

Nutritional status and caries at children in Tajinan Sub-District Malang District

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Abstract

Background: Caries is a multifactorial disease that can happen to all ages, caries and malnutrition are problems that often happens to children and can affect general health. Caries can be related to malnutrition. Caries can make the child uncomfortable and lower the child's appetite, thus leading to the decrease of nutritional intake which can make the child's tooth more susceptible to caries and make the existing caries more severe, then it's back to the beginning where the worsened caries will make the child's appetite worse and so on.

Objectives: To know the relations between caries and nutritional status at children in Tajinan sub-district Malang district.

Methods: 80 elementary students were selected from two elementary school at Tajinan sub-District Malang District. Then the nutritional status is measures by anthropometric, using the body mass index for age (IMT/U) and Z-score and the level of caries is measured by using DMF-T and def-t index.

Conclusion: There is an inverse relationship between the two variables (nutritional status and caries) in children, which means the lower the child's nutritional status the higher the caries is and vice versa. The Spearman significancy is $p=0,012$ ($P<0,05$). Conclusion: There is a relationship between nutritional status and caries.

Keywords: Nutritional Status; Malnutrition; Children; Caries

1. Introduction

Caries is one of the most common diseases in children worldwide and has an impact on children's overall health. Dental caries in children often goes untreated and the effects can be felt immediately and in the long term on the quality of life of the child (1). The effects of dental caries include pain in the oral cavity, orthodontic problems, and enamel defects, in addition to having an impact on speech, eating and increasing the risk of caries in permanent teeth (2).

Children have a high risk of chronic infection in their teeth, caries is one of the possible infection (3), According to data from the Ministry of Health, the prevalence of caries in Indonesia is 88.8% with the highest age group being 5-9 years old (67.3%) ,in addition, based on Basic Health Research (RISKESDAS) 2018, the prevalence of cavities in children is still very high, which is approximately 93%, which means that only 7% of children in Indonesia are free of dental caries (4).

Caries itself is a common chronic infection that occurs due to cariogenic bacteria, especially Streptococcus Mutans, which metabolizes sugar into acid and triggers demineralization of tooth structure (5). Caries is a disease which aetiology is multifactorial. At present the aetiology accepted is based on a four factor theory that includes

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microorganism, oral environment, host and time (6). Host factors come from humans themselves, for an example a person's nutrition.

The nutritional status of an individual can be defined as the result between nutritional intake received and the nutritional demands, and should allow for the utilization of nutrients to maintain reserves and compensate for losses (7). Indonesia is one of the countries with a very high prevalence rate of stunting in the world, with a prevalence of 30.8% based on the WHO report (8). Where stunting is a nutritional problem that arises from the result of chronic or recurrent undernutrition (9). In addition, a report from UNICEF states that the number of overweight and obese people is increasing across all age and income groups (10).

Undernutrition can lower salivary secretion, changes salivary composition, lower salivary buffer capacity, and lower salivary flow. It also can cause impaired enamel formation which can lead to hypoplastic enamel and can cause malposition of teeth in dental arch. (8,11,12). Where as obesity also associated with a decreased flow rate of stimulated saliva and changes in salivary composition (13). Where those changes can make a person more vulnerable to developing caries.

2. Material and methods

The observational analytic with cross sectional approach in elementary school children at 2 school in Tajinan sub-district. The study uses 80 samples using simple random sampling

2.1. Nutritional Status

The nutritional status data was obtained from Tajinan public health center by using anthropometric measurement which includes the child's weight and height. Then the nutritional status is determined by calculating the z-score based on the index of body mass index for age (IMT/U) using Indonesian's regulation of the minister of health number 2 of 2020.

2.2. Dental Caries

The data on dental caries was obtained by carrying out dental health examination using disposable sonde, dental mirror, and london college tweezer. Then the dental caries is measured using dmf (decay, missing and filled) and DEF (decay, extraction and filled) index by summing the component of each index.

3. Results and discussion

The study was conducted on 80 samples in two elementary school in Tajinan sub-district. Using simple random sample to observe the relationship between nutritional status and caries.

3.1. Nutritional Status

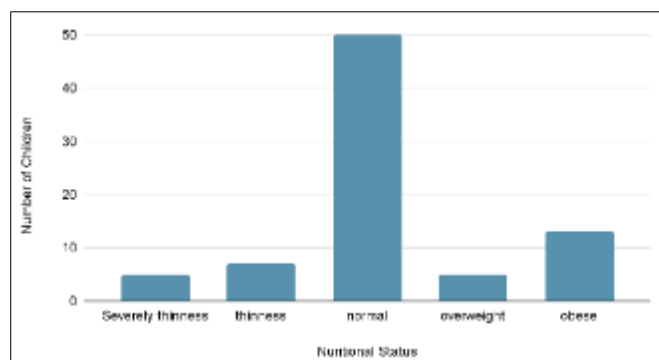


Figure 1 Distribution of nutritional status

From 80 samples we found that there are 5 children who falls to the category of Severely thinness, 7 children who falls to the thinness category, 50 children who falls to normal category, 5 children who falls to overweight category and 13 children who falls on obese category.

3.2. Caries

3.2.1. Caries Distribution and Gender

Table 1 Caries distribution based on gender among 80 samples

Gender	DMF and def score
Male	5.34
Female	4.23

From 80 samples we found that the total of tooth damage that was caused by caries is higher in male than in female.

3.2.2. Caries and Age

Table 2 Caries distribution based on Age among 80 samples

Age	DMF Score	DMF Index	def Score	def Index
6	1	Very Low	7	Very High
7	0.35	Very Low	5.41	High
8	1.29	Low	4.14	High
9	1.92	Low	3.54	Medium
10	1.67	Low	2	Low
11	1.75	Low	0.33	Very Low
12	0	Very Low	0	Very Low

From 80 samples we found that there is a trend or tendency that the DMF score increase with age, while the def score decrease with age.

3.2.3. Caries and Nutritional Status

Table 3 Caries distribution based on Nutritional Status among 80 samples

Nutritional Status	DMF Score	def Score	DMF and def Score
Severely Thinness	0.80	6.40	7.20
Thinness	1.14	3.71	4.86
Normal	1.48	3.58	5.06
Overweight	1.40	2.20	3.60
Obese	1.69	1.38	3.08

From 80 samples we found that there is a trend or tendency that the total of tooth damage that was caused by caries increased with undernutrition (severely thinness and thinness) and decreased with overnutrition (overweight and obese).

3.3. Correlation Result of Nutritional Status and Caries

Table 4 Correlation result of nutritional status and caries among 80 samples

	Correlation Coefficient	P	N
Spearman's rho	-0.278	0.012	80

Statistically significant ($P < 0,05$).

Based on the result of the correlation with Spearman's test, it's found that there is a significant relationship between nutritional status and caries. The negative result in the correlation coefficient signifies that the relationship between the two variable is an inverse correlation, inverse correlation indicates that the two variables tend to move in opposite direction or in this case the lower the nutritional status the higher the incidence of caries and vice versa.

4. Discussion

From the study data (table 1) it's found that the female subject's total tooth damage caused by caries is lower than the male. This may be because girls mature faster which can be a trigger for them to start caring for the oral and teeth health earlier. Besides that, they are believed to develop a sense of shame and an attraction to the opposite gender earlier so they strive to look clean and beautiful to attract the opposite gender (14).

DMF and def scores describe caries in a person's oral cavity, where the higher the value of these two scores, the more caries, fillings and loss of teeth due to caries. Generally in the data (table 2) there is a trend or tendency where the def score is higher than the DMF score. This may be due to the fact that the enamel on primary teeth is thinner and more permeable and overall less dense when compared to the enamel of permanent teeth, the enamel of primary teeth is also softer and more easily worn. Overall the enamel of primary teeth is more susceptible to the formation and development of carious lesions when compared to the enamel of permanent teeth (15). This may explain the generally lower DMF score compared to def score in the data.

From the study data (table 2), it was found that with increasing age, the average DMF score will also increase while the def score decreases. This may occur because as the age of the child increases, the number of permanent teeth that grow will also increase, and exposed in the oral cavity longer so that the possibility of exposure to food debris is greater so that it is more susceptible to caries. Likewise with primary teeth, over time primary teeth will be replaced by permanent teeth so that there are fewer and fewer primary teeth in the child's oral cavity which causes the def score to drop.

From the study we can see that overnutrition or above normal nutritional status does not necessarily make someone more susceptible to caries. This result is in line with the previous study by Perez at 2020 and Shi at 2022 (16,17). This is probably because children with obesity is found to have higher frequency in eating than other groups of nutritional status. Where chewing especially chewing hard food can cause salivary production to increase thus affecting self cleansing of the oral cavity, besides that it was also found that obese children have high leptin levels (18). Leptin is a hormone protein in saliva that can affect the colonization of oral bacteria that cause caries, leptin can prevent attachment between *S. mutans* and tooth (19).

Children with undernutrition are observed to have atrophy in salivary gland that causes the salivary secretion in the oral cavity to decrease there is atrophic changes including shrinkage of acinar cells, loss of cytoplasmic material and degenerative changes in subcellular organelles, changes in salivary composition that lower salivary buffer capacity, and also the decrease in salivary flow because of the difference body size, this difference affect the size of salivary gland, and lack of masticatory activity (8,20). The decrease in salivary flow can also affect salivary composition, the saliva becomes viscous thus leading to the decrease of pH and changes in the organic and inorganic component, it can also lower salivary buffer capacity because the salivary bicarbonate system is dependent on salivary flow (21). Children with undernutrition is also prone to impaired enamel formation which can lead to hypoplastic enamel, and delayed eruption (22). Undernutrition can also cause a reduction in the length of the base of the skull, the height of the jaw, the width of the upper and lower jaw and the height of the face which can contribute to lack of space for tooth eruption resulting in malposition of teeth in dental arch, where according to Dayakata, Herawati and Darwis research in 2019 can have significant relationship with caries (12,23).

Based on the Spearman's test analysis (table 4) it is found that there is a significant relationship between nutritional status and caries with an inverse correlation where as one variable increases the other variable decrease. This result is probably because the effect of dental caries includes pain in oral region, orthodontic problem, enamel defect, and can

also affect speech, and eating (2). Caries can affect eating because of pain and uncomfortable feeling it causes that can lower children's appetite. The unbalanced food intake is one of the direct causes of nutritional problem (24). The lack of nutrition can lower body immune system, when that happens the body is more susceptible to infectious disease, if one got a gastrointestinal infection the body's nutrition absorption will be disturbed, this will exacerbate the condition of undernutrition (25). Undernutrition can lower salivary secretion, changes salivary composition, lower salivary buffer capacity, and lower salivary flow. It also can cause impaired enamel formation which can lead to hypoplastic enamel besides that undernutrition can also cause malposition of teeth in dental arch. (8,11,12). Where these things can cause a person to become more susceptible to dental caries and further accelerate or worsen the progress of existing caries thus affecting the eating process and worsen the person's nutritional status.

The results of this study are in line with the results of several previous studies on related topics, such as in research conducted by Murphy in 2022; Yani in 2015; Kariya and Singh in 2022; Folayan and his friends in 2019; Setijanto and his friends in 2018, where these studies suggest that there is a relationship between nutritional status and dental caries (26–30).

5. Conclusion

There is a relationship between nutritional status and caries with an inverse correlation. This indicates that the two variables tend to move in opposite direction or in this case the lower the nutritional status the higher the incidence of caries and vice versa.

Providing information which can be used as data and references to improve caries prevention programs or to improve nutritional status improvement programs.

Compliance with ethical standards

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Disclosure of Conflict of interest

No major conflict of interest to be disclosed.

Statement of ethical approval

The study was approved by the faculty of dentistry at Airlangga University (NO. 809).

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