

Association of Malnutrition Based on Body Mass Index with A Presence of Oral Disease

Meta Maulida Damayanti*, Yuniarti**, Caecielia Makaginsar***, Siska Nia Irasanti****

*Pathology Anatomy Department, Faculty of Medicine, Universitas Islam Bandung

**Anatomy Department, Faculty of Medicine Universitas Islam Bandung

***Medical Education, Bioethics, and Humanity Department, Faculty of Medicine Universitas Islam Bandung

****Public Health Department, Faculty of Medicine, Universitas Islam Bandung

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ABSTRACT

Background: To maintain oral health, the body needs good nutrition. The relationship between nutritional status and oral health conditions is very complex, influenced by many factors, both internal and external. Inadequate nutrition can increase the risk of oral disease. **Objective:** To analyze the association between malnutrition with bleeding gum, tooth mobility, and toothache. **Methods:** This study used the cross-sectional analytic observational design. Data were collected from the Manarul Huda Islamic Boarding School in Bandung, which 38 participants were selected based on criteria. Body mass index perform to asses nutritional status, while oral disease was collected through form data. Analysis's data using chi-square and SPSS 23 version. **Results:** Classification of body mass index the highest in undernutrition group (47.4%) and oral disease the highest for bleeding gum (44.7%), there was no significant association between malnutrition and oral disease with p value >0.05 . **Conclusion:** Early analysis of nutritional assessment reduced oral disease. Further assessment will be needed to determine the long-term oral health effect of malnutrition.

Keywords: Body mass index, malnutrition, oral disease

Correspondence: Meta Maulida Damayanti, Pathology Anatomy Department, Universitas Islam Bandung, Taman Sari 22 Bandung, West Java, Indonesia, Email: meta.fkunisba@gmail.com

INTRODUCTION



Malnutrition term is used to describe deficiency, excess, or imbalance of various nutrients, resulting in adverse effects on body composition, homeostasis, and functions.¹ In modern times, malnutrition is still a major public health issue. A greater chance of dying from degenerative diseases in middle age, but being underweight increases the risk of dying from infectious diseases at the young age.² Linear growth spurts can occur at any age, despite the fact that the first 1000 days are crucial for future growth and development, as well as the most essential time for intervention to prevent stunting, linear growth spurts can occur at a later age and may restore stunting, especially throughout adolescence, providing another opportunity for focused interventions to break the genetic cycle of starvation.³ Many developing countries have had rapid improvements in nutritional status in recent decades. However, the prevalence of malnutrition remains a serious problem as well as obesity is increasing substantially.⁴ Infection and malnutrition are common in countries with inadequate health care policies particularly in remote village and show a synergistic relationship. Malnutrition increases infection-related morbidity and mortality.⁵

Children with poor nutritional status or malnutrition have a higher probability of dental caries than children with normal nutritional status.⁶ The number of dental functional units were significantly associated with poor nutritional status.⁷ The bodies requires certain essential elements in small amounts and their absence or excess can be generated by severe body function failure and even death, because these essential elements directly affect the body's metabolic and physiological processes. Malnutrition can cause to decreased immunity, increased susceptibility to various oral and systemic diseases, impaired growth and development both physically and mentally, and decreased function. Nutrition affects oral health, craniofacial development and maintenance of the oral soft tissues.⁸ Malnutrition is common among elementary school children. Appropriate

screening in school health programs and proper nutrition in educational programs can be recommended as early as possible.⁹ To assess nutritional status, body mass index measurement is commonly used. Body mass index was carried out to identify the influence of diet, namely healthy food versus unhealthy food.¹⁰ Poor intake and nutritional status, leading to decreased resistance to infection and consequently an increase in disease burden.¹¹ Many factors influence oral disease such as tooth loss, including oral hygiene practices, trauma, bad habit such as smoking, socioeconomic status and individual background. Tooth loss interferes with the quality of life, including eating process because most foods require a perfect masticatory function.¹²

Many studies have analyzed the relationship between malnutrition and oral health in the elderly. Malnutrition and poor oral health are a major concern for global health, especially among the older population, while in the pediatric population studies are still rare. In children, it is an effective period in analyzing the association between malnutrition and the presence of oral diseases so that preventive measures can be taken immediately. Further research is needed to elucidate the role of malnutrition in oral disease.

MATERIALS AND METHODS

This study was conducted at Manarul Huda Islamic Boarding School in Bandung on early March 2021 to 38 students, aged 9–14 years and were in the fourth until nine grades of primary school. The study is an analytic observational with a cross sectional design. Prior to data collection, all participants initially were explained the purpose and objective of the study and the procedures involved in participating, and declaring confidentiality of the data and anonymity of subjects and permission was taken to conduct this study, and then participants was asked by filling an informed consent.

BMI calculations were used for assess nutritional status. Measurement of height and weight was taken, and then the weight of BMI (kg)/height (m²) was calculated. Measurements are based on the World Health Organization (WHO) classification into underweight (≤ 18.4 kg/m²), normal (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) and obese (≥ 30.0 kg/m²). Body weight is measured using a body scale. Prior to the start of the examination, the scale was tested for accuracy and calibrated. Heavy clothes and accessories were asked to be removed from respondents. The respondent is instructed to stand on the scale after it has been turned on and appears to be zero. The weight is then recorded. The procedure was repeated 2 to 3 times and measurements were recorded by calculating the average. Height is measured using a stature meter. Respondents were asked to stand in an anatomical position. The respondent's head is horizontally positioned in the Frankfort area; the head plate is lowered so that it touches the top of the respondent's head. This procedure is repeated 2 times and measurements are recorded by calculating the average.

In this kind of pandemic, oral disease obtained by the primer data collection from data form of oral health complaint that consists of presence: bleeding gum, tooth mobility, and toothache. The data form consisted of questions about the participant's current oral health condition, which were identified from perceptions of perceived oral health problems. The participants identified oral disease based on symptomatic, namely bleeding gums, tooth mobility, or toothache. Bleeding gums can be assessed when brushing teeth. Blood that comes out when brushing teeth or when touched by objects that enter the mouth. Tooth mobility are identified by feeling the teeth loose when pressing with the tongue or fingers. Toothache is identified based on the description of pain that comes and goes, pain when chewing food, a toothache that will disappear spontaneously without professional treatment, or severe toothache so that can't eat and even sleep. The

definition of each disease was explained in advance to all participants on the information sheet distributed.

SPSS 23.0 software was used to process and analyze the data. P value < 0.05 were considered as significant. 95% confidence intervals were reported.

Ethical issue was approval obtained from The Health Research Ethics Committee (reference: 08/KEPK-Unisba/XII/2020), Faculty of Medicine, Universitas Islam Bandung.

RESULTS

Data on the body mass index are shown in Table 1. There were more participants in the underweight (47.4%) classification than participants in other classifications.

Table 1. Body Mass Index

Classification	BMI	n
Under weight	≤ 18.4	18 (47.4%)
Normal	18.5-24.9	17 (44.7%)
Over weight	25-29.9	1 (2.6%)
Obesity	≥ 30.0	2 (5.3%)

Table 2 present the oral disease among participants. Toothache (44.7%) was significantly more than other oral diseases. Rate of tooth mobility was the least.

Table 2. Oral disease

Oral disease	Presence	Absence
Bleeding Gum	16 (42.1%)	22 (57.9%)
Tooth mobility	14 (36.8%)	24 (63.2%)
Toothache	17 (44.7%)	21 (55.3%)

Associations was strongest within a bleeding gum and undernutrition status, but statistically no a significant interaction was apparent ($p=0.238$). There were no statistically significant differences for those in malnutrition and oral disease. None of the potential nutritional status has a consistent effect on the risk of developing oral disease. (Table 3)

Table 3. Associations between malnutrition and presence of oral disease.

Oral disease		Normal	Malnutrition	P-value
Bleeding Gum				
Presence	1 6	6	10	0.238
Absence	2 2	11	11	
Tooth mobility				
Presence	1 4	6	8	0.78
Absence	2 4	12	12	
Toothache				
Presence	1 7	7	10	0.821
Absence	2 1	11	10	

DISCUSSION

Our study analyzed the association of malnutrition with oral disease. We found that the relationship between malnutrition and oral disease did lead to a body mass index in the underweight category. Similar to other study, we found that the effects of undernutrition were stronger with dental caries. Malnutrition is prone to dental and oral diseases, and conversely, poor oral health can lead to malnutrition. Dental caries, which is an oral disease, and nutritional status showed a different relationship in the studied population, influenced by the sociodemographic profile of the family. Malnutrition can affect the body's homeostasis, so that it can indirectly lead to the development of oral disease, by reducing resistance to microbial biofilms and reducing tissue healing ability. Studies conducted by Sheetal et al. have shown that enamel hypoplasia, salivary gland hypofunction and changes in salivary composition may be mechanisms of caries-related malnutrition.¹³ Malnutrition negatively affects the development of craniofacial structures and teeth. Deficiency of nutrients during amelogenesis and dentinogenesis leads to the destruction of tooth structure, which tends

to be a source of cariogenic bacteria. Improper nutrition deprives children of essential nutrients for growth and development, including the structure of the oral cavity.¹⁴ Malnutrition and oral disease in early childhood are persistent and interrelated global health challenges, especially in remote villages with inadequate health facilities. However, statistically it did not show a significant relationship, this could be influenced by the number of research subjects and the method of collecting data based on respondents' complaints.

Dental and oral disease predicts poor nutritional status.¹⁵ In this study, many students complained about bleeding gum, especially when brushing their teeth, which made them panic when blood came out when gargling. However, few of them are aware that this can happen because of problems in the mouth such as dirt in the form of plaque and calculus caused by poor oral hygiene. In addition to bleeding gum, Inadequate oral prophylaxis also causes tooth mobility. If there is tooth mobility then the possibility of inflammation of the gums even due to periodontitis. Periodontitis is a chronic inflammatory condition that develops when a dysbiotic microbial plaque biofilm forms under the gingival margin. The biofilm and the deleterious immune inflammatory response are a high risk for the damaging process. Other causes are individual genetics, lifestyle, bad habits, nutritional intake and environmental factors. Dietary nutrients are necessary for survival because they provide an important source of energy in the form of macronutrients, essential cofactors in the form of micronutrients, which influence the action of enzymes during the regulation of anabolic and catabolic processes in human cells. The role of micronutrients is very good in human physiology and reduces the risk of periodontal disease.¹⁶ Brushing teeth one of the hygiene practices that need to be considered. Another study stated that an increased risk of periodontitis, DMFT (lost teeth) was associated with an increase in Body Mass Index.^{17,18}

Children's oral and dental common problems include soft tissue lesions, inflammation, odontogenic disease, dental caries, periodontal disease (gingivitis and periodontitis), malocclusion, and traumatic injury to teeth. While benign epithelial or soft tissue diseases, secondary trauma lesions, and oral signs and symptoms of systemic disease are all present in oral tissues, malignant lesions in children are uncommon.^{19,20} The oral health status of children, including tooth decay, periodontal disease, calculus, bleeding gums, and general oral hygiene are very poor.²¹ The study shows many students complain about toothache, especially when eating, this is mostly caused by cavities. Cavities that are not treated will cause them to expand and deepen, so it will press the nerves that cause toothache. Obesity and dental caries are complex disorders with similar risk factors. Studies around the world report mixed results on the relationship between dental caries and obesity.²² An oral examination can uncover signs and symptoms of immunologic illness, endocrinopathy, hematological conditions, systemic infections, and nutritional disturbances. The incidence of cavities is also possible by enamel dysplasia caused by malnutrition in the first years of life, and malnutrition-related oral manifestations. The mouth cavity is involved in a variety of physiological activities, including digestion, breathing, and phonation. Common symptoms are frequently preceded by oral signs. It is important to know the relationship between systemic health, one of which is malnutrition and oral health.²³

Few studies have explored whether the oral disease have impact of nutritional status, although this has been posited factors may influences. Unlike other studies, we found no difference in the association between malnutrition and the incidence of oral disease. Further research should be carried out aiming to explore the variables that might influence more closely; such as, diet and intensity of physical activity.

Limitations are recognized, due to the limited sample data and the pandemic period, there is a risk of primary data collection in the form of direct oral examination.

CONCLUSION

This study shows that malnutrition is common in children. Many participants complained about oral disease, especially toothache. Toothache is a symptom caused by various kinds of problems with the teeth. Poor dental health is significantly linked to malnutrition, despite the fact that no definitive causality can be shown. Health screening and proper nutrition education programs in Islamic Boarding School can be recommended as early as possible.

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