age. There are various influence factors of teeth eruption are those genetic factor, hormonal, geographic, race, sex, economic status, nutrition, and growth factors.⁵

Focusing in nutrition, although it is known that it's influence on the process of growth and development of teeth remains unclear does not mean it does not give any effect. Nutritional deficiencies might give a lesser impairment on tooth growth and development compared to the growth and development of skeleton and other body systems, but there is an evidence that tooth maturity is affected by the environment, such as severe malnutrition. WHO determines malnutrition assessment by comparing body weight and height known as body mass index (BMI) that is adjusted for age. Several researches were conducted to study the relationship between tooth eruption time and body weight and height of children proved that the children who had body

weight and height below average had been shown to experience changes in eruption time compared to those who had body weight and height within the standard range.⁶

II. Method

The research examined the erupted and not erupted teeth of the students in 5 randomly selected schools in Bandung. A tooth was characterized of having erupted when any part of the crown was visible through the oral mucous and is defined as category 1 and not erupted tooth was categorized as 0.

Study Design :cross sectional study

Study Location : Bandung District, West Java, Indonesia

Study Duration :October 2017 to Desember 2018.

Sample size : 228 participants

Inclusion criteria:students of elementary school age 6 to 8 years old

Exclusion criteria:no history of systemic disease(s), and consented to participate in the study.

Procedure methodology.

The children's physical body development was assessed through anthropometric measurement. The weight was determined by weighing a child in kilogram using a digital weighing scale after removal of shoes and any overcoat. The height of the child was measured in meters and corrected to the nearest one decimal point when the child was standing while the back and knees were straight, and feet drawn together by using wall mounted tape measure.

Statistical analysis

The data were analyzed using statistical package for social science Inc. (SPSS) v23.0. The correlation test used the Spearman rank correlation with the following statistical hypotheses.

H₀: There is no significant correlation between BMI and permanent tooth eruption

H₁: There is a significant correlation between BMI and permanent tooth eruption

Test Criteria: Reject H₀ if p-value <0.05 and accept H₀ if p-value > 0.05.

III. Result

Descriptive analysis was used to obtain a description of the characteristics of the research sample and a general description of the research variables. Characteristics of the sample consisted of gender and age. The research variables consisted of BMI, and number of children's teeth eruption with a total of 228 children are included in the criteria comprised of 57.9% of boys and 42.1% of girls.

Table no 1 shows the number of children aged 6-7 years is 201 (88.2%) and the rest is between 8-9 years old.

Table no 1: Children's Characteristics

Characteristic	Number	Percentage (%)
Gender		
Male	132	57,9%
Female	96	42,1%
Age		
5-7 years old	201	88,2%
8-9 years old	27	11,8%
Total	228	100,0%

Table no 2 shows that the body mass index (BMI) category consists of very thin, thin, normal, overweight and obese. Based on the calculation results, it can be seen that the number of children who have normal BMI is 173, 11 children were very thin, 25 were included in thin, 15 were overweight, and 4 were included in the obesity criteria.

Table no 2: Body Mass Index (BMI)

BMI Category	Number
Very thin	11
Thin	25
Normal	173
overweight	15

Obese	4
Total	228

Table no 3 shows the total number of tooth eruptions of 228 children was 1253 with an average of 5.50 and the most number was 14 eruptions from one child.

Table no 3:Number of permanent teeth eruption.

	Number of permanent teeth eruption
N	228
Mean	5,50
Deviation Std.	3,64
Minimum	0,00
Maximum	14,00
Total of permanent teeth eruption	1.253

Based on gender, there is no difference between body mass index and the number of permanent teeth eruptions among boys and girls (table no 4). Although, body mass index and the number of permanent tooth eruptions in girls have a higher average than boys.

Table no 4:BMI and The Number of PermanentTeeth Eruption Based On Gender

Variable	Gender	
	Male (n=132)	Female (n=96)
BMI		
$\bar{x} \pm SD$	14,47±1,96	14,62±1,74
Min-Max	5,48-22,30	11,16-19,92
The Number Of Permanent Teeth Eruption		
$\bar{x} \pm SD$	5,21±3,53	5,89±3,77
Min-Max	0,00-14,00	0,00-14,00

Based on the calculation of correlation using the Spearman rank, the results show that correlation p values is above 0.05 (table no 5). Hence, there can be concluded that there is no significant relationship between BMI and permanent teeth eruption.

Tableno 5:Corelation of BMI and Permanent teeth eruption

Variable	Corelation	p-value
BMI <--> teeth eruption	0,108	0,103

Source : SPSS Output v23.0

Table no 6:Corelation of BMI and Permanent Teeth Eruption Based on Gender

Variable	Corelation	p-value
Male		
BMI <-->teeth eruption	0,103	0,239
Female		
BMI <-->teeth eruption	0,116	0,260

Source : SPSS Output v23.0

Based on analysis by using the Spearman ranking was obtained results that the p value is above 0.05 both in boys and girls (table no 6). Thus, the result may conclude that there is no significant relationship between BMI and permanent teeth eruption based on gender. In other word, there is no difference in the effect of gender on permanent teeth eruption because the correlation is almost the same.

IV. Discussion

Malnutrition might cause interference in the oral cavity in the form of anatomical, physiological, and pathological disorders. This situation in turn, may cause malnutrition as a result of a severe disturbance in the mastication function. This reciprocal relationship also applies to good nutritional condition that will promote good oral hygiene alternately. Malnutrition can alter homeostasis so that the oral cavity becomes more susceptible to various abnormalities, biofilm microorganisms, and decreases tissue healing ability, and may even affect oral cavity development. One form of malnutrition is protein-energy malnutrition (PEM), which is a state of protein and high-energy food deficiency related to body needs or both.⁷ Malnutrition is disturbance of the balance between the supply of nutrient and energy to the body's needs of it that will cellularly maintain the process of growth and development, maintenance and functioning of the body run normally. PEM consist of mild, moderate, and severe. A mild PEM occurs due to acute energy deficiency, moderate PEM arises as a result of protein deficiency and is chronic, meanwhile the severe PEM could be acute or chronic resulting from lack of protein and energy. This malnutrition that occurs during the process of growth and development might affect the structure of the oral cavity. Some cases of oral cavity disturbances are associated with deficiencies of some nutrients such as vitamin C, B, A, protein, and high-energy food. PEM and vitamin D deficiencies can result in delays of tooth eruption, tooth size and tooth enamel disorders, meanwhile vitamin A deficiency may cause impairment of tooth formation as a result of decreased epithelial tissue development.⁸

On the contrary, many study had showed that there is no direct correlation between malnutrition and teeth eruption process. This happens might be due to differences methods in conducting the research for example included and excluded variable, definition of nutritional status, race, gender, and type of the teeth, so there are many statement regarding correlation coefficients between dental development and nutritional status. Tooth eruption time is largely influenced by multifactorial which is strongly related to bone growth. As a result, factors that interfere bone growth such as chronic diseases, infections, or insufficient energy, protein, and lack of nutrition can also change the time of tooth eruption.⁴ The timing permanent tooth eruption are influenced by gender, racial, genetic and environmental factors. Some studies proved that permanent tooth eruption among female were more advance compared to those of male children, this condition related to sex maturity where the girls experience sex maturity more faster than the boys. In addition, the race has also been shown to provide a major role in the eruption of permanent teeth proving that genetic differences are the most influencing factor in eruption time.^{9, 10} On the other hand, there is another factor influencing permanent teeth eruption is that environmental factors including smoking during pregnancy, climate, circadian rhythms, fluoride intake, premature loss of deciduous teeth, systemic disease, nutrition, physical constitution, morphology of the craniofacial region, premature birth, and socioeconomic factors.⁹ Previous research on the effect of family on permanent tooth eruption by considering the size of the tooth, the speed of the calcification process, and the time needed for tooth movement, proved that genetic factors greatly affected the eruption of permanent teeth.¹¹

The results of this study contradicts some previous studies which stated that there was a closer relationship between nutritional status that is stated with BMI and permanent tooth eruption. This study shows that the correlation of BMI with permanent tooth eruption is not significant, it could be because the BMI range is not large enough, and the results of this study are similar to the study of Khan (2011) in Pakistani children which shows the results that no prediction for the permanent teeth eruption can be made based on BMI only.¹² Children who participated in this study generally have good nutritional status (173) so that eruption of permanent teeth also looks good according to the age of the child ie an average of 14 teeth both female and male. In the contrary, according to some statements permanent tooth eruption is closely related to gender. But in this case, other factors that are not less important, such as environmental, ethnic, and hormonal factors have influenced the results of the study. Thus, it can be assumed that the eruption of permanent teeth of each child is not only influenced by nutritional status but also depends on the population from which the child originates.⁹

V. Conclusion

This survey of elementary school children aged 6-9 years old in the city of Bandung showed that there is no correlation between the nutritional status of children that is stated with BMI and permanent tooth eruption. However, the nutritional status of children must still receive full attention because it will more or less affect the condition of the oral cavity, one of which is the permanent teeth eruption that is one of its elements.

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