

Relationship between Vitamin A and Vitamin C intake on Dental Caries

Amilia Yuni Damayanti^{1*}, Nurul Marfu'ah², Siti Salamah³, Fiki Husna⁴

{ amilia@unida.gontor.ac.id }

^{1,3,4}Nutrition Department, Faculty of Health Science, University of Darussalam Gontor, Ngawi.
²Pharmacy Department, Faculty of Health Science, University of Darussalam Gontor, Ngawi.

Abstract. Background Dental caries is a multifactorial disease with a number of risk factors. Dental caries in children become important because it can cause chewing disorders which in the long run can lead to malnutrition because children have difficulty chewing their food. This study aims to analyze whether the level of intake of vitamin A and vitamin C is associated with the incidence of dental caries in schoolchildren. **Methods** The design of this study was an observational study with a cross-sectional design. This research was conducted at Madrasah Ibtidaiyah, Ngawi. The study period starts from April - May 2019. The assessment of dental caries is evaluated from the DMF-T index. The instrument used to determine food intake, vitamin A and vitamin C was a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) form and the Nutrition Adequacy Rate Form. Primary data in this study were collected by interviewing respondents directly with questions that have been provided. **Results** Statistical test results indicate a significant relationship between the intake of vitamin A and vitamin C on dental caries status in MI children ($p = <0.05$). **Conclusions** Vitamins and minerals play a role in dental caries and are needed in the process of tooth formation. Deficiency of vitamins can increase the risk of dental caries.

Keywords: caries, intake, vitamin A, vitamin C

1. Introduction

Dental caries is important because it can cause chewing dysfunction, this disorder can make children lazy to chew which if continued in the long term can be at risk of malnutrition that affects the activity and health of children (Hanum et.al 2019). Based on the results of RISKESDAS 2018 57.6% of Indonesian people have dental and mouth problems but only 10.2% have received medical services (Riskesdas, 2018). Caries in children is currently receiving less attention from parents on the assumption that the tooth will be replaced by permanent teeth, but the experience of caries is related to the development of dental caries in the future (Hanum et.al, 2019).

Dental caries is a multifactorial disease and has many risk factors, several risk factors that cause dental caries include plaque with acidic pH, behavior and knowledge, food consumption and cariogenic beverage (Hanum et.al, 2019; Talibo et.al, 2016; Fitriati et.al, 2017). Nutrition, diet and dental health of children are particularly related for children in the growth and development phase. Good and proper nutrition is important to support the health and growth of teeth on the other hand dental health is important to support adequate nutrition intake (Agung & Nurlitasari 2017).

Dental caries itself is a dental and oral health disorder that is formed due to the presence of food scraps attached to the teeth and ultimately causes calcification so that the impact on porous and cavities (Widayati et.al, 2014). In these foods, the activity of microorganisms in shared carbohydrates causes damage to the teeth starting with enamel, dentin and cementum (Mariati, 2015).

Nutrients affect human growth and development as well as the development and growth of teeth. Healthy tooth growth can occur if all the nutrients needed for its formation are available in sufficient quantities. The formation of teeth is supported by the intake of Vitamin A and Vitamin D. Vitamin A is needed in the formation of tooth enamel while vitamin D is needed for the growth of the dentin layer of teeth. Vitamin C deficiency can damage teeth, swelling of the oral cavity, gingival bleeding and eventually tooth loss due to the result of collagen hydroxylation (Agung & Nurlitasari, 2017).

Vitamins and minerals affect the formation of dental caries. In the tooth formation phase, vitamin A deficiency can interfere with the function of ameloblast cells and vitamin C deficiency can cause reduced odontoblast response to induction that comes from ameloblast so that the formation of odontoblast is imperfect (Zakiyah et.al, 2017). In addition, some vitamins and minerals that affect dental caries include are vitamins A, B, C and D, and minerals are calcium, phosphorus, fluorine, and zinc. Vitamin A deficiency can damage the formation of enamel and dentin, vitamin C deficiency can cause odontoblast degeneration (Ramayanti & Purnakarya, 2013).

2. Instruments and Methods

2.1 Design, Place and Time

The design of this study was an observational study with a cross-sectional design. This research was conducted at Madrasah Ibtidaiyah Nurussalam, Ngawi. The study began from April to May 2019. The independent variable in the study was the intake of vitamin A and vitamin C, while the dependent variable was dental caries.

2.2 Instruments

The assessment of dental caries in this study was evaluated from the DMF-T index. The instrument used were dental diagnostic tools such as mouth glass, tweezers, masks and gloves, 70% alcohol, cotton, and DMF-T examination sheets. The instrument used to determine food intake, vitamin A and vitamin C was a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) and 24-hour food recall form and the Nutrition Adequacy Rate Form. Primary data in

this study were collected by interviewing respondents directly with questions that have been provided.

2.3 Population and Research Subjects

The targeted population in this study was school-age children with 96 primary school students MI Nurussalam in Ngawi as the subjects. The inclusion criteria in this study were elementary school children aged 7 - 12 years and the exclusion criteria were elementary school children who were not willing to fill out the questionnaire.

2.4 Data Collection and Analysis

The dental caries value is determined by the DMF-T index, the data is obtained by dental examination by a dentist and written in the examination form. Data on vitamin A and vitamin C intake were obtained by conducting direct interviews with respondents using the SQ-FFQ form and the 24-hour food recall form. Vitamin A and vitamin C data are processed using Nutrisurvey software and the Indonesian Food Composition Table (TKPI). Then the data is analyzed with a computer program.

Statistical tests began with the Shaphiro-Wilk test to determine the distribution of data (normal = $p > 0.05$). Chi-square test was used to analyze the relationship between vitamin A and vitamin C intake with dental caries. This study has received ethical permission from the RSUD Dr. Moewardi Fakultas Kedokteran Universitas Sebelas Maret with Number: 393 / III / HREC / 2019.

3. Results and Discussion

3.1 Results.

Food intake data in this study were assessed using the SQFFQ method which records food intake for one month. Questions given included the frequency of 7 categories of food classification during the past month, the categories and the amount of food consumed by respondents can be seen in table 1.

Table 1. Categories and Amount of Food Consumed by Respondents

Food Category	Amount of Food (Type)
Carbohydrate Source	13
Sources of Animal Protein	21
Vegetable Protein Source	6
Source of fat	3
Vegetables	19
Fruits	17
Assortment and snacks	19

3.2 Discussion.

These results indicate that there was a significant correlation between vitamin C intake and the incidence of dental caries statistically. Strengthened by research Hendarto (2015) which said that vitamin C can maintain healthy teeth in the formation of a collagen and vitamin C deficiency can have an impact on the disruption of dental and oral health. In another study.

This study proves that the lack of vitamin C intake causes dental caries tends to be higher than the respondent's vitamin C intake which is sufficient, seen from the amount of children who consume vitamin C intake but experience "high" dental caries less than children who consume less vitamin C, as many as 63,5% are in caries level "high". Looked from the questionnaire, there are still many respondents rarely for consume fruits and vegetables, this makes antioxidants that function to destroy free radicals will be reduced.

Vitamins are complex substances that the body needs in small amounts and have functions that help regulate or process the body's metabolism. Vitamins are one of the substances that the body needs, the need for vitamins in small amounts does not make it a trivial thing because deficiency of vitamin intake can affect the onset of illness and disruption of the body's metabolism because its function cannot be replaced by other compounds (Permana et.al, 2018).

Dental caries, which is a disorder of the teeth and mouth, is caused by many factors, including vitamin and mineral deficiencies, some vitamins that are known to be associated with dental caries, including vitamins A, B, C, and D and minerals, namely calcium, phosphorus, flour, and zinc (Zakiyah et.al, 2017; Ramayanti & Purnakarya, 2013). Vitamins have physiological functions in the growth of bones and teeth. Vitamin A is needed in building strong bones and teeth (Agung & Nurlitasari, 2017). Vitamin C acts as a collagen maker which is a protein making up skin tissue, joints, bones and other supporting tissues (Permana et.al, 2018).

Teeth that are in the pre-eruptive phase are affected by the nutritional status of the body. Malnutrition affects oral structure and its development. Things that have been linked to abnormalities in the mouth structure are a deficiency of vitamin D, vitamin C, vitamin B, and vitamin A and lack of protein-energy. Vitamin A deficiency plays a role in decreasing epithelial tissue development, impaired tooth formation, hypoplastic enamel. The effect of vitamin C deficiency causes the irregular formation of dentin, changes in the pulp of bleeding gum teeth, delayed wound healing and formation of damaged collagen (Sheetal et al., 2013).

References

- [1] Agung IGA, Nurlitasari DF. Asupan Gizi, Pola Makan dan Kesehatan Gigi Anak. *Interdental: Jurnal Kedokteran Gigi* . 2017 Jun 28; 13(1): hal 21-24.
- [2] Fitriati N, Hernawan A, Trisnawati, E. Perilaku Konsumsi Minuman Ringan (Softdrink) dan pH Saliva dengan Kejadian Karies Gigi. *Unnes Journal of Public Health*. 2017; 6(2): 113-122.
- [3] Hanum NA, Hamid A, Ismalayani. Tingkat Risiko Karies Gigi Permanen Anak-Anak Taman Kanak-kanak di Kota Palembang di Masa Datang. *Jurnal Kesehatan Gigi dan Mulut*. 2019 Jun; 1(1) : 23-28.
- [4] Hasil Utama Riskesdas 2018. Kementerian Kesehatan Badan Penelitian dan Pengembangan Kesehatan. Available from: <http://www.depkes.go.id/>
- [5] Hendaro A. Nutrisi Dan Kesehatan Gigi-Mulut Pada Anak. *Jurnal Pediatri*. 2015; 17(1) : 71-75.
- [6] Mariati NW. Pencegahan dan Perawatan Karies Rampan. *Jurnal Biomedik (JBM)*, 2015 Maret; 7 (1): 23-28.
- [7] Permana YE, Santoso E, Dewi C. Implementasi Metode Dempster-Shafer untuk Diagnosa Defisiensi (Kekurangan) Vitamin pada Tubuh manusia. *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*. 2018 Maret; 2 (3): 1194-1203.
- [8] Ramayanti S, Purnakarya I. Peran Makanan Terhadap Kejadian Karies Gigi. *Jurnal Kesehatan Masyarakat*. 2013 Sept; 7 (2): 89-93.
- [9] Sheetal A, Hiremath VK, Patil AG, Sajjanetty S, Kumar SR. Malnutrition and its Oral Outcome – A Review. *Journal of Clinical and Diagnostic Research*. 2013 Jan; 7 (1): 178-180.
- [10] Talibo RS, Mulyadi NS, Bataha Y. Hubungan Frekuensi Konsumsi Makanan Kariogenik dan Kebiasaan Menggosok Gigi dengan Kejadian Karies Gigi pada Siswa Kelas III Sdn 1 & 2 Sonuo. *e-Journal Keperawatan (e-KP)*. 2016 Feb; 4 (1): 1-8.
- [11] Widayati N. Faktor yang Berhubungan dengan Karies Gigi pada Anak Usia 4–6 Tahun. *Berkala Epidemiologi*. 2014 Mei; 2 (2): 196-205.
- [12] Zakiyah F, Prijatmoko D, Novita M. Pengaruh Status Gizi terhadap Erupsi Gigi Molar Pertama Permanen Siswa Kelas 1 SDN di Kecamatan Wilayah Kota Administrasi Jember. *e-Jurnal Pustaka Kesehatan*. 2017 Sept; 5 (3): 469-474.