
Correlation between the Severity of Dental Caries and Nutritional Status of in-School-Age Children of SD Negeri Tidung Makassar

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Abstract

Dental caries is a major problem of oral health and a common chronic disease which happens in childhood. School age children are nation's future generation and capital development. Therefore, the health condition of school-age children must be improved. One of the health effort is by improving nutrition in elementary school-age children. Nutritional status and nutrient intake are important for oral and dental health because nutrition such as vitamin A and D, calcium, phosphorus, fluoride have effects on morphology, composisiton and tooth eruption patterns. These factors will determine the susceptibility of teeth to dental caries. The aim of this study was to determine correlation between the severity of dental caries and nutritional status of in-school-age children of SD Negeri Tidung. This study was a descriptive observational study with a cross-sectional design and involved 189 samples with a simple random sampling method. The severity of dental caries was measured by Decayed Missing Filling-Teeth index and nutritional status was measured using the anthropometric standard of Indonesian Ministry of Health. The result of this study is "normal" nutritional status has the highest percentage of 64% or as many as 121 samples. While the severity of dental caries "very severe" has the highest percentage of 24.3% or as many as 46 samples. From the results of statistical test using Sperman's RHO test, shows that R-value was -0.074 and p-value was 0.312 which means that there was no significant correlation between dental caries severity and nutritional status in students of SD Negeri Tidung Makassar, both boys, girls, and overall students.

Keywords: Dental caries severity; nutritional status; in-school-age children.

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1. Introduction

Oral and dental health is often not a priority for some people, even though teeth and mouth are the entry gate for food that is needed for health and other things that can disrupt the health of other organs. Nutritional status is a condition resulted from a balance between the intake and absorption of nutrients in the body. Nutritional status can be affected by balanced macronutrient and micronutrient nutrient intakes [1]. Based on the research of Riskesdas 2013, the nutritional status of children aged 5-12 years showed that national prevalence of “underweight” (according to BMI/U) in children aged 5-12 years was 11.2%, consisting of 4.0% “severe underweight” and 7.2% “underweight”. Nutritional status of “severe underweight” is lowest in Bali (2.3%) and highest in East Nusa Tenggara (7.8%). Nationally, problem of overweight in children aged 5-12 years is still high at 18.8%, consisting of “overweight” 10.8% and “obesity” 8.8%. The lowest “overweight” prevalence is in East Nusa Tenggara (8.7%) and the highest in DKI Jakarta (30.1%) [2]. Dental caries is one of the major problem of oral diseases. It is a multifactorial disease which is related to oral hygiene, dietary patterns, fluoride intake and socioeconomic status [3]. One of the most related to dental caries is cariogenic food intake, unbalanced dietary patterns and nutrient intake [4]. Under nutrition in childhood can affect skeletal growth and decreased in height. In addition, poor nutrition in childhood can affect delayed tooth eruption and dental caries [5]. The correlation between nutritional status and dental caries has not been thoroughly investigated and because of the strongly related nutrition to dental caries, so this study was conducted to determine the correlation between caries severity and nutritional status in elementary school students in SD Negeri Tidung Makassar.

2. Materials and Methods

2.1. *Description of the Study Area*

This study was a descriptive observational study with a cross-sectional design using simple random sampling method. The study was conducted on students of SD Negeri Tidung Makassar for five months, starting from April to August 2017.

2.2. *Population and Sample*

Population of this study was 358 people, the sample in this study was 189 samples obtained by using the Slovin formula with the intention that the results can be representative and limited funds can be overcome effectively and efficiently without reducing the quality of study results.

2.3. *Collecting Data and Procedure Intervention*

The study was conducted by assessing nutritional status by measuring height using microtoise and weight using digital scales. Then the calculation of nutritional status is done by using the Zscore IMT/U value [6].

2.4. *Data Analysis*

To obtain IMT scores, can use the formula below:

IMT= (Weight (kg))

(Height(m) x height (m))

Classification indicator of IMT/U :

- Severe underweight : Zscore <-3.0
- Underweight : Zscore \geq -3.0 s/d < -2.0
- Normal : Zscore \geq -2.0 s/d \leq 1.0
- Overweight : Zscore > 1.0 s/d \leq 2.0
- Obesity : Zscore > 2,0

Then students who had been measured their nutritional status were examined for dental caries by assessing the severity of caries using the DMF-T index [7]. Components of DMF-T are :

- Decayed (D) is tooth with caries which can be filled include tooth with secondary caries. Decay is assessed with dental explorer.
- Missing (M) is losing tooth or tooth with indication of extraction both causes by caries or periodontal diseases. Not include tooth missing because of orthodontic treatment, impaction, unerupted tooth, congenitally missing or avulsion.
- Filling is tooth which is already filled without secondary caries.
- DMF-T scores by adding D + M + F scores
- Mean DMF-T scores is obtained by adding total DMF-T scores and divided into total person.

Table 6: Categorization DMF-T (WHO)

DMF-T scores	Severity of dental caries
0,0 – 1,1	Very mild
1,2 – 2,6	Mild
2,7 – 4,4	Moderate
4,5 – 6,5	Severe
6,6 >	Very severe

After the results was obtained, then the data was recorded and analyzed using statistical package for social science (SPSS) version 20.0 for Windows. Statistical test is performed using the correlation test using the Sperman's RHO test and the results was processed and tabulated. Significance was set at $p < 0.05$ (significance level at 95%).

2.5. Ethical consideration and clearance

Ethical clearance was obtained from Health Research Ethics Committee of Health Polytechnic Makassar. A written consent was obtained from respondents before filling out the questionnaire and dental examination..

3. Results

The total respondents who participated in this study were 189 people, with total of boys was 100 (52.9%) and girls was 89 (47.1%). This can be seen in:

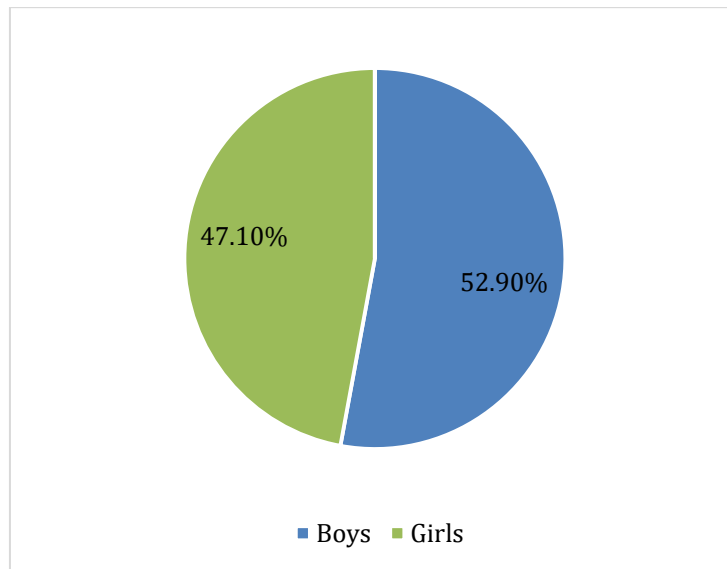


Figure 1: Diagram of the characteristics distribution of respondents by sex

Table 1: Frequency Distribution of Nutritional Status in Students of SD Negeri Tidung

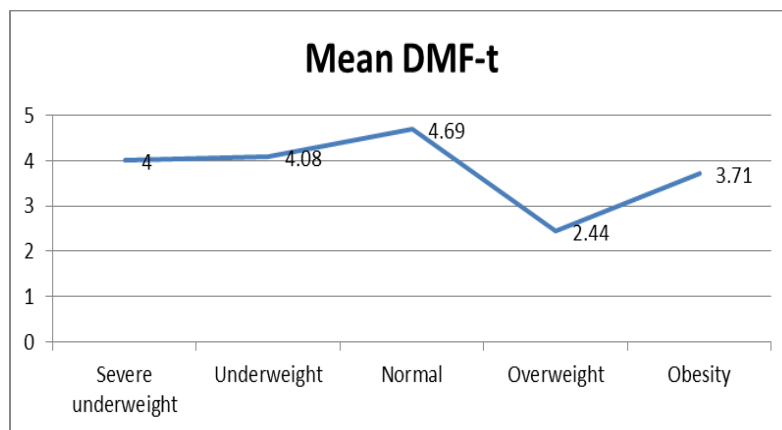
Nutritional Status	n	%
Severe underweight	3	1.5
Underweight	12	6.3
Normal	121	64.0
Overweight	32	16.9
Obesity	21	11.1
Total	189	100

Based on Table 1, it can be seen that “normal” nutritional status has the highest percentage of 64.0% or 121 respondents, then “overweight” nutritional status is 16.9% or as many as 32 respondents, followed by “obesity” nutritional status of 11.1% or as many as 21 respondents, then “underweight” nutritional status of 6.3% or as many as 12 respondents, and “severe underweight” nutritional status has the lowest percentage that is equal to 3 respondents.

Table 2: Frequency Distribution of Caries Severity in Students of SD Negeri Tidung

Nutritional Status	n	%
Very mild	37	19.6
Mild	28	14.8
Moderate	43	22.8
Savere	35	18.5
Very savere	46	24.3
Total	189	100

Table 2 shows that the severity caries of “very severe” has the highest percentage that is 24.3% (46 respondents), while the severity of caries “mild” has the lowest percentage that is 14.8% (28 respondents).

**Figure 2:** Graphic Distribution Mean DMT-t and Nutritional Status in Students of SD Negeri Tidung Makassar

On graphic 2, nutritional status “severe underweight” has mean DMF-t 4, nutritional status “underweight” has mean DMF-t 4.08, nutritional status “normal” has mean DMF-t 4.69, while nutritional status “overweight” has mean DMF-t 2.44 and “obesity” has mean DMF-t 3.71.

Table 3: Correlation between DMF-t and Nutritional

Nutritional Status	n	Mean DMF-T	<i>p-value</i>
Severe underweight	1	8	0.811*
Underweight	8	4.6	
Normal	58	4.5	
Overweight	13	4.8	
Obesity	9	4.0	
TOTAL	89	25.9	

Status in Girls of SD Negeri Tidung Makassar

*Spearman's RHO correlation test: $p < 0.05$ = significant

Correlation between DMF-t and nutritional status of girls in SD Negeri Tidung Makassar are obtained p-value 0.811 which means that there was no significant correlation between DMF-t and nutritional status in students of SD Negeri Tidung Makassar based on correlation test by Spearman's RHO test as shown on table 3.

Table 4: Correlation between DMF-t and Nutritional Status in Boys of SD Negeri Tidung Makassar

Nutritional Status	n	Mean DMF-T	p-value
Severe underweight	2	2	0.312*
Underweight	4	3	
Normal	63	4.83	
Overweight	19	3.11	
Obesity	12	3.50	
TOTAL	100		

*Spearman's RHO correlation test: $p < 0.05$ = significant

Based on correlation test using Spearman's RHO test as shown on table 4, correlation between DMF-t and nutritional status in boys of SD Negeri Tidung Makassar was obtained p value 0.312 which means that there were no significant correlation between DMF-t and nutritional status of boys in SD Negeri Tidung Makassar.

As shown on table 5, correlation between DMF-t and nutritional status in students of SD Negeri Tidung Makassar was obtained p-value 0.312 which means that there were no significant correlation between DMF-t and nutritional status in students of SD Negeri Tidung Makassar.

Table 5: Correlation between DMF-t and Nutritional Status in Students of SD Negeri Tidung Makassar

Nutritional Status	n	Mean DMF-T	p-value
Severe underweight	3	4	0.312*
Underweight	12	4,08	
Normal	121	4,69	
Overweight	32	2,44	
Obesity	21	3,71	
TOTAL	189		

*Spearman's RHO correlation test: $p < 0.05$ = significant

4. Discussion

The study about correlation between nutritional status and severity of caries in students of SD Negeri Tidung Makassar was carried out. Sample was taken using simple random sampling method. The severity of caries

“very severe” has the highest percentage while the severity of caries “very mild” has the lowest percentage. This may occur because of cariogenic intake of food and high score of tooth decay is strongly associated with an unbalanced dietary. Cariogenic food such as candies, ice cream, chocolate, and biscuit can cause dental caries. The nature of cariogenic foods are high in carbohydrates, sticky, and easily destroyed in mouth. Correlation between carbohydrates intake and dental caries has association with plaque formation in tooth surface. Plaque which formed from food scraps attached to the teeth will be overgrown with bacteria that convert glucose into acid so that oral PH decreases into 4.5. In that condition, tooth enamel structure will dissolve. In addition, frequency of consuming cariogenic foods is also one of the significant contributors to dietary. Acid from food will decrease oral pH which causes demineralization in tooth enamel. Beside that, higher frequency of consuming cariogenic food will cause more demineralization instead of remineralization. This unbalanced condition will cause dental caries [8]. In this study, the highest mean DMF-t was found in children with nutritional status “normal”, followed by nutritional status “underweight”, nutritional status “severe underweight”, nutritional status “obesity”, and “overweight”. The result showed that correlation between nutritional status and caries in children is far more complex than its dietary intake. A study showed that caries on primary teeth has association with early childhood with poor nutrition. Nutrition such as vitamin A and D, calcium, and phosphorus and fluoride have effects on morphology, composisiton and tooth eruption patterns. These factors will determine the susceptibility of teeth to dental caries [5]. Beside that, dental caries is a multifactorial disease which is related to oral hygiene, bacteria, food, fluoride intake, and socioeconomic status [3, 9]. Based on the correlation test using Sperman's RHO test showed that the correlation between severity of caries and nutritional status of students in both girls and boys and overall students in SD Negeri Tidung Makassar obtained $p\text{-value} > 0.05$ indicating that there was no significant correlation between severity of caries and nutritional status in students of SD Negeri Tidung Makassar. These results are in line with the research conducted by Sharma S and his colleagues 2014 in India which showed that there was no association between dental caries scores and BMI according to age in children and study conducted by Swaminathan (2019) that found no association between BMI-for-age and dental caries in children [10]. This is supported by a study conducted by Xavier A and his colleagues 2013 in preschool children in Brazil who obtained an insignificant correlation between dental caries through components of DMT-t and nutritional status through BMI component. However, this is not in line with the research conducted by Willerhausen B and his colleagues 2007 in Germany showing an association between BMI and the frequency of dental caries in deciduous teeth, which resulted in a decrease in caries-free percentage with increased BMI, in which 44.6% of children underweight experiencing caries-free, 40.7% of babies with normal weight, and 31.7% of children are obese [11]. The difference in results may occur due to different sample populations from specific populations. In addition, dental caries is a multifactorial etiology, which is the presence of several factors that cause the formation of caries lesions such as host factors, agents or microorganisms, substrate or diet and time factors. Early caries can occur if all four factors exist and interact with each other. The relationship between nutritional status and dental caries is still not known with certainty. However, studies showed that malnutrition during tooth development can increase the susceptibility of teeth to caries due to defects in tooth formation (deciduous or permanent), delayed eruptions, and disturbances of salivary glands [12, 13]. However, this still needs further investigation. Because the severity of caries in students of SD Negeri Tidung Makassar was still very high, it is necessary to have dental health education regarding oral hygiene, diet and sugar consumption and regular visits to the dentist are more

emphasized in children with high risk of caries. The provision of this information should be individualized and carried out continuously to mothers and children. The knowledge of mothers about dental health is very important because it is an important factor in influencing health and disease of the child's teeth. The importance of the role of parents in maintaining oral and dental hygiene in their children is very necessary.

5. Limitation of The Study

The factors that influence severity of dental caries in this study is only nutritional status, while there are many other factors that severity of dental caries In-School-Age Children.

6. Conclusions

Based on the results that has been obtained in this study, it can be concluded as follows:

- a. This study obtained a statistically insignificant correlation between the severity of caries and nutritional status in students of SD Negeri Tidung Makassar.
- b. Dental caries is still one of the serious health problems in children where the severity of caries "very high" has the highest percentage in this study.
- c. Dental caries is a multifactorial etiology of disease, which there are several factors that cause the formation of caries lesions such as host or host factors, agents or microorganisms, substrate or diet and time factors.
- d. Preventive for dental caries should include strategies to provide appropriate nutrition, especially in children and adults, in addition to promoting oral and dental health itself. Significant success in reducing the prevalence of caries with prevention programs in schools and further education as well as motivation from parents is very necessary.

7. Abbreviations

BMI: Body Mass Index

SD : Sekolah Dasar = Elementary School

8. Competing interest

The authors declare that they have no competing interest.

9. Recommendation

Based on the results of this study, it is recommended to prevent early caries in children by giving education to parents and children on how to maintain dental and oral hygiene, hygiene, improving dietary patterns, bending periodic visits to the dentist.

References

- [1]. Supariasa, I., B. Bakri, and I. Fajar, *Penilaian Status Gizi Edisi Revisi*. Jakarta: Penerbit Buku Kedokteran ECG, 2012.
- [2]. Risesdas, Riset kesehatan dasar (Risesdas) 2013. Lap Nas, 2013. **2013**(1): p. 384.
- [3]. Yen, C. and S. Hu, Association between dental caries and obesity in preschool children. *Eur J Paediatr Dent*, 2013. **14**(3): p. 185-9.
- [4]. Arrow, P., J. Raheb, and M. Miller, Brief oral health promotion intervention among parents of young children to reduce early childhood dental decay. *BMC public health*, 2013. **13**(1): p. 245.
- [5]. Parkar, S.M. and M. Chokshi, Exploring the association between dental caries and body mass index in public school children of Ahmedabad city, Gujarat. *SRM Journal of Research in Dental Sciences*, 2013. **4**(3): p. 101.
- [6]. Menkes RI, Keputusan Menteri Kesehatan RI: Standar Antropometri Penilaian Status Gizi Anak. 2011, Jakarta.
- [7]. Klein, H., C.E. Palmer, and J.W. Knutson, Studies on dental caries: I. Dental status and dental needs of elementary school children. *Public Health Reports (1896-1970)*, 1938: p. 751-765.
- [8]. Wawointana, I.P., A. Umboh, and P.N. Gunawan, Hubungan konsumsi jajanan dan status karies gigi siswa di SMP NEGERI 1 Tareran. *e-GIGI*, 2016. **4**(1).
- [9]. Ramayanti, S. and I. Purnakarya, Peran makanan terhadap kejadian karies gigi. *Jurnal Kesehatan Masyarakat Andalas*, 2013. **7**(2): p. 89-93.
- [10]. Swaminathan, K., et al., Correlation Between Body Mass Index and Dental Caries Among Three-to 12-Year-Old Schoolchildren in India: A Cross-Sectional Study. *Cureus*, 2019. **11**(8).
- [11]. Willerhausen, B., et al., Association between body mass index and dental health in 1,290 children of elementary schools in a German city. *Clinical oral investigations*, 2007. **11**(3): p. 195-200.
- [12]. Batista, L.R.V., E.A.M. Moreira, and A.C.T. Corso, Food, nutritional status and oral condition of the child. *Revista de Nutrição*, 2007. **20**(2): p. 191-196.
- [13]. Muliadi, Peranan Gizi yang Berkualitas dalam Mencegah Malnutrisi pada Anak Sekolah Dasar. *Jurnal Samudra UNM*, 2007.