# Characteristics of Dental Health, Dentomaxillar Growth and Body Mass Index in 3-6 years old Children in Yahya Kindergarten Bandung

Winny Yohana[1]*, Rosiliwati Wihardja[1]

1. Oral Biology Department, Dentistry Faculty of Universitas Padjadjaran, Bandung, Indonesia.

## Abstract

Dental caries is one of the most common dental health problems in children in Indonesia. Untreated caries can cause pain and discomfort during eating activities, so it will affect the body mass index (BMI). The purpose of this study was to determine of dental health with BMI, and dentomaxillary growth and development in children aged 3-6 years.

This study used a cross section method. Subjects were 103 children consisting of 54 boys and 49 girls from Yahya Kindergarten, Bandung. This study was a descriptive research using a survey technique with cross-sectional design. Physical examination such as body weight and height, TMJ condition and intra oral examination to determine dental health status and dentomaxillary growth and development were performed on the samples.

The results showed the average BMI of boys was 15.69 with average dental health status (def-t): 3.56. Average BMI in girls: 15.13 and average def-t: 2.38. Dentomaxillary growth and development were shown by malocclusion in 31 children (30.10%) consisting of 17 girls (16.51%) and 14 boys (13.59%). The most prevalent types of malocclusion were class 2, found in 17 children (16.51%). Crossbite was found in 9 children (8.73%), crowding 3 children (2.92%). Deep bite was seen in 2 children (1.94%). Fusion of teeth was found in 2 children (1.94%) and Temporomandibular disorder (clicking) was observed in 3 children (2.91%).

The conclusions of this study are, children aged 3-6 years have an average def-t of 3.15 while the average BMI is normal (15.53), 2 fusion of teeth (1.94%), 3 Temporomandibular disorder (2.91%) and 31 cases of malocclusion (30.10%),

## Introduction

According to WHO, dental and oral health are associated with general health.[1] Caries is a process of demineralization in hard tissue of the teeth and is followed by damage to its organic material. Factors affecting caries are the host, substrate, microorganism, and time. Dental caries can damage the teeth irrespective of age, culture, ethnicity, and socio-economics status.[2]

Dental caries is one of the most common dental and oral diseases found in the community. According to WHO the prevalence of dental caries in children in industrialized countries is 60-90% of the population.[3] Dental caries in children under five is estimated to be quite high and can cause pain and discomfort in eating activities, resulting in decreased appetite that can affect the body mass index.[4]

Nutrition is defined as food intake related to the body's need for nourishment.[5] Adequate nutrition includes the quality, quantity, and ability of the body to use it properly to meet the demands of the body's metabolism.[6] Adequate nutrition is vital for running the biochemical activities of a child's growth and nutrition. Nutritional deficiencies can affect overall body condition, since dental and oral health are interconnected with each other. [7] The nutritional status of children between the ages of 3 and 6 years old may be assessed using body mass index (BMI). The purpose of this study is to discover the association between dental health and BMI, and dentomaxillary growth and

*Corresponding author:*
Dr. Winny Yohana, drg., Pediatric Dentist;
Oral Biology Department,
Dentistry Faculty of Universitas Padjadjaran,
Bandung, Indonesia.
E-mail: winny.yohana@fkg.unpad.ac.id

development in children aged 3-6 years old at Yahya Kindergarten in Bandung, Indonesia.

## Materials and methods

This was a descriptive research employing a customized survey. There were 103 children, consisting of 54 boys and 49 girls. Various examinations including body weight and height; temporo-mandibular examination; intra-oral examination to determine dental health (def-t), occlusion, fusion of teeth and clicking were performed. Nutritional status was assessed based on the BMI. This study categorized the BMI into 3 groups: underweight, normal and overweight. The data were then tabulated and analyzed.

## Results

| Gender | Frequency | Percentage (%) |
|--------|-----------|----------------|
| Boy | 54 | 52.43 |
| Girl | 49 | 47.57 |
| Total | 103 | 100 |

**Table 1.** Sample distribution based on gender.

| Category | Frequency | Percentage (%) |
|----------|-----------|----------------|
| underweight | 12 | 11.6 |
| Normal | 78 | 75.8 |
| overweight | 13 | 12.6 |
| Total | 103 | 100 |

**Table 2.** Characteristics of nutritional status.

| Gender | Minimum | Maximum | Average |
|--------|---------|---------|---------|
| Boy | 0 | 11 | 3.56 (±3.98) |
| Girl | 0 | 15 | 2.38 (±4.19) |
| Total | 0 | 15 | 3.15 (±3.89) |

**Table 3.** Average of dental health status (def-t) in boy and girl

Table 1 describes the demographic characteristics of the study. The samples consist of 103 children: 54 boys (52.43%) and 49 girls (47.57%). Table 2 describes the nutritional status of the children in the study. In general, children between the ages 3-6 years old have normal BMI 78(75.8%); 12 children are underweight (11.6%), and 13 children are overweight (12.6%). Table 3 shows that the average dental health status of the boys is higher (worse) dan the girls.

Table 4 shows the average def-t of 2.15 is found among overweight children, which is the lowest def-t in the overall sample. While

underweight children and those of normal BMI have average def-t values of 3.58 and 3.35 respectively, 46 children are free from caries. Table 5 shows that out of 78 children with normal BMI, 41.03% have very low def-t values, 12.82% have low def-t, 11.54% have medium def-t and 34.61% have high def-t values, indicating poor oral health.

| Category | Minimum | Maximum | Average |
|----------|---------|---------|---------|
| underweight | 0 | 9 | 3.58 |
| Normal | 0 | 9 | 3.35 |
| overweight | 0 | 15 | 2.15 |
| Total | 0 | 15 | 3.15 |

**Table 4.** Average of dental health status (def-t) in each category BMI.

| def-t | Frequency | Percentage (%) |
|-------|-----------|----------------|
| 0-1,1,1 | 32 | 41.03 |
| 1,2-2,6 | 10 | 12.82 |
| 2,7-4,4 | 9 | 11.54 |
| 4.5 > | 27 | 34.61 |
| Total | 78 | 100 |

**Table 5.** Characteristics of dental health status (def-t) in normal BMI.

| Category | Age (year) | Gender | BMI |
|----------|-----------|--------|-----|
| Fusion of 61-62 | 3 | Girl | 13.88 |
| Fusion of 81-82 | 5 | Girl | 12.46 |

**Table 6.** Characteristic of dental anomalies.

| Category | Age(year) | Gender | Caries | Malocclusion | BMI | Bad habit |
|----------|-----------|--------|--------|--------------|-----|-----------|
| Clicking | 3 | Girl | free | Class 2 | 13 underweight | Thumb sucking |
| Clicking | 5 | Girl | free | Class 1 | 12.46 underweight | Thumb sucking |
| Clicking | 5 | Boy | 4 | Class 1 | 11.79 underweight | Thumb sucking |

**Table 7.** Characteristic of temporomandibular disorder.

Table 6 shows dental anomaly, namely fusion of teeth 6.1-6.2 (girl, 3 years old) and fusion of teeth 8.1-8.2 (girl, age 5 years), are found in 2 children (1.94%). Table 7 shows the characteristics of tempero mandibular disorder (TMD), 3 children have clicking related to bad habits; thumb sucking, underweight BMI, and malocclusion, namely there are 2 children with class 1 malocclusions, and 1 child with class 2 malocclusions. The prevalence of TMD is 3 (2.91%), while another research mentioned that the prevalence of TMD in children is around 6%.[8,9]

Table 8 shows that 31 children (30.10%) have malocclusion, consisting of 17 girls (16.51%) and 14 boys (13.59%). The commonest type of malocclusion is class 2 malocclusion (16.51%) reported in equal numbers of boys and girls. Crossbite is found in 9 children (8.73%), comprised of 7 girls and 2 boys. Crowding is found in 3 children (2.92%), comprised of 2 boys and 1 girl. Deep-bite is found in 2 boys (1.94%).

| Category | Frequency | Precentage |
|---|---|---|
| Total | 103 | 100 |
| Normal Occlusion | 72 | 69.90 |
| Malocclusion (n=31) | 31 | 30.10 |
| Girls | 17 | 16.51 |
| Boys | 14 | 13.59 |
| Type of Malocclusion | | |
| Crowding | 3 | 2.92 |
| Crossbite | 9 | 8.73 |
| Protrusion (class 2) | 17 | 16.51 |
| Deepbite | 2 | 1.94 |

**Table 8.** Characteristic of malocclusion.

**Discussion**

The sample of the study were 103 children consisting of 54 boys and 49 girls from Yahya Kindergarten, Bandung, aged 3-6 years. The results of this study show the average def-t in children aged 3-6 years is 3.56 (± 3.98) (table 2). This means that a child aged 3-6 years has around 1-7 teeth with caries. The reason for this condition is that the children aged 3-6 years in Yahya Kindergarten are still lack of awareness in carrying out dental treatment for caries. Prevention is deemed important to prevent worse condition of the oral and dental health of these children. [10,11]

Table 2 shows the BMI distribution and in general, children between the ages 3-6 years old have normal BMI 78 (75.8%), 12 (11.6%) are underweight, and 13 are overweight (12.6%). This result is consistent with the outcomes of the Indonesian Basic Health Research (RIKERDAS) in 2013, that the majority of Indonesian children have normal nutritional status (70%).[12] About BMI results, the average nutritional status of boys: 15.69 (± 2.38) with an average dental health status (def-t): 3.56 (± 3.98). Average nutritional status in girls: 15.13 (± 2.38) and average dental health status (def-t): 2.38 (± 4.19). The overall result of this study is that children 3-6 years old have an average dental health status (def-t) of 3.15 (± 3.89), while the average BMI is normal 15.53 (± 2.45). The highest nutritional status is found in girls: 24.07 with free caries, and the lowest nutritional status is also in girls: 11.45 with 9 caries. The highest dental health status (def-t) is found in boys: 15, while the condition of free caries is found both in boys and girls as many as 46 people (44.66%).

The results of this study also show that there are differences of def-t between the BMI group. The group of children who are underweight have higher def-t if compared to normal weight and overweight. This is reliable with a study by Benzian (2011), saying that children with caries have high risk in decreasing BMI.[13] Toothache will cause difficulties in chewing all the desired food. If this situation is allowed to continue, it will interfere with nutrient intake. Poor nutritional intake will affect the weight of the children, and low BMI will become the consequence.[12]

The children who are underweight have higher def-t (table 4), this result is in accordance with research by Mohamadi's (2012), saying that children with growth and development of the body may be related to dental health, diet and metabolic factors.[14] Children with many dental cavities will suffer from poor mastication, than food is difficult completely absorption in the intestine. If this condition is allowed to continue, it will less nutrient and interfere metabolism. Table 3 shows that boys have worse dental health status (def-t) than girls, meaning that girls have better dental health status than boys. In this study it is seen that girls have lower caries than boys, probably because girls are more obedient to parents, and have concern for appearance. When they realize that their teeth have holes, they try to convey them immediately to their parents. This research is in accordance with the study of Mamai et al. 2016 that girls have lower caries than boys, because girls mature quicker than boys and have concerns for appearance.[15] The results of the study are not in accordance with Shafer's study, which found that both girls and boys had the same average dental health status (def-t).[16] Girls are more compliant and concerned about their appearance. Thus, when they realized they had cavities, they would notify their parents immediately.

As seen in table 4, children 3-6 years old with overweight BMI, have dental health status (def-t) 2.15 where this is the lowest def-t ratio compared to other nutritional status. In normal BMI, dental health status (def-t) is 3.35, while children who have underweight nutritional status have def-t 3.58. Furthermore 12 children with underweight nutrition had an average deft of 3.58, but there are also 5 underweight children who have free caries. A total of 78 children with normal nutrition (BMI) have an average caries of 3.35, but there are 30 children who have normal nutritional status with free caries. There are 13 children who have overweight BMI and have def-t 2.15, nevertheless there are 9 people who have free caries. It can be seen that there is a relationship between caries and BMI, the greater BMI, the smaller def-t. This suggest that there may be an inverse relationship between caries and BMI.

Dental anomalies found in this study is fusion of teeth 61-62 in girls of age 3 years old, and fusion of teeth 81-82 in girls of age 5 years old, so the prevalence is found in 2 children (1.94%). Fusion of primary teeth is prevalent in primary dentition with the incisors being more affected and is usually incomplete and results in a large tooth crown. The prevalence of fusion teeth is apparently in accordance with the study of Acikel et all, that in the caucasian race the prevalence of fusion teeth in primary teeth is 0.1-1.6% .[17] Temporomandibular disorder is found in 3 children (2.91%). The form of the disorder is clicking. This clicking is related to bad habits such as thumb sucking, underweight BMI, and malocclusion. 2 children with clicking have class 1 malocclusion, and 1 child with class 2 malocclusion. According to another research, the prevalence of temporomandibular disorder in children is around 6%. [9, 11]

In the primary teeth that have proximal caries, tooth migration can occur from the posterior to the anterior where this may be due to the anterior force component of occlusal force.[18] This suggests that the growth and development of bone in children is disturbed due to reduced tooth contact as an anchorage space in occlusion. Malocclusion may be caused by bad habits such as thumb sucking, nail biting, use of pacifiers and biting into objects. If the primary teeth are free of caries, there is little chance of malocclusion. However, in this study, among

those free from caries, 7 children (6.80%) have malocclusion. This suggests that the malocclusion may have been hereditary (class 3: 4 girls, class 2: 2girls, 1 boy). This is in agreement with the expert opinion that the etiology of malocclusion is genetics.[19]

## Conclusion

The conclusion of this study is that 3-6-year old children have average dental health status (def-t) of 3.15 (± 3.89), while the average BMI is normal 15.53 (± 2.45), fusion teeth 2 (1.94%), Temporo mandibular disorder 3 (2.91%), and dentomaxillary growth and development which is shown by malocclusion is 31 (30.10%),

## Acknowledgements

The article is original, it has never been published before.

## Declaration of Interest

The authors confirm that there are no known conflict of interest associated with this publication.

## References

1. Petersen PE. World Health Organization Global Policy for Improvement of Oral Health World Health Assembly. 2007. Int Dent J.2008;58: 115-21
2. Pitts N., Zero D., Marsh P., Ekstrand K. Dental Caries. Nat Rev Dis Primers. 2017 May 25;3:17030. Doi:10. 1038/nrdp.2017.30
3. Tafere Y., Chanie S., Dessie T., Gedamu H. Assessment of Prevalence of Dental Caries and the Associated Factors among Patients Attending Dental Clinic in Debre Tabor General Hospital: a Hospital- Based Cross-Sectional tudy. BMC Oral Health. 2018; 18:119 doi:10.1186/s12903-018-0581-8
4. Duijster D., Sheiham A., Hobdell H M., Itchon G. Monse B. Association between Oral Health- Related Impact and Rate of Weight gain after Extraction of Pulpal Involved Teeth in Underweight Preschool Filipino. BMC Public Health 2013; 13: 533 doi:10.1186/1471-2458-13-533
5. WHO. 2016. Available in http://www.who.int/topics/nutrition/en
6. Steegeman, CA., Davis, JR. The Dental Higienist's Guide to Nutritional. 2015. 4th ed. Missouri: Elsevier 4,234-8
7. Lifshitz F., Nutrition and Growth. J Clin Res Pediatr Endocrinol. 2009 Jun;1(4): 157-63
8. Sena MF, Mesquita KS, Santos FR., Silva FW., Serrano KV. Prevalence of Temporo Mandibular Dysfunction in Children and Adolescents. Rev Paul Pediatr J. 2013 Dec; 31(14):538-45 doi: 10.1590 /S0103-05822013000400018
9. Minghelli B., Cardoso I., Porfirio M., Goncalves R., Prevalence of Temporo andibular Disorder in Children and Adolescents from Public Schools in Southern Portugal. North American Journal of Medical Sciences. 2014;6(3): 126-32. Doi:10.4103/1947-2714.128474.

10. Taufan B., Yayi SP., Udjijanto T.,Djauhar I. Mother's Belief their Children's Dental Health as a Potential Predictor of Mother's Dental Health Attitude for Early Childhood. Journal of International Dental and Medical Rerearch. 2018;11(3):955-9

11. Risqa RD., Anton R, Peter A, Febriana S, Melissa A, Diah AM. The Behavior Change on Brushing Teeth of Children by Mothers Using a Periodic Dental Health Evaluation Card. Journal of International Dental and Medical Rerearch. 2016;9(273-81)

12. Kemenkes. Riset Kesehatan Dasar. Badan Penelitian dan Pengembangan Kesehatan: Kementrian Kesehatan RI Bakti Husada. 2013

13. Benzian H, Monse B, Weltzen RH, et al. Untreated Severe Dental Decay: A Neglected Determinant of Low Body Mass Index in 12-year-old Filipino children. BMC Public Health 2011; 11(558): 1-10

14. Mohammadi TM, Hossienian Z, Bakhteyar M. The Association of Body Mass Index with Dental Caries in an Iranian Sample of Children. JOHOE/Spring 2012;1(1): 29-35

15. Mamai-Homata E, Koletsi-Kounari H, Margaritis V. Gender Differences in Oral Health Status and Behavior of Greek Dental Students: A Meta-Analysis of 1981, 2000, and 2010. *J Int Soc Prev Community Dent.* 2016;6(1):60–68. doi:10.4103/2231-0762.175411

16. Shaffer JR., Leslie JE., Feingold E., Govil M., McNeil WD., Crout JR. et al. Caries Experience Differs Between Females and Males across Age Group in northern Appalachia. International J of Dentistry. 2015 Article ID 938213, 8 pages http://dx.doi.org/10.1155/2015/938213

17. Acikel H., Ibis S., Tunc SE. Primary Fussed Teeth and Findings in Permanent Dentition. Med Princ Pract. 2018 May, 27(2): 129-132. Doi:10.1159/000487322

18. Sarmad S. Al Qassar S., Mavragani M., Psarras V., Halazonetis J. The Anterior Component of Occlusal Force Revisited: Direct Measurement and Teoritical Considerations. Europan Journal of orthodontic 2016. 38(2).

19. Uribe LMM., Miller SF. Genetics of Dentofacial Variation in Human Malocclusion. Orthod Craniofac Res. 2015 Apr; 18(01):91-99. Doi: 10.1111/ocr.12083